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INCH-POUND
MIL-PRF-24635F
21 April 2020
SUPERSEDING
MIL-PRF-24635E(SH)
w/INT. AMENDMENT 2
12 September 2018
MIL-PRF-24635E
15 September 2009

PERFORMANCE SPECIFICATION

COATING SYSTEM, WEATHER-RESISTANT, EXTERIOR USE

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification establishes the performance requirements for weather-resistant coating systems for use on metal, glass reinforced plastic, wood, and plastic/composite exterior surfaces.

1.2 Classification. Coatings are of the following types, classes, grades, and compositions, as specified (see 6.1 and 6.2).

1.2.1 Types.

a. Type II - Standard durability, silicone alkyd coatings with volatile organic compound (VOC) content not greater than 340 grams per liter (g/L) (2.8 pounds per gallon [lb/gal])

b. Type III - Standard durability, silicone alkyd coatings with VOC content not greater than 250 g/L (2.08 lb/gal)

c. Type IV - Standard durability, silicone alkyd coatings with VOC content not greater than 100 g/L (0.83 lb/gal)

d. Type V - High durability, polysiloxane coatings with VOC content not greater than 250 g/L (2.08 lb/gal)

e. Type VI - High durability, polysiloxane coatings with VOC content not greater than 100 g/L (0.83 lb/gal)

1.2.2 Classes. (See 3.5.13)

a. Class 1 - High gloss, not less than 85 gloss units (GU)

b. Class 2 - Semi-gloss, 45 to 60 GU

c. Class 3 - Low gloss, not greater than 12 GU

1.2.3 Grades.

a. Grade A - Standard pigmented

b. Grade B - Low solar absorbent (LSA) pigmented

Comments, suggestions, or questions on this document should be addressed to Commander, Naval Sea Systems Command, ATTN: SEA 05S, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to CommandStandards@navy.mil, with the subject line “Document Comment”. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.dla.mil.

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1.2.4 Compositions.

a. Composition 1 - One-component

b. Composition 2 - Two-component

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

FEDERAL STANDARDS

FED-STD-141 - Paint, Varnish, Lacquer and Related Materials: Methods of Inspection, Sampling and Testing

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-23236 - Coating Systems for Ship Structures

MIL-DTL-24441 - Paint, Epoxy-Polyamide, General Specification for

MIL-DTL-24441/20 - Paint, Epoxy-Polyamide, Green Primer, Formula 150, Type III

MIL-DTL-24441/29 - Paint, Epoxy-Polyamide, Green Primer, Formula 150, Type IV

(Copies of these documents are available online at https://quicksearch.dla.mil.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910 - Occupational Safety and Health Standards

40 CFR 60 - Standards of Performance for New Stationary Sources

40 CFR 63 - National Emission Standards for Hazardous Air Pollutants for Source Categories

40 CFR 82 - Protection of Stratospheric Ozone

40 CFR 261.24 - Toxicity Characteristic

(Copies of these documents are available online at www.ecfr.gov/.)

NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES (NIEHS)

National Toxicology Program (NTP) Annual Report on Carcinogens

(Copies of this document are available online at www niehs.nih.gov.)

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NAVAL SEA SYSTEMS COMMAND (NAVSEA) PUBLICATIONS

S9510-AB-ATM-010 - Nuclear Powered Submarine Atmosphere Control Manual

(Copies of the chapter titled "Material Control Program" are available from Commander, Naval Sea Systems Command, ATTN: SEA 05Z4, 1333 Isaac Hull Ave. SE Stop 5122, Washington Navy Yard DC 20376-5122 or by email request to commandstandards@navy.mil.)

T9070-AL-DPC-020/077-2 - NAVSEA Hazardous Material Avoidance Process

(Copies of this document are available online via Technical Data Management Information System (TDMIS) at https://mercury.tdmis.navy.mil/ by searching for the document number without the suffix. Refer questions, inquiries, or problems to: DSN 296-0669, Commercial (805) 228-0669. This document is available for ordering (hard copy) via the Naval Logistics Library (NLL) at https://nll.navsup.navy.mil. For questions regarding the NLL, contact the NLL Customer Service at nllhelpdesk@navy mil, (866) 817-3130, or (215) 697-2626/DSN 442-2626.)

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 600/4-79/020 - Methods for Chemical Analysis of Water and Wastes

EPA SW-846 - Test Methods for Evaluating Solid Waste: Physical/Chemical Methods

(Copies of these documents are available online at www.epa.gov.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

ASTM INTERNATIONAL

ASTM D185 - Standard Test Methods for Coarse Particles in Pigments

ASTM D523 - Standard Test Method for Specular Gloss

ASTM D562 - Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer

ASTM D609 - Standard Practice for Preparation of Cold-Rolled Steel Panels for Testing Paint, Varnish, Conversion Coatings, and Related Coating Products

ASTM D610 - Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces

ASTM D660 - Standard Test Method for Evaluating Degree of Checking of Exterior Paints

ASTM D661 - Standard Test Method for Evaluating Degree of Cracking of Exterior Paints

ASTM D714 - Standard Test Method for Evaluating Degree of Blistering of Paints

ASTM D823 - Standard Practices for Producing Films of Uniform Thickness of Paint, Coatings and Related Products on Test Panels

ASTM D1014 - Standard Practice for Conducting Exterior Exposure Tests of Paints and Coatings on Metal Substrates

ASTM D1210 - Standard Test Method for Fineness of Dispersion of Pigment-Vehicle Systems by Hegman-Type Gage

ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes

ASTM D1364 - Standard Test Method for Water in Volatile Solvents (Karl Fischer Reagent Titration Method)

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ASTM D1475 - Standard Test Method for Density of Liquid Coatings, Inks, and Related Products

ASTM D1849 - Standard Test Method for Package Stability of Paint

ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

ASTM D2369 - Standard Test Method for Volatile Content of Coatings

ASTM D2805 - Standard Test Method for Hiding Power of Paints by Reflectometry

ASTM D3359 - Standard Test Methods for Rating Adhesion by Tape Test

ASTM D3828 - Standard Test Methods for Flash Point by Small Scale Closed Cup Tester

ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films

ASTM D4400 - Standard Test Method for Sag Resistance of Paints Using a Multinotch Applicator

ASTM D5895 - Standard Test Methods for Evaluating Drying or Curing During Film Formation of Organic Coatings Using Mechanical Recorders

ASTM D6677 - Standard Test Method for Evaluating Adhesion by Knife

ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres

ASTM E1252 - Standard Practice for General Techniques for Obtaining Infrared Spectra for Qualitative Analysis

ASTM E1347 - Standard Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry

ASTM F718 - Standard Specification for Shipbuilders and Marine Paints and Coatings Product/Procedure Data Sheet

ASTM G154 - Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

ASTM G155 - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

ASTM G173 - Standard Tables for Reference Solar Spectral Irradiances: Direct Normal and Hemispherical on 37° Tilted Surface

(Copies of these documents are available online at www.astm.org.)

