

INCH-POUND

MIL-PRF-32171B

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SUPERSEDING

MIL-PRF-32171A

30 March 2006

PERFORMANCE SPECIFICATION

DECK COATINGS, HIGH DURABILITY

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 requirements for high-durability, wear-resistant deck coatings for use in high-traffic areas, with minimal maintenance.

1.2 Classification. Coatings covered by this specification are of the following types and classes, as specified (see 6.2):

1.2.1 Types. The types of deck coating systems are as follows:

Type I – Interior deck coating system for general use.

Type II – Interior deck coating system for submarine use.

Type III – Weather deck coating system (excluding MIL-PRF-24667 nonskid products).

Type IV – AFFF station deck coating system.

1.2.2 Classes. The classes of deck coatings are as follows:

Class 1 – Semi-gloss.

Class 2 – High gloss.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 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, 4, or 5 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.

Comments, suggestions, or questions on this document should be addressed to: Commander, Naval Sea Systems Command, ATTN: SEA 05B5, 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 http://assist.daps.dla.mil .

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FEDERAL STANDARDS

- | | | |
|-------------|---|--|
| FED-STD-141 | - | Paint, Varnish, Lacquer and Related Materials; Methods of Inspection, Sampling and Testing |
| FED-STD-595 | - | Colors Used in Government Procurement |

DEPARTMENT OF DEFENSE SPECIFICATIONS

- | | | |
|---------------|---|---|
| MIL-DTL-24441 | - | Paint, Epoxy-Polyamide, General Specification for |
| MIL-PRF-23236 | - | Coating Systems for Ship Structures (QPL) |

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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.

CODE OF FEDERAL REGULATIONS (CFR)

- | | | |
|---|---|--|
| 29 CFR 1910.1000 | - | Air Contaminants |
| 29 CFR 1990 | - | Identification, Classification, and Regulation of Potential Occupational Carcinogens |
| 40 CFR 60, Ch. 1, Appendix A, Method 24 | - | Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings |
| 40 CFR 63 | - | National Emission Standards for Hazardous Air Pollutants for Source Categories |
| 40 CFR 82 | - | Protection of Stratospheric Ozone |
| 40 CFR 302 | - | Designation, Reportable Quantities, and Notification |
| 40 CFR 355 | - | Emergency Planning and Notification |
| 40 CFR 372.65 | - | Specified Toxic Chemical Listings |

(Copies of these documents are available from the Superintendent of Documents, U.S. Government Printing Office, Washington DC 20401 or online at www.gpoaccess.gov/index.html.)

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NAVAL SEA SYSTEMS COMMAND (NAVSEA)

S9510-AB-ATM-010 - Submarine Atmosphere Control Manual, Chapter 7

(Copies of this document are available from Commander, Naval Sea Systems Command, Code SEA 05Z9, 1333 Isaac Hull Ave., SE, Stop 5122, Washington Navy Yard, DC 20376-5122.)

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 B117	-	Standard Practice for Operating Salt Spray (Fog) Apparatus (DoD adopted)
ASTM D523	-	Standard Test Method for Specular Gloss (DoD adopted)
ASTM D562	-	Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer
ASTM D610	-	Standard Practice for Evaluating Degree of Rusting on Painted Steel (DoD adopted)
ASTM D714	-	Standard Test Method for Evaluating Degree of Blistering of Paints (DoD adopted)
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 (DoD adopted)
ASTM D1475	-	Standard Test Method for Density of Liquid Coatings, Inks, and Related Products
ASTM D1729	-	Standard Practice for Visual Appraisal of Colors and Color Differences of Diffusely-Illuminated Opaque Materials
ASTM D1849	-	Standard Test Method for Package Stability of Paint (DoD adopted)
ASTM D2047	-	Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine
ASTM D2247	-	Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity (DoD adopted)
ASTM D2697	-	Standard Test Method for Volume Nonvolatile Matter in Clear or Pigmented Coatings (DoD adopted)
ASTM D2794	-	Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact) (DoD adopted)
ASTM D3278	-	Standard Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus (DoD adopted)
ASTM D3363	-	Standard Test Method for Film Hardness by Pencil Test (DoD adopted)
ASTM D4060	-	Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser (DoD adopted)

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ASTM D4400	-	Standard Test Method for Sag Resistance of Paints Using a Multinotch Applicator
ASTM D6037	-	Standard Test Methods for Dry Abrasion Mar Resistance of High Gloss Coatings
ASTM D6905	-	Standard Test Method for Impact Flexibility of Organic Coatings
ASTM E260	-	Standard Practice for Packed Column Gas Chromatography
ASTM E1252	-	Standard Practice for General Techniques for Obtaining Infrared Spectra for Qualitative Analysis

(Copies of these documents are available from ASTM International, 100 Barr Harbor Dr., P.O. Box C700, West Conshohocken, PA 19428-2959 or online at www.astm.org.)