SAE INTERNATIONAL

SAE AMS-STD-595 - Colors Used in Government Procurement

SAE AMS-STD-595/10076 - Red, Gloss, Coast Guard Deck Red

SAE AMS-STD-595/10080 - Brown, Gloss, Seal Brown / NASA Safety Brown

SAE AMS-STD-595/10324 - Brown, Gloss, Tan

SAE AMS-STD-595/10371 - Brown, Gloss, Buff / Coast Guard Spar

SAE AMS-STD-595/11105 - Red, Gloss, OSHA Safety Red/DoT Highway Red

SAE AMS-STD-595/11136 - Red, Gloss

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SAE AMS-STD-595/12197 - Orange, Gloss, Coast Guard International Orange
SAE AMS-STD-595-12199 - Orange, Gloss, Coast Guard #40
SAE AMS-STD-595/12246 - Orange, Gloss, OSHA Safety Orange
SAE AMS-STD-595/13538 - Yellow, Gloss, DoT Highway Yellow, ANA 507
SAE AMS-STD-595/13655 - Yellow, Gloss, OSHA Safety Yellow, ANA 505
SAE AMS-STD-595/14062 - Green, Gloss, Deep Green
SAE AMS-STD-595/14088 - Green, Gloss, Olive Drab
SAE AMS-STD-595/14260 - Green, Gloss, Coast Guard Safety Green
SAE AMS-STD-595/14449 - Green, Gloss, Light Green
SAE AMS-STD-595/15044 - Blue, Gloss, Dark Blue, Insignia Blue, ANA 502
SAE AMS-STD-595/15123 - Blue, Gloss, Coast Guard Bright Blue
SAE AMS-STD-595/15182 - Blue, Gloss, Coast Guard Blue
SAE AMS-STD-595/15200 - Blue, Gloss, Light Blue
SAE AMS-STD-595/16076 - Gray, Gloss
SAE AMS-STD-595/16081 - Gray, Gloss, Dark Gray, ANA 513
SAE AMS-STD-595/16099 - Gray, Gloss, Coast Guard Blue Gray
SAE AMS-STD-595/16173 - Gray, Gloss
SAE AMS-STD-595/16187 - Gray, Gloss, Mechanic Gray Navy Standard
SAE AMS-STD-595/16251 - Gray, Gloss, Coast Guard Light Gray
SAE AMS-STD-595/16270 - Gray, Gloss
SAE AMS-STD-595/16307 - Gray, Gloss, Machinery Gray
SAE AMS-STD-595/16376 - Gray, Gloss
SAE AMS-STD-595/16555 - Gray, Gloss
SAE AMS-STD-595/17038 - Miscellaneous, Gloss, OHSA Black, ANA 515, 622
SAE AMS-STD-595/17043 - Miscellaneous, Gloss, Gold
SAE AMS-STD-595/17100 - Miscellaneous, Gloss, Purple
SAE AMS-STD-595/17142 - Miscellaneous, Gloss, OSHA Safety Purple
SAE AMS-STD-595/17875 - Miscellaneous, Gloss, Insignia White, ANA 511
SAE AMS-STD-595/17886 - Miscellaneous, Gloss, Bone White
SAE AMS-STD-595/17925 - Miscellaneous, Gloss, Bright White
SAE AMS-STD-595/20109 - Brown, Semi-Gloss, Deck Brown
SAE AMS-STD-595/23655 - Yellow, Semi-Gloss
SAE AMS-STD-595/23814 - Yellow, Semi-Gloss

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SAE AMS-STD-595/26008[1] - Gray, Semi-Gloss, Deck Gray, NAVSEA
SAE AMS-STD-595/26173[1] - Gray, Semi-Gloss, Ocean Gray, NAVSEA
SAE AMS-STD-595/26231 - Gray, Semi-Gloss
SAE AMS-STD-595/26270[1] - Gray, Semi-Gloss, Haze Gray, NAVSEA
SAE AMS-STD-595/26307 - Gray, Semi-Gloss, Bulkhead Equipment Gray
SAE AMS-STD-595/26373[1] - Gray, Semi-Gloss, Light Gray, NAVSEA
SAE AMS-STD-595/26586 - Gray, Semi-Gloss
SAE AMS-STD-595/27038 - Miscellaneous, Semi-Gloss, ANA 514
SAE AMS-STD-595/27142 - Purple, Semi-Gloss, Coast Guard Safety Purple
SAE AMS-STD-595/27769 - Light Beige, Semi-Gloss
SAE AMS-STD-595/27875 - Miscellaneous, Semi-Gloss, ANA 626
SAE AMS-STD-595/27886 - Miscellaneous, Semi-Gloss
SAE AMS-STD-595/34097 - Green, Flat, Field Green, ANA 627
SAE AMS-STD-595/36076 - Gray, Flat, Dark Gray
SAE AMS-STD-595/36231 - Gray, Flat, Coast Guard International Gray
SAE AMS-STD-595/36270 - Gray, Flat or Lusterless, Haze Gray
SAE AMS-STD-595/37038 - Miscellaneous, Flat, Black International, Navy #3 Black, ANA 604

(Copies of these documents are available online at www.sae.org.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. The coatings furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.2 and 6.3).

3.2 Formulation. With the exception of vehicle resin (all types) and pigmentation (types V and VI only), the manufacturer may choose the ingredients used in the formation of the coatings described herein. Vehicle resin formulations shall be as described in 3.2.1.1 through 3.2.1.3, and pigmentation is as described in 3.2.2.

3.2.1 Vehicle resin.

3.2.1.1 Type II, III, and IV coatings (composition 1). The vehicle resin for these coating types and compositions shall consist of a one-component, copolymerized, air-drying silicone modified long-oil soya alkyd.

3.2.1.2 Type V and VI coatings (composition 1). The vehicle resin for these coating types and compositions shall consist of a one-component, moisture-cure polysiloxane coating.

[1]The SAE AMS-STD-595 color coordinates for Navy standard gray colors are inconsistent with the color coordinates in MIL-PRF-24635. For color cards 26008, 26173, 26270, and 26373, refer to the requirements defined in 3.5.12.a for color matching.

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3.2.1.3 Type V and VI coatings (composition 2). The vehicle resin for these coating types and compositions shall consist of a two-component, hybrid-cure polysiloxane coating. The allowed proportions of the ratio of resin component to hardener shall be limited to 4 to 1, 3 to 1, 2 to 1, or 1 to 1 by volume. When mixed and applied in accordance with the manufacturer's instructions, the final coating system shall be in accordance with all requirements herein.