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC-SP 3	-	Power Tool Cleaning
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(Copies of this document are available from SSPC Publication Sales, 40 24th Street, 6th floor, Pittsburgh, PA 15222-4656 or www.sspc.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 (except for related specification sheets), 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). Qualification inspection shall consist of compliance with tables I, II, and III and all other applicable requirements of this specification.

3.1.1 Materials. For two-component systems, the allowed proportions for the ratio of resin component to hardener shall be limited to 4:1, 3:1, 2:1, or 1:1 by volume. When mixed and applied in accordance with the manufacturer's instructions, the final coating system shall be in accordance with all requirements of this specification.

3.2 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable 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.

3.3 Ozone-depleting substances (ODS). The use of any ODS in the composition of the coating under this specification, directly or referenced in any test method, is prohibited. Class I or Class II ozone-depleting chemicals are defined by 40 CFR 82.

3.4 Toxicity. The coating shall have no adverse effect on the health of personnel when used for its intended purpose, and shall not cause any environmental problems during waste disposal (see 6.6). Unless otherwise specified herein, the material used in the coating shall have no known carcinogenic or potentially carcinogenic materials identified by the Occupational Safety and Health Administration (OSHA) (29 CFR 1910.1000) as regulated carcinogens, or the International Agency for Research on Cancer (IARC) latest monographs, or the latest annual report of the National Toxicity Program (NTP); and shall have no extremely hazardous substances (EHS) or toxic chemicals identified in 29 CFR 1910.1000, 40 CFR 302, 355, and 372, respectively. The manufacturer is responsible for maintaining carcinogenic free, extremely hazardous substance free and toxic chemical free materials. The manufacturer shall not, unless specific material maximum levels are cited herein, allow the addition of any of these prohibited materials to the formulation and when any of these prohibited materials are/may be present, as a result of being present as a trace or impurity in other ingredient(s), the concentration of the prohibited material shall not equal or exceed 0.01 percent by weight of the coating.

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3.4.1 Asbestos content. The asbestos content may not exceed 0.5 percent by weight of the dry coating film.

3.4.2 Metal content. The content of each soluble metal and total content of each metal of the coating shall be less than the values listed in tables I and II when tested as specified in 4.5.1.2.

TABLE I. Soluble metals content.

Antimony and its compounds	15.0
Arsenic and its compounds	5.0
Barium and its compounds (excluding barite)	100.0
Beryllium and its compounds	0.75
Cadmium and its compounds	1.0
Chromium (VI) compounds	1.0
Chromium and its chromium (III) compounds	560.0
Cobalt and its compounds	50.0
Copper and its compounds	25.0
Fluoride salts	180.0
Lead and its compounds	5.0
Mercury and its compounds	0.20
Molybdenum and its compounds	350.0
Nickel and its compounds	20.0
Selenium and its compounds	1.0
Silver and its compounds	5.0
Tantalum and its compounds	100.0
Thallium and its compounds	7.0
Tungsten and its compounds	100.0
Vanadium and its compounds	24.0
Zinc and its compounds	250.0

TABLE II. Total metals content.

Antimony and its compounds	0.015
Arsenic and its compounds	0.005
Barium and its compounds (excluding barite)	0.10
Beryllium and its compounds	0.0002
Cadmium and its compounds	0.0005
Chromium (VI) compounds	0.001
Chromium and its chromium (III) compounds	0.56

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TABLE II. Total metals content – Continued.

Cobalt and its compounds	0.005
Copper and its compounds	0.01
Fluoride salts	0.18
Lead and its compounds	0.005
Mercury and its compounds	0.0002
Molybdenum and its compounds	0.35
Nickel and its compounds	0.02
Selenium and its compounds	0.002
Silver and its compounds	0.001
Tantalum and its compounds	0.100
Thallium and its compounds	0.007
Tungsten and its compounds	0.100
Vanadium and its compounds	0.01
Zinc and its compounds	0.25
NOTE: ^{1/} Total cobalt content may exceed 0.005 percent by weight (up to 0.2 percent by weight) only if a cobalt drier is used to effect proper drying. Regardless of whether a cobalt drier is used, soluble cobalt content may not exceed table I requirements.	