3.2.2 Pigmentation (types V and VI only). Only those pigments listed in table I shall be used in the manufacture of LSA products in haze gray, deck gray, ocean gray, and light gray. Coating formulations shall be manufactured using a minimum of 2 weight percent rutile titanium dioxide (white) and 0.7 weight percent chromium green-black hematite (black) by total solids. The manufacturer shall select amounts of the pigments in table I required to match the specified colors. The soluble and total metals content shall not exceed the limits listed in table II.

TABLE I. Pigments required for LSA haze gray, LSA deck gray, LSA ocean gray, and LSA light gray.

Color	Chemistry	Chemical abstracts service #
White	Rutile titanium dioxide	13463-67-7
Black	Chromium green-black hematite	68909-79-5
Blue	Cobalt chromite green spinel	68187-49-5
Yellow	Nickel antimony titanium yellow rutile	8007-18-9
Yellow	Yellow iron oxide	51274-00-1
Blue	Copper phthalocyanine blue	147-14-8

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TABLE II. Metal content of coatings.

Metal and its compound in each coating dry film	Soluble metal, maximum (mg/L)	Total metal content, maximum (%WT)
Antimony	15.0	0.015
Arsenic	5.0	0.005
Barium (excluding barite)	100.0	0.1
Beryllium	0.75	0.0002
Cadmium	1.0	0.0005
Chromium VI compounds	1.0	0.001
Chromium and chromium III compounds	560.0	0.56
Cobalt	50.0	0.005
Copper	25.0	0.01
Fluoride salts	180.0	0.18
Lead	5.0	0.005
Mercury	0.2	0.0002
Molybdenum	350.0	0.035
Nickel	20.0	0.02
Selenium	1.0	0.002
Silver	5.0	0.001
Tantalum	100.0	0.100
Thallium	7.0	0.007
Tungsten	100.0	0.1
Vanadium	24.0	0.01
Zinc	250.0	0.25

NOTES:
1. Total cobalt content may exceed 0.005% WT (up to 0.2 percent WT) only if a cobalt dryer is used to affect proper drying. However, soluble cobalt content shall not exceed the requirements of this table.
2. Copper content does not apply to green and blue SAE International colors as described in 2.3.

3.2.3 Recycled, recovered, environmentally preferable, or biobased materials. Recycled, recovered, environmentally preferable, or biobased materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.2.4 Ozone-depleting substances (ODS). ODS shall not be used in the composition of the coating, either directly or referenced in any test method. Class I or class II ODSs are defined by 40 CFR 82.

3.2.5 Toxicity and prohibited materials.

3.2.5.1 Toxicity. When evaluated in accordance with 4.5.1, the coating system shall pose no serious or high risk to the health of personnel or the environment when used for its intended purpose (see 4.5.1 and 6.4).

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3.2.5.2 Prohibited materials. The coating system shall not contain any chemicals categorized as “prohibited” in accordance with T9070-AL-DPC-020/077-2.

3.2.6 Metal content. When tested as specified in 4.5.2, the content of each soluble metal and the total content in each system component of the coating system shall not exceed the values listed in table II. Total metal content may be submitted in place of soluble metal content if the total metal content value is lower than what is listed in the soluble metal column.

3.2.7 Hazardous air pollutants (HAP) content. When evaluated as specified in 4.5.3, the total HAP content, as defined by the 40 CFR 63, Subpart II (Environmental Protection Agency [EPA] National Emission Standards for Hazardous Air Pollution) requirements for shipbuilding and ship repair, of each system component, shall not exceed the VOC content limit prescribed for the specific types (see 3.2.8).

3.2.8 Volatile organic compound (VOC) content.

3.2.8.1 Type II. When tested as specified in 4.5.4, the VOC content shall not exceed 340 g/L (2.8 lb/gal).

3.2.8.2 Types III and V. When tested as specified in 4.5.4, the VOC content shall not exceed 250 g/L (2.08 lb/gal).

3.2.8.3 Types IV and VI. When tested as specified in 4.5.4, the VOC content shall not exceed 100 g/L (0.83 lb/gal).

3.3 Identification (ID) characteristics (all types, classes, grades, and compositions). Values for ID characteristics shall be those established for the product at the time it is submitted for qualification testing (see 4.2 and 6.2). The purpose of these values is to serve as a basis for determining that the material being offered during acquisition is essentially the same as that which was approved under qualification testing. ID characteristics for all types, classes, grades, and compositions shall be conducted at 16 to 27 °C (60 to 80 °F) and 50±10 percent relative humidity. The manufacturer shall provide ASTM method(s), FED-STD-141 methods, other consensus standards, or a copy of unique test methodology or any other necessary information on methodology used to determine the following ID characteristics:

a. Chemical nature of each component
b. Principal constituents (10 percent or more of total)
c. Percent nonvolatile vehicle
d. Percent volatile
e. Density for mixed coating (g/L) (lb/gal) (ASTM D1475)
f. Pot life (composition 2 only)
g. Shelf life
h. Mixing instructions

3.4 Manufacturer’s NAVSEA-reviewed ASTM F718. See 6.2.

3.5 Performance requirements.

3.5.1 Flash point. When tested as specified in 4.5.5, the flash point of each component shall be greater than 38 °C (100 °F).

3.5.2 Storage stability.

3.5.2.1 Partially full container (composition 1). When tested as specified (see 4.5.6.1), the mixed coating shall be smooth and uniform, have a consistency not greater than 100 Kreb units, and shall exhibit no skinning, pressure, corrosion of the container, odor of spoilage, grains, lumps, or streaks. At the end of the specified storage time, the coating shall meet the requirements of 3.5.10 and 3.5.13. The International Commission on Illumination L*, a*, and b* (CIELAB) color difference (ΔE) of the mixed coating shall be not greater than 0.5 CIELAB units from the original color values measured prior to the required storage period.

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3.5.2.2 Full container. When tested as specified (see 4.5.6.2), the mixed coating shall be smooth and uniform, have a consistency not greater than 100 Kreb units, and shall exhibit no skinning, pressure, corrosion of the container, odor of spoilage, grains, lumps, or streaks. At the end of the specified storage time, the mixed coating shall meet the requirements of 3.5.10 and 3.5.13. The CIELAB ΔE of the mixed coating shall be not greater than 0.5 CIELAB units from the original color values measured prior to the required storage period.

3.5.3 Coarse particles. When tested as specified (see 4.5.7), the coarse particles shall be not greater than 0.5 percent by weight of the mixed coating.

3.5.4 Consistency. When tested as specified (see 4.5.8), the consistency of the mixed coating shall be not greater than 95 Kreb units.

3.5.5 Fineness of grind. When tested as specified (see 4.5.9), the fineness of grind of the mixed coating shall receive a minimum ASTM D1210 rating of Hegman 4.5, with no particles observed between the Hegman 0 and 4 gauge marks.

3.5.6 Brushing properties. When tested as specified (see 4.5.10), the coating shall brush evenly over the test panel with good flow and spreading qualities. The coating shall dry to a uniform film free from seeds, runs, sags, or streaks.