TABLE III. Quantitative requirements of the deck coating.

Characteristic	Requirements	
	Minimum	Maximum
Viscosity (KU)	70	90
Weight/gallon (pounds)	12.0	13.5
Fineness of grind (hegman)	5.0	----
Sag resistance (mils)	5.0	----

3.5 Off-gassing (Type II only). The coating shall be tested for off-gassing in accordance with Chapter 7 of NAVSEA Technical Manual S9510-AB-ATM-010 and shall be certified for and assigned a usage category of either “Limited” or “Permitted” (see 4.5.2 and 6.7).

3.6 Volume solids. The volume of solids of the coating shall be 65 percent minimum.

3.7 Volatile organic compound (VOC) content solvent. The VOC of all types and classes of the coating shall be less than 250 grams per liter (g/L).

3.8 Flash point. The flash point of the coating shall be greater than 38 °C (100 °F).

3.9 Shelf-life. The shelf life of the coating shall be at least 12 months, with a minimum ASTM D1849 level of 8 reported for all qualities.

3.10 Drying or cure time. Coatings shall require not more than 24 hours between coats for full cure and shall be ready for service within 7 days after the application of the last coat. Application and cure shall be at the lowest allowed temperature specified by the manufacturer.

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3.11 Abrasion resistance.

3.11.1 All classes. The abrasion resistance of the coating shall not exceed 70-milligram loss.

3.11.2 Class 2 only. The percent gloss retention must exceed 90 percent.

3.12 Impact resistance. Impact resistance of the coating shall not be less than 50 inch-pounds.

3.13 Flexibility. A film of coating shall show no checking, cracking, or flaking at less than 10-percent elongation.

3.14 Pencil hardness. The pencil hardness of the coating shall be 2H minimum.

3.15 Slip resistance. The dry slip resistance of the coating shall be no less than 0.70 static coefficient of friction (COF), and the wet slip resistance shall be no less than 0.60 static COF.

3.16 Hazardous air pollutant (HAP) content. The content of the HAPs solvents in the mixed coating or its components shall not exceed the weight percent (percent by weight) values listed in table IV. Within these limitations and the requirement that the finished coating meet all requirements of this specification, solvent selection is the responsibility of the manufacturer. HAP materials are defined by 40 CFR 63.

TABLE IV. Hazardous air pollutant solvent content limits.

Hazardous solvent in total enamel	Maximum, %WT
Benzene	0.05
Chlorinated solvent(s), total Carbon tetrachloride Chloroform (trichloromethane) Methylene chloride (dichloromethane) Tetrachloroethylene (perchloroethylene) 1,1,1-Trichloroethylene (methyl chloroform) Trichloroethylene	0.05
Ethylbenzene	0.05
Methyl, ethyl, and butyl mono-ethers of ethylene glycol or the acetates, total (also known as methyl, ethyl, and butyl cellosolves and acetates)	0.05
Methyl ethyl ketone (MEK)	0.05
Methyl isobutyl ketone (MIBK)	0.05
Toluene	0.05
Xylene (all forms), total	0.1

3.17 Condition in container. The coating shall be free from grit, seeds, skins, abnormal thickening, or livering in a freshly-opened container, and shall show no more pigment settling or caking than can be easily and completely reincorporated to a smooth, uniform state. Water based coatings shall also be free of rust staining, emulsion breakdown, spoilage and rancidity. Container shall be free of corrosion.

3.18 Resistance to water. When tested as specified herein, a film of coating shall show no wrinkling or blistering immediately after removal of the wetted sponges. The coating shall be no more than slightly affected when examined 2 hours after removal of the wetted sponges. After 24 hours of air drying, the portion of the panel which was covered by the wetted sponges shall be visually indistinguishable with regard to hardness and adhesion from the portion which was not exposed to water.

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3.19 Resistance to hydrocarbon fluid. When tested as specified herein, a film of coating shall show no blistering or wrinkling and no more than a slight whitening or softening upon removal of the fluid wetted sponge. After 2 hours of air drying, the portion of the panel that was covered by fluid wetted sponge shall be visually indistinguishable with regard to hardness, color, and gloss from a panel prepared at the same time, but not exposed to hydrocarbon fluid.