3.5.7 Rolling properties. When tested as specified (see 4.5.11), the coating shall roll evenly over the test panel with good flow and spreading qualities. The coating shall dry to a uniform film free from seeds, runs, sags, or streaks. The dried film shall show an even, smooth finish.

3.5.8 Spraying properties. When tested as specified (see 4.5.12), the coating shall create a consistent spray fan and shall show no running, sagging, streaking, or orange peel. The cured film shall show no seeding, dusting, floating, mottling, hazing, or other film defects.

3.5.9 Sag resistance. When tested as specified (see 4.5.13), the sag resistance for the coating system shall be at least 50 percent greater than the manufacturer's maximum recommended wet film thickness (WFT) specified in the manufacturer's NAVSEA-reviewed ASTM F718.

3.5.10 Drying times. When tested as specified (see 4.5.14), the coating's set-to-touch time shall be not greater than 4 hours, and the dry-through time shall be not greater than 16 hours when applied at the maximum WFT specified in the manufacturer's NAVSEA-reviewed ASTM F718.

3.5.11 Contrast ratio. When tested as specified (see 4.5.15), the contrast ratio of the fully cured coating shall be as follows:

Color	Contrast ratio
Gray and black	≥0.98
White	≥0.90
Red, yellow, and orange	≥0.75
All other colors	≥0.80

3.5.12 Color. The colors of the fully-cured coatings shall be as follows:

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a. NAVSEA haze gray (26270), deck gray (26008), ocean gray (26173), and light gray (26373) colors, defined by CIELAB color space, shall match the following:

Color	L*	a*	b*
Haze gray	56.00	-1.83	-1.37
Deck gray	30.28	-1.16	-2.94
Ocean gray	49.53	-1.61	-4.47
Light gray	66.30	-2.09	-0.02

b. All other colors, when used, shall be in accordance with the appropriate SAE AMS-STD-595 color card number.

c. If the flat color card does not exist, class 3 colors shall be matched to the appropriate SAE AMS-STD-595 semi-gloss color card.

3.5.12.1 Color deviation. When tested as specified (see 4.5.16), the measured color deviation terms ΔE, ΔL*,Δa*, and Δb* from the CIELAB values defined in 3.5.12.a (or specified SAE AMS-STD-595 color card) shall be not greater than the CIELAB units listed below as either positive or negative (+ or -) values:

	Color deviation values			
	ΔE	ΔL*	Δa*	Δb*
CIELAB values defined in 3.5.12.a	0.5	0.3	0.3	0.3
SAE AMS-STD-595 color card	1.0	0.5	0.5	0.5

3.5.13 Gloss. When tested as specified (see 4.5.17), the 60-degree specular gloss of the coating shall be as specified below. For class 2, the as-applied, initial gloss may exceed the required 45 to 60 GU range, but shall not exceed 75 GU in any case and shall not exceed 60 GU at the conclusion of the long-term exterior exposure test as specified (see 3.5.18).

Class	Gloss
1	≥85 GU
2	45 to 60 GU
3	7 to 12 GU

3.5.14 Total solar reflectance (TSR) (grade B only). When tested as specified (see 4.5.18), LSA coatings shall meet the TSR requirements for the colors specified in table III. The test card produced in 4.5.16 shall be used to determine the TSR.

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TABLE III. TSR requirements.

	Color groups	NAVSEA-defined colors	CIELAB "L*" range	CIELAB "a*" range	CIELAB "b*" range	Minimum TSR
1	Black	N/A	<26	-1.5 to +1.5	-1.5 to +1.5	0.25
2	Dark gray	Deck gray	24 to 42	-4 to +2	-8 to +4	0.25
3	Medium to light gray	Haze gray, ocean gray, light gray	40 to 77	-4 to +3	-3 to +8	0.35

3.5.15 Adhesion.

3.5.15.1 Composition 1 coatings. When tested as specified (see 4.5.19.1), the candidate coatings shall be applied over the coated substrates with no visible film irregularities. The overcoat shall not wrinkle or lift the first coat and shall dry to a smooth, uniform finish. The coating adhesion shall achieve a minimum ASTM D3359 classification of 4A or 4B.

3.5.15.2 Composition 2 coatings. When tested as specified (see 4.5.19.2), the candidate coatings shall be applied over the coated substrates with no visible film irregularities. The overcoat shall not wrinkle or lift the first coat and shall dry to a smooth, uniform finish. The coating adhesion shall achieve an ASTM D6677 rating of 10.

3.5.16 Water resistance. When tested as specified (see 4.5.20), the coating system shall show no blistering or wrinkling when examined immediately after removal from distilled water. When examined 2 hours after removal, there shall be no softening, whitening, or dulling. After 24 hours of drying, the portion of the panel that was immersed shall be indistinguishable, with regard to adhesion and general appearance, from a panel prepared at the same time but not immersed. The 60-degree specular gloss of the immersed panel shall conform to the minimum gloss requirements of 3.5.13 after the 24-hour exposure.

3.5.17 Accelerated weathering.

3.5.17.1 Types II, III, and IV coatings. When tested as specified (see 4.5.21), the coating system shall show no evidence of chalking and a gloss loss not greater than 75 percent of the gloss measured before exposure. The ΔE shall be not greater than 2 CIELAB units from the values measured before exposure.

3.5.17.2 Types V and VI coatings. When tested as specified (see 4.5.21), the coating system shall show no evidence of chalking, and the gloss shall conform to the requirements of 3.5.13 after exposure. The ΔE shall be not greater than 1 CIELAB unit from the values measured before exposure.

3.5.18 Long-term exterior exposure.

3.5.18.1 Type II, III, and IV coatings. When tested as specified (see 4.5.22), the coating systems shall meet the following requirements:

a. 60-degree gloss shall be not less than 75 percent of that measured prior to testing.

b. Chalking shall receive an ASTM D4214 rating not less than 8 of figure 2 of ASTM D4214.

c. Checking shall receive an ASTM D660 rating not less than 9.

d. Cracking shall receive an ASTM D661 rating not less than 9.

e. Blistering shall receive an ASTM D714 rating not less than 10.

f. When CIE color values of the exposed test panels are compared to the original CIE color values of the test panel, the ASTM D2244 ΔE shall be not greater than 2 CIELAB units.

g. Tape test adhesion of the exposed composition 1 coatings shall achieve a minimum ASTM D3359 classification of 3A or 3B.