3.20 Resistance to salt spray (Type III only). When tested as specified herein, a film of coating examined immediately after removal from the test shall show no more than a trace of corrosion in accordance with ASTM D610 and no more than five scattered blisters no larger than 1 millimeter in diameter.

3.21 Resistance to condensation. When tested as specified herein, a film of coating shall show a maximum ASTM D714 blister rating of 8 few or better after testing for 100 hours. The ASTM D714 blister rating shall be 6 few or better when evaluated after an additional 200 and 400 hours. Blisters within 12 millimeters of all edges shall be disregarded.

3.22 Pot life. The pot life of the coating shall be a minimum of ½ hour at 21 °C (70 °F) and 80-percent humidity.

3.23 Gloss. The 60-degree specular gloss of the coating shall be between 45 percent and 60 percent for Class 1 and greater than 80 percent for Class 2.

3.24 Color and surface appearance. The color of the coating shall be in accordance with FED-STD-595, as specified (see 6.2), and the surface shall be uniform in appearance and shall show no mottling, orange peel, pinholing, streaking, seeding, or floating pigment when tested in accordance with the test method specified in table V.

3.25 Resistance to aqueous film forming foam (AFFF) (Type IV only). When tested as specified herein, a film of coating examined immediately after removal from the test shall be visually indistinguishable with regard to hardness, color, and gloss from a panel prepared at the same time, but not immersed.

3.26 Serviceability. The deck coating shall show no deficiencies that would limit its serviceability when examined during and after the minimum service period specified.

3.27 Batch specific VOC certification. Manufacturer shall prepare label instructions in accordance with 29 CFR 1910. Each container must be affixed with a hazardous chemical warning label in accordance with 29 CFR 1910.1200. To comply with the Environmental Protection Agency (EPA) National Emission Standards for Hazardous Air Pollution (NESHAP) requirements for shipbuilding and ship repair, the following two statements must appear on each paint can label:

- a. A certification that the paint in the container meets the NESHAP requirements for shipbuilding and ship repair.
- b. A statement of the ratio of volatile content to solids expressed as grams of volatile organic hazardous air pollutants (VOHAP) per liter of solids.

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 consist of the examinations and tests specified in table IV.

4.2.1 Qualification sample. The qualification sample shall consist of enough component materials (i.e., Parts A and B if a two-component system) to create 4 liters (1 gallon) of the final mixed coating.

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4.3 Conformance inspection.

4.3.1 Lot. For purposes of conformance inspection, a lot shall consist of all coating of the same formula number from a single uniform batch or single uniform blend of batches for each component (of a multi-component coating) offered for delivery at one time. Two representative samples of component A and of component B from each lot of a multi-component paint (total of four samples per lot) shall be evaluated for verification tests. The four samples per lot shall be packaged in separate containers. Single component coatings shall be represented by two samples. Minimum size for each sample shall be 1 liter (1 quart).

4.3.2 Conformance tests. Conformance tests for acceptance of individual lots shall consist of all tests identified in table V. At a minimum, the contractor shall select representative samples from the first and last containers from each lot of coating, and subject the samples to all conformance tests. Results shall meet the applicable requirements in section 3.

TABLE V. Qualification and conformance testing.

Item	Qualification testing required	Conformance testing required	Requirement paragraph	Test method paragraph
Toxicity	Yes	No	3.4	4.5.1
Asbestos content	Yes	No	3.4.1	4.5.1.1
Total and soluble metal content	Yes	No	3.4.2	4.5.1.2
Off-gassing	Yes	No	3.5	4.5.2
Volume solids	Yes	No	3.6	4.5.3
VOC content	Yes	No	3.7	4.5.4
Flash point	Yes	Yes	3.8	4.5.5
Shelf life	Yes	No	3.9	4.5.6
Drying or curing time	Yes	Yes	3.10	4.5.7
Abrasion resistance	Yes	No	3.11	4.5.8
Impact resistance	Yes	No	3.12	4.5.9
Flexibility	Yes	No	3.13	4.5.10
Pencil hardness	Yes	Yes	3.14	4.5.11
Slip resistance	Yes	No	3.15	4.5.12
HAP content	Yes	No	3.16	4.5.13
Condition in container	Yes	No	3.17	4.5.14
Resistance to water	Yes	No	3.18	4.5.15
Resistance to hydrocarbons	Yes	No	3.19	4.5.16
Resistance to salt spray (Type III only)	Yes	No	3.20	4.5.17
Condensation resistance	Yes	No	3.21	4.5.18
Pot life	Yes	No	3.22	4.5.19
Gloss	Yes	Yes	3.23	4.5.20
Color/surface appearance	Yes	Yes	3.24	4.5.27
Resistance to AFFF (Type IV only)	Yes	No	3.25	4.5.21
Serviceability	Yes	No	3.26	4.5.22

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TABLE V. Qualification and conformance testing – Continued.