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3.5.18.2 Type V and VI coatings. When tested as specified (see 4.5.22), the coating systems shall meet the following requirements:

a. 60-degree gloss shall conform to the requirements of 3.5.13.

b. Chalking shall receive an ASTM D4214 rating not less than 8 of figure 2 of ASTM D4214.

c. Surface area of rust shall receive an ASTM D610 rating not less than 9.

d. Checking shall receive an ASTM D660 rating not less than 9.

e. Cracking shall receive an ASTM D661 rating not less than 9.

f. Blistering shall receive an ASTM D714 rating not less than 10.

g. When CIE color values of the exposed test panels are compared to the original CIE color values of the test panel, the ASTM D2244 ΔE shall be not greater than 1 CIELAB unit.

h. Tape test adhesion of the exposed composition 1 coatings shall achieve a minimum ASTM D3359 classification of 3A or 3B.

i. Knife adhesion of composition 2 coatings shall achieve a minimum ASTM D6677 rating of 6.

3.5.19 Recoating.

3.5.19.1 Composition 1 coatings. When tested as specified (see 4.5.23), the recoat shall be applied over the exposed substrates with no visible film irregularities. The recoat shall not wrinkle or lift the exposed coat and shall cure to a smooth, uniform finish. The recoat adhesion shall achieve a minimum ASTM D3359 classification of 3A or 3B.

3.5.19.2 Composition 2 coatings. When tested as specified (see 4.5.23), the recoat shall be applied over the exposed substrates with no visible film irregularities. The recoat shall not wrinkle or lift the first coat and shall cure to a smooth, uniform finish. The recoat adhesion shall achieve a minimum ASTM D6677 rating of 10.

3.5.20 Serviceability. When tested as specified (see 4.5.24), the coating shall show no deficiencies that would limit its serviceability when examined during and after the minimum service period specified.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. Qualification inspection (see 4.2).

b. Conformance inspection (see 4.3).

4.2 Qualification inspection. Qualification inspection shall include all tests listed in table IV.

4.2.1 General inspection. The coating system's ID characteristics shall be reviewed to ensure conformance to the requirements specified in 3.3.

4.2.2 Formulation inspection. The coating system's vehicle resin (see 3.2.1), pigmentation (see 3.2.2), recycled, recovered, environmentally preferable, or biobased materials (see 3.2.3), and ODSs (see 3.2.4) shall be verified as required by the qualifying activity.

4.2.3 Changes to product. A change to the formulation, production processes, or production equipment used in the manufacture of the coating system that has been qualified shall require written approval by NAVSEA. Incorporation of any changes that have not been so approved shall require requalification of item in question.

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TABLE IV. Qualification and conformance tests.

Item	Requirement paragraph	Test paragraph	Conformance testing required	Applicable test standard
Toxicity	3.2.5.1	4.5.1.1	No	---
Prohibited materials	3.2.5.2	4.5.1.2	No	---
Total and soluble metal content	3.2.6	4.5.2	No	---
HAP content	3.2.7	4.5.3	No	40 CFR 63, appendix A, method 311
VOC content	3.2.8	4.5.4	Yes	40 CFR 60, appendix A-7, method 24
ID characteristics	3.3	4.2.1	No	---
Flash point	3.5.1	4.5.5	Yes	ASTM D3828
Storage stability – partial container	3.5.2.1	4.5.6.1	No	ASTM D1849
Storage stability – full container	3.5.2.2	4.5.6.2	No	ASTM D1849
Coarse particles	3.5.3	4.5.7	No	ASTM D185
Consistency	3.5.4	4.5.8	Yes	ASTM D562
Fineness of grind	3.5.5	4.5.9	Yes	ASTM D1210
Brushing properties	3.5.6	4.5.10	No	---
Rolling properties	3.5.7	4.5.11	No	---
Spraying properties	3.5.8	4.5.12	No	FED-STD-141
Sag resistance	3.5.9	4.5.13	Yes	ASTM D4400
Drying time	3.5.10	4.5.14	Yes	ASTM D5895
Contrast ratio	3.5.11	4.5.15	Yes	ASTM D2805
Color deviation	3.5.12.1	4.5.16	Yes	ASTM D2244
Gloss	3.5.13	4.5.17	Yes	ASTM D523
TSR	3.5.14	4.5.18	No	ASTM E903, ASTM G173
Adhesion	3.5.15	4.5.19	No	ASTM D3359, ASTM D6677
Water resistance	3.5.16	4.5.20	No	ASTM D1308, ASTM D714
Accelerated weathering	3.5.17	4.5.21	No	ASTM E1347, ASTM D523, ASTM D2244, ASTM D4214, ASTM G155
Long-term exterior exposure	3.5.18	4.5.22	No	ASTM D1014, ASTM D523, ASTM D4214, ASTM D610, ASTM D660, ASTM D661, ASTM D714, ASTM D2244, ASTM D3359, ASTM D6677
Recoat	3.5.19	4.5.23	No	ASTM D3359, ASTM D6677
Serviceability	3.5.20	4.5.24	No	---

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4.2.4 Extension of qualification. Testing and qualification of type IV products shall automatically be extended to type II and III products. Testing and qualification of type VI products shall automatically be extended to type V products. Testing and qualification of grade B (LSA) products shall be automatically extended to grade A products. Testing and qualification of one color variant of a given type, class, grade, and composition shall be automatically extended to all other colors for the same product, provided that the only difference in the product formulations is in the color pigment concentrations.

4.3 Conformance inspection. Conformance inspection shall include the specific tests identified in table IV. At a minimum, conformance inspection shall be performed on the first lot and every 19,000 L (5,000 gal) thereafter. A lot shall consist of all components of a coating formulation from a single uniform batch or single uniform blend of batches offered for delivery at one time.

4.4 Test conditions. Unless otherwise specified herein, all physical tests on the coating system shall be performed at 16 to 27 °C (60 to 80 °F) and 50±10 percent relative humidity.

4.4.1 Test panels and surface preparation. Unless otherwise specified herein, test panels shall be nominal 150 by 300 by 3 millimeters (6 by 12 by 0.125 inches) plate aluminum or cold-rolled steel. Test panels shall be degreased in accordance with method B, C, or D of ASTM D609. The degreased test panels shall be abrasive blasted with new, clean, aluminum oxide to provide an average profile pattern of 0.051 to 0.076 millimeter (0.002 to 0.003 inch) on both sides. Test panels shall be primed with a primer qualified to MIL-DTL-24441, type IV or MIL-PRF-23236, type VII, class 17, for qualification testing.

4.5 Test methods.

4.5.1 Toxicity and prohibited materials.

4.5.1.1 Toxicity. A Health Hazard Assessment (HHA) will be conducted to ensure conformance to 3.2.5.1, as required by the qualifying activity. The Navy and Marine Corps Public Health Center (NMCPHC) will evaluate the coating systems using data provided by the manufacturer/distributor to the NMCPHC (see 3.2.5.1 and 6.4).

4.5.1.2 Prohibited materials. Prohibited materials shall be verified for conformance to 3.2.5.2 as required by the qualifying activity.

4.5.2 Metal content. Soluble and total metal content, except tantalum and tungsten, shall be determined on pulverized, cured film of the coating system in accordance with 40 CFR 261.24(a). The test results for each metal shall meet the requirements of 3.2.6. Tantalum and tungsten soluble metal content and total metal content shall be analyzed as specified in 4.5.2.1. Calculation of individual hazardous metal content can be based on either the manufacturer's testing of batches or the supplier's data for raw materials used in the product. When specified (see 6.2), a formulation value shall be provided that shall not be exceeded when the coating system is tested in accordance with this paragraph.

4.5.2.1 Tantalum and tungsten content. The tantalum and tungsten content of the cured coating shall be determined using any appropriate spectroscopy test method. The tests shall be conducted in accordance with the instrument manufacturer's directions. Data supporting the test method choice and analytical accuracy shall be established. The test results for tantalum or tungsten shall meet the requirements of 3.2.6.

4.5.3 HAP content. The HAP content of the coating shall be measured in accordance with 40 CFR 63, appendix A, method 311 (EPA test method 311). Solvent fractions shall be identified in accordance with ASTM E1252 with the results recorded as percent weight of the total coating system. Alternate methods of analysis shall be approved by NAVSEA. When specified (see 6.2), formulation data may be used by manufacturers in lieu of testing to demonstrate compliance with 3.2.7. The formulation data shall have a consistent and quantitatively known relationship to the testing required. Calculation of individual HAP contents can be based on either the manufacturer evaluation of batches or supplier data for raw materials used in the product. The test results for HAP content shall meet the requirements of 3.2.7.

4.5.4 VOC content. The VOC content of the coating shall be measured in accordance with 40 CFR 60, appendix A-7, method 24. The sample shall be conditioned at 22±1 °C (72±2 °F) for 24 hours prior to conducting the analysis. The test results for VOC content shall meet the requirements of 3.2.8.

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4.5.5 Flash point. The flash point of the coating or any component shall be determined in accordance with ASTM D3828. Results shall meet the requirements of 3.5.1.

4.5.6 Storage stability.

4.5.6.1 Partially-full containers (composition 1 only). A multiple friction lid can shall be filled three-quarters with the coating material mixed per the manufacturer's NAVSEA-reviewed ASTM F718. The lid shall be secured tightly and the can inverted momentarily. The can shall then be placed in an upright position and left undisturbed for 48 hours at 22.2 to 26.7 °C (72 to 80 °F). After 48 hours, the coating shall be inspected for skinning. The can shall then be resealed and aged for 7 days at 49±1 °C (120±2 °F) prior to reinspection. After the specified storage time, the storage stability shall be determined in accordance with ASTM D1849. The test results shall meet the requirements of 3.5.2.1.

4.5.6.2 Full container. Two samples of the coating shall be obtained for testing. The first sample shall be left undisturbed and conditioned at 49±1 °C (120±2 °F) for 7 days. The second sample shall be left undisturbed and conditioned at 22.2 to 26.7 °C (72 to 80 °F) for 12 months. After the specified storage time, the storage stability shall be determined in accordance with ASTM D1849. The test results shall meet the requirements of 3.5.2.2.

4.5.7 Coarse particles. The amount of coarse particles and skins shall be determined in accordance with ASTM D185. The test results shall meet the requirements of 3.5.3.

4.5.8 Consistency. The consistency of the mixed coating shall be determined in accordance with ASTM D562 in Kreb units. The test results shall meet the requirements of 3.5.4.

4.5.9 Fineness of grind. The fineness of grind of the coating shall be measured in accordance with ASTM D1210. The test results shall meet the requirements of 3.5.5.

4.5.10 Brushing properties. The coating shall be brushed in accordance with the manufacturer's instructions to a test panel prepared as specified in 4.4.1. The panel shall be visually inspected to meet the requirements 3.5.6.

4.5.11 Rolling properties. The coating shall be rolled in accordance with the manufacturer's instructions onto a test panel prepared as specified in 4.4.1. The panel shall be visually inspected to meet the requirements of 3.5.7.

4.5.12 Spraying properties. The coating shall be sprayed onto a test panel prepared as specified in 4.4.1. The panel shall be observed for spraying properties in accordance with method 4331.2 of FED-STD-141. The test results shall meet the requirements of 3.5.8.

4.5.13 Sag resistance. The sag resistance of the coating shall be determined in accordance with ASTM D4400. The test results shall meet the requirements of 3.5.9.

4.5.14 Drying times. The set-to-touch and dry-through times for a coating applied at the maximum WFT in accordance with the manufacturer's NAVSEA-reviewed ASTM F718 and at 22±1 °C (75±2 °F) and 40±10 percent relative humidity shall be determined in accordance with ASTM D5895. The test results shall meet the requirements of 3.5.10.

4.5.15 Contrast ratio. The contrast ratio of the fully-cured coating shall be determined in accordance with ASTM D2805. The test results shall meet the requirements of 3.5.11.

4.5.16 Color deviation. Test specimens shall be prepared in accordance with ASTM D823 method C or E using a nominal 0.151-millimeter (0.006-inch) blade film applicator onto a clear plate glass or a standard black and white Leneta chart. The color deviation shall be determined in accordance with ASTM D2244, using an instrument having a D_{65} light source, a 45-degree illumination angle, and a 0-degree viewing angle. The instrument shall be demonstrated to read the color of National Institute of Standards and Technology (formerly National Bureau of Standards) traceable standards. The L*, a*, and b* color values defined in 3.5.12.a shall be used to calculate the ΔE values. For all other colors, the L*, a*, and b* color values for the specified SAE AMS-STD-595 color cards shall be measured for the coating being procured. The measured color of the coating being procured shall be compared with the values for the specified color cards and used to calculate the ΔE values. The test results shall meet the requirements of 3.5.12.1.

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4.5.17 Gloss. The thoroughly mixed coating shall be applied to a standard black and white Leneta chart in accordance with ASTM D823. A film applicator shall be used that will produce a WFT of 0.151 millimeter (0.006 inch). Allow the coating to cure-to-service in accordance with the manufacturer's NAVSEA-reviewed ASTM F718 at the conditions specified (see 4.4) in a dust-free environment. A longer cure time may be used if necessary to meet the gloss requirement of this specification. The 60-degree specular gloss shall be determined in accordance with ASTM D523. The test results shall meet the requirements of 3.5.13.

4.5.18 TSR. TSR of the coating shall be measured between 250 and 2,500 nanometers in accordance with ASTM E903. TSR shall be calculated at air mass 1.5 by applying the solar weighting factors in ASTM G173. Measurements shall be made on the test cards produced in 4.5.16. The test results shall conform to the requirements of 3.5.14.