Viscosity	Yes	Yes	Table III	4.5.23
Weight per gallon	Yes	Yes	Table III	4.5.24
Fineness of grind	Yes	Yes	Table III	4.5.25
Sag resistance	Yes	Yes	Table III	4.5.26

4.4 Inspection conditions. All inspections shall be performed in accordance with the test conditions specified in section 4.

4.5 Test methods. The coating shall be tested in accordance with the applicable methods specified in this section.

4.5.1 Toxicity. The material shall be evaluated by the Navy Environmental Health Center (NEHC) using the administrative Health Hazard Assessment (HHA) to determine compliance with the requirements of 3.4 (see 3.4, 6.2, and 6.6).

4.5.1.1 Asbestos content. Asbestos content shall be determined on a dry film of the coating in accordance with 29 CFR 1915.1001, Appendix K, and the results shall be recorded as a percent by weight of the dry coating film.

4.5.1.2 Soluble and total metal content. Soluble and total metal content, except tantalum and tungsten, shall be determined on a dry film of the coating in accordance with the 40 CFR 261, Appendix III, and the appropriate test listed in tables VI and VII. Soluble metal content shall be analyzed as milligrams per liter (mg/L). Total metal content shall be analyzed as percent by weight of the dry coating film. Tantalum and tungsten soluble metal content and total metal content shall be analyzed as specified in 4.5.1.3.

TABLE VI. Test methods for evaluating solid waste physical/chemical methods. EPA SW-846.

Metal/material	Digestion test method
All metals, except Chromium (VI)	3050
Chromium (VI)	3060
Antimony	7040 or 7041
Arsenic	7060 or 7061
Barium	7080 or 7081
Cadmium	7131
Total chromium	7190
Chromium (VI)	7195, 7196, or 7197
Lead	7421
Mercury	7470 or 7471
Nickel	7520 or 7521
Selenium	7740 or 7741
Silver	7760 or 7761

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TABLE VII. Methods for chemical analysis of water and waste. EPA 600/4-020.

Metal/material	Test method
Beryllium	210.1 or 210.2
Cobalt	219.1 or 219.2
Copper	220.1 or 220.2
Fluoride	340.1, 340.2, or 340.3
Molybdenum	246.1 or 246.2
Thallium	279.1 or 279.2
Vanadium	286.1 or 286.2
Zinc	289.1 or 289.2

4.5.1.3 Tantalum and tungsten content. Determine the tantalum and tungsten content of the coating using any appropriate spectroscopy test method. Conduct the tests in accordance with the equipment manufacturer's directions for the use of the instrument. Paint manufacturer is responsible for justifying the test method choice and analytical accuracy.

4.5.2 Off-gassing (Type II only). The coating shall be tested in accordance with Chapter 7 of NAVSEA Technical Manual S9510-AB-ATM-010, by a Government approved testing facility. The results shall be submitted to the Government for evaluation and approval for use (see 3.5 and 6.7).

4.5.3 Volume solids. Volume solids shall be tested in accordance with ASTM D2697.

4.5.4 Volatile organic content (VOC) solvent. VOC shall be determined in accordance with 40 CFR 60 Ch. I, Appendix A, Method 24, allowing the sample to reside at 22 ± 1 °C (72 ± 2 °F) for 24 hours prior to conducting the analysis. No oven heating is allowed.

4.5.5 Flash point. Flash point shall be tested in accordance with ASTM D3278.

4.5.6 Shelf life. Shelf life shall be tested in accordance with ASTM D1849. Storage temperature shall be 25 ± 2 °C.

4.5.7 Drying or cure time. The coating shall be tested for cure time in accordance with FED-STD-141, Method 4061.3.

4.5.8 Abrasion resistance.

4.5.8.1 All classes. Abrasion resistance shall be tested in accordance with ASTM D4060 using the CS 17 wheel, 1000 cycles, and a 1-kilogram load.