4.5.19 Adhesion. Six panels shall be prepared in accordance with 4.4.1. The coatings shall then be applied and allowed to cure-to-service in accordance with the manufacturer's NAVSEA-reviewed ASTM F718 and tested as follows:

a. Two panels shall be coated with one coat of the candidate coating at the recommended per-coat dry film thickness (DFT) listed on the manufacturer's NAVSEA-reviewed ASTM F718. After the panels have cured at the conditions specified in 4.4 for 7 days, a second coat of the candidate coating shall be applied to both panels at the manufacturer's recommended per-coat DFT. The panels shall be allowed to cure-to-service at the conditions specified in 4.4 in accordance with the manufacturer's NAVSEA-reviewed ASTM F718.

b. Two panels shall be coated with one coat of MIL-DTL-24441/20 or MIL-DTL-24441/29, type IV, formula 150 at a nominal WFT of 0.076 to 0.101 millimeter (0.003 to 0.004 inch). After the panels have cured at the conditions specified in 4.4 for 7 days, both panels shall be given an overcoat of the candidate coating, applied at the recommended per-coat DFT listed on the manufacturer's NAVSEA-reviewed ASTM F718. The panels shall be allowed to cure-to-service at the conditions specified in 4.4, in accordance with the manufacturer's NAVSEA-reviewed ASTM F718.

c. Two panels shall be coated with one coat of the primer for any system qualified to MIL-PRF-23236, type VII, class 17, in accordance with the manufacturer's NAVSEA-reviewed ASTM F718 for the primer selected. After the panels have cured at the conditions specified in 4.4 for 7 days, both panels shall be given an overcoat of the candidate coating, applied at the recommended per-coat DFT listed on the manufacturer's NAVSEA-reviewed ASTM F718. The panels shall be allowed to cure-to-service at the conditions specified in 4.4, in accordance with the manufacturer's NAVSEA-reviewed ASTM F718.

4.5.19.1 Composition 1 coatings. For coatings with a manufacturer's recommended total system DFT greater than 0.127 millimeter (0.005 inch), X-cut adhesion shall be determined in accordance with ASTM D3359, method A. For coatings with a manufacturer's recommended total system DFT less than or equal to 0.127 millimeter (0.005 inch), cross-cut adhesion shall be determined in accordance with ASTM D3359, method B. Results shall meet the requirements of 3.5.15.1.

4.5.19.2 Composition 2 coatings. Knife adhesion shall be determined in accordance with ASTM D6677. Results shall meet the requirements of 3.5.15.2.

4.5.20 Water resistance. Two panels shall be prepared in accordance with 4.4.1. A film of coating shall be applied to both test panels by drawing down in accordance with ASTM D823 to the manufacturer's recommended total system DFT. The coating film shall be allowed to cure-to-service in accordance with the manufacturer's NAVSEA-reviewed ASTM F718 at the conditions specified in 4.4. Exposed uncoated metal surfaces shall be coated with wax or a primer in accordance with MIL-DTL-24441. One panel shall then be immersed in distilled water at 23±1 °C (73±2 °F) for 24 hours in accordance with ASTM D1308. The exposed panel shall be examined for blistering in accordance with ASTM D714 and visually compared to the second, unexposed panel. Results shall meet the requirements of 3.5.16.

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4.5.21 Accelerated weathering. Two panels shall be prepared as specified in 4.4.1, with the exception that the panels shall be nominal 75 by 150 by 3 millimeters (3 by 6 by 0.125 inches) cold rolled-steel. The coating being tested shall then be applied to the panels by drawing down films of coating in accordance with ASTM D823 to the manufacturer's recommended total system DFT. The panels shall be allowed to cure-to-service in accordance with the manufacturer's NAVSEA-reviewed ASTM F718, at the conditions specified in 4.4. The initial color of the test panels shall be measured in accordance with ASTM E1347 on any suitable instrument. The initial 60-degree gloss of the test panels shall be measured in accordance with ASTM D523. The panels shall be exposed for 2,000 hours to accelerated weathering using a xenon-arc test apparatus in accordance with ASTM G155, cycle 1. The cycle shall be 1 hour and 42 minutes of xenon-arc light exposure at 63±1 °C (145±2 °F) and 18 minutes of light and spray with an irradiance of 0.35 watts per square meter. After exposure, color and gloss shall be measured again in accordance with ASTM E1347 and ASTM D523. The ΔE shall be calculated in accordance with ASTM D2244, and the gloss change shall also be calculated. Any chalking shall be evaluated in accordance with ASTM D4214. Results shall meet the requirements of 3.5.17.

4.5.22 Long-term exterior exposure. Four test panels shall be prepared as specified in 4.4.1. The coating being tested shall be applied to the required total system DFT and allowed to cure-to-service in accordance with the manufacturer's NAVSEA-reviewed ASTM F718 between applications of each coat at the conditions specified in 4.4. The initial color of the test panels shall be measured in accordance with ASTM E1347. The initial 60-degree gloss of the test panels shall be measured in accordance with ASTM D523. Test specimens shall be mounted on a test fence having a 45-degree, south-facing rack at a distance not greater than 30 meters (100 feet) of an ocean high-tide line. The exposure shall be in accordance with ASTM D1014. The fence shall be at a facility approved by the qualifying activity. Prior to initiating the test, the wall of test panels shall be photographed (a gray color scale shall be included in all photos). The test panels shall be exposed for a period of 1 year and then evaluated for conformance with 3.5.18.

4.5.23 Recoat. The remaining two test panels exposed in accordance with 4.5.22 shall be lightly hand-sanded and rinsed with fresh water. The test panels shall then be dried for 24 hours at the conditions specified in 4.4. The coating being tested shall then be brush-applied to one-half of the surface of each of the two panels, and the overcoated panels shall be cured for 48 hours at the conditions specified in 4.4. The overcoat adhesion shall be determined in accordance with 4.5.19.1 for composition 1 and 4.5.19.2 for composition 2. Results shall meet the requirements of 3.5.19.

4.5.24 Serviceability. The coating shall be applied in a NAVSEA-approved area aboard a U.S. Naval vessel for a minimum service period of 6 months. Results shall meet the requirements of 3.5.20.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

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6.1 Intended use. This specification covers silicone alkyd and polysiloxane coatings that are designed to resist environmental effects and retain color and gloss over time on Navy ships. Coatings of types II through IV are intended for use as marking/contrast paints on topside surfaces, as well as for color-coding piping systems. Coatings of types V through VI are primarily intended to provide a highly durable, topside exterior coating that is color-stable and can be easily cleaned. Type V and VI coatings contain pigments with high near-infrared reflectance that are not appreciably degraded by exposure to ultraviolet light. All coatings covered by this specification are non-lead-, non-chromate-, and non-asbestos-containing materials. These coatings have been formulated to comply with air pollution regulations that allow a maximum VOC content of 250 grams of solvent minus water per liter of paint (2.08 lb/gal) as delivered and to comply with California regulations that allow a maximum VOC of 100 g/L. MIL-PRF-24635, type II coatings may be used where maximum VOC content limits are allowed to exceed 250 g/L but may not exceed 340 g/L. These products are not to be thinned. The coatings may be applied with brushes, rollers, or spray to bare steel and aluminum substrates, or to substrates that have previously been coated with the same product type or anti-corrosive primers conforming to MIL-PRF-23236 or MIL-DTL-24441. MIL-PRF-24635, types II through IV coatings may not be applied over MIL-PRF-24635 types V through VI coatings.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.

b. Type, class, grade, and composition (see 1.2).

c. ID characteristics (see 3.3).

d. Manufacturer's NAVSEA-reviewed ASTM F718 (see 3.4).

e. Color (see 3.5.12.a, or SAE AMS-STD-595 color designation nomenclature recommended).

f. Metals content (see 4.5.2).

g. HAP content (see 4.5.3).

h. Packaging requirements and recommended packaging and labeling methods (see 5.1 and 6.7).

i. Batch VOC content certification (see 6.5).

j. When a Safety Data Sheet (SDS) is required (see 6.6).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL No. 24635, whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Commander, Naval Sea Systems Command, ATTN: SEA 05S, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to CommandStandards@navy.mil. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at https://assist.dla.mil.

6.4 Toxicity evaluation. The NMCPHC requires sufficient information to permit an HHA of the product. Upon completion of the HHA, a copy will be provided by the NMCPHC to the Government for evaluation. The HHA process is described on the NMCPHC's website, http://www.med.navy.mil/sites/nmcphc/industrial-hygiene/Pages/health-hazard-assessment.aspx.

6.5 VOC content certification. Contracting officers will require the manufacturer to provide the Government with a written VOC content certification, as described in 40 CFR 63.785(a)(2), for each batch of coating product from which any quantity of the coating product is supplied to the Government under the contract. The Government reserves the right to reject as defective any coating product for which the VOC content certification has not been provided.

6.6 SDS. When specified (see 6.2), contracting officers will identify those activities requiring copies of completed SDSs prepared in accordance with appendix D of 29 CFR 1910.1200. In order to obtain the SDS, federal acquisition regulation clause 52.223-3 will be in the contract. The contracting activity should be given an SDS at the time of contract award.

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6.7 Recommended packaging methods. Suggested packaging methods are contained in table V.

TABLE V. Packaging.

Packaging	Recommended methods for direct Government acquisitions
Containers	The composition 1 coatings should be furnished in cans capable of holding 0.47 liter (1 pint), 0.945 liter (1 quart), 3.78 liters (1 gallon), and 18.9 liters (5 gallons). In addition, composition 1 coatings may also be furnished in cartridges, packs, and aerosol cans, as defined in the acquisition document. The composition 2 coatings should be furnished in cans appropriate to kit requirements capable of holding 0.47 liter (1 pint), 0.945 liter (1 quart), 3.78 liters (1 gallon), and 18.9 liters (5 gallons). Kits should consist of multiple containers, one of which should be large enough to contain all components for mixing purposes. Not all components are required to be supplied in a single can. In addition, composition 2 coating components may also be furnished in cartridges, burst packs, and aerosol cans, as defined in the acquisition document.
	Multiple friction plug containers should be in accordance with PPP-C-96, type V, class 2. Interior coatings should be as specified therein. Wire handles, as specified therein, should be provided for the 1-gallon container. Closure of the properly filled and sealed cans should be as specified in the appendix thereto.
	All shipping containers should comply with the requirements of the Uniform Freight Classifications (UFC), the National Motor Freight Classification (NMFC), and the applicable requirements of 49 CFR and all UN Model Regulations.
	The coatings covered by this specification should be purchased by volume. The units of procurement should be in multiples of 1 liter or 1 U.S. liquid gallon at 15.5 °C (60 °F).
Packaging to ASTM D3951	Packaging considered commercial in nature should conform to the requirements of ASTM D3951.
	All containers should comply with the requirements of the UFC, the NMFC, and the applicable requirements of 49 CFR and all UN Model Regulations.
Level of pack (packaging should be specified as follows)	Overseas delivery packaging (level A): Intermediate containers of like-size kits of coating should be packed in close-fitting wood boxes conforming to ASTM D6251/D6251M, overseas type, or ASTM D6880/D6880M, class 2. Box closure and strapping should be as specified in the applicable box specification or the appendix thereto, except that strapping should be flat and finish B.
	Domestic delivery (level B) packing: Level B packing should be the same as for level A, except that boxes should be domestic type or class and the strapping should be finish A or B.
Palletization	Intermediate containers should be palletized in accordance with MIL-STD-147.
Packing for acquisitions involving direct delivery to Navy ships or installations	All lumber and plywood, including laminated veneer materials, used in shipping container and pallet construction, member, blocking, bracing, and reinforcing must be fire-retardant treated material in accordance with MIL-L-19140 as follows: General use, weather resistant (type II, category I) and general use, non-weather resistant (type I, category I).
Unit kits	Composition 2 coatings covered by this specification should be packed and packaged as kits.
SDS and product/procedure data sheets	A copy of the SDS and company product data/procedure sheets should be attached to the shipping document for each destination (see 6.2).

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TABLE V. Packaging - Continued.

Packaging	Recommended methods for direct Government acquisitions
Hazardous warnings	Labels should be in accordance with 29 CFR Parts 1910, 1915, 1917, 1918, 1926, and 1928, as well as 49 CFR.
	All individual containers should have the following marking: "CAUTION: This material contains volatile solvents with probable hazardous vapors. Use with adequate ventilation. Avoid prolonged breathing of vapors or spray mists. The solvents are highly flammable; avoid open flame and smoking."
	Each component container, shipping container, and palletized load should be marked with the appropriate hazard symbol.
	Unit containers should be marked as follows: "This product is asbestos-, lead-, hexavalent-chromium-, and cadmium-free, except for possible trace levels."
VOC content	VOC content should be stated on the label using the following statement: "Contains (insert VOC content) grams per liter (insert VOC content in lb/gal) of volatile organic content per 40 CFR 60, appendix A-7, method 24."
HAP content	HAPs should be stated on the label using the following statement: "Contains (insert HAP content here in g/L and lb/gal) solids (nonvolatiles) per 40 CFR 63."
Shelf life	Labels should include the product's manufacture date and expiration date and meet the requirements of MIL-STD-129.
Application instructions	Manufacturers should include their NAVSEA-reviewed ASTM F718 with each shipment of the material covered by this specification.

6.8 Subject term (key word) listing.

Alkyd
Alkyd, silicone
Flat
Gloss
Gray
Low-gloss
Low solar absorbent
LSA
Marking
Paint
Polysiloxane
Semi-gloss
Topcoat
Topside

6.9 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

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CONCLUDING MATERIAL

Custodians:
Army – MI
Navy – SH
Air Force – 84

Review activities:
Army – MR
Navy – AS

Preparing activity:
Navy – SH
(Project 8010-2019-005)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at https://assist.dla mil.