4.5.8.2 Class 2 only. Percent gloss retention shall be tested in accordance with ASTM D6037 using 20 cycles and a 500-gram load (Method A), or 20 double-strokes with a 500-gram load (Method B).

4.5.9 Impact resistance. Impact resistance shall be tested in accordance with ASTM D2794.

4.5.10 Flexibility. Prepare one steel test panel to SSPC-SP 3, and coat with an epoxy primer meeting MIL-DTL-24441 or listed on QPL-23236, applied and cured per manufacturer's instructions. Prepare a second steel test panel to SSPC-SP 3 and apply the primer specified by the manufacturer for the system being tested, per manufacturer's instructions. For systems not requiring a prime coat, prepare steel panel to SSPC-SP 3 degree of surface cleanliness, and apply the coating system. Apply each coat to the minimum DFT allowed, and allow to fully cure per manufacturer's instructions. Impact flexibility shall be tested in accordance with ASTM D6905. A minimum of 10× magnification shall be used during inspection of the tested panel for cracking.

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4.5.11 Pencil hardness. Pencil hardness shall be tested in accordance with ASTM D3363.

4.5.12 Slip resistance. Dry slip resistance shall be tested in accordance with ASTM D2047. Wet slip resistance shall also be tested per ASTM D2047, with the exception that the test panels shall be sprayed with a potable water mist until the entire surface is visibly coated with water immediately prior to testing.

4.5.13 Hazardous air pollutant (HAP) content. Hazardous solvent content of each coating shall be determined in accordance with ASTM E260 or EPA Method 311, as applicable. Solvent fractions shall be identified in accordance with ASTM E1252 with the results recorded as the percent weight of the total paint. Alternate methods of analysis must be reviewed and approved by NAVSEA. Formulation data may be used by manufacturers in lieu of testing to demonstrate compliance with hazardous air pollutant requirements of this specification. The manufacturer's formulation data must have a consistent and quantitatively known relationship to the testing required. Calculation of individual HAP contents can be based on either manufacturer evaluation of batches or supplier data for raw materials used in the product.

4.5.14 Condition in container. Condition in container shall be tested in accordance with Method 3011.3 of FED-STD-141.

4.5.15 Resistance to water. Prepare a test panel per SSPC-SP 3, and apply each coat of the coating system to the minimum wet film thickness specified by the manufacturer. Allow each intermediate coat to cure at room temperature per manufacturer's instructions prior to applying the next coat. After the final coat of the system has been applied, air dry at room temperature for 7 days, or until full cure-to-service time per manufacturer's instructions is reached, whichever is shorter. Coat all exposed surfaces. The panel shall be laid flat and sponges wet with distilled water shall be laid on the panel, in a manner to cover the full face of the test panel. The sponges shall be kept wet for a period of 7 days at ambient laboratory conditions. The sponges may be covered, but such covering shall not restrict all evaporation. Evaporation will leach water soluble materials from the paint into the sponge. After the 7 days have passed, remove the sponges; observe the panel for ASTM D1308 effects after 2 and 24 hours.

4.5.16 Resistance to hydrocarbon fluid. Prepare a test panel per SSPC-SP 3, and apply each coat of the coating system to the minimum wet film thickness specified by the manufacturer. Allow each intermediate coat to cure per manufacturer's instructions prior to applying the next coat. After the final coat of the system has been applied, air dry at room temperature for 7 days, or until the full cure-to-service time per manufacturer's instructions is reached, whichever is shorter. Coat all exposed surfaces. The test panels shall be laid flat and sponges wet with commercial kerosene or jet fuel shall be laid on the panel in a manner to cover the full face of the test panel. The sponges shall be kept wet for a period of 24 hours at ambient laboratory conditions. The sponges may be covered to restrict evaporation, but such covering shall not restrict all evaporation. Evaporation will leach fuel soluble materials from the paint into the sponge. After the 24-hour period is complete, remove the sponges, and observe the panel for ASTM D1308 effects.

4.5.17 Resistance to salt spray (Type III only). Prepare one steel test panel to SSPC-SP 3, and coat with an epoxy primer meeting MIL-DTL-24441 or listed on QPL-23236, applied and cured per manufacturer's instructions. Prepare a second steel test panel to SSPC-SP 3 and apply the primer specified by the manufacturer for the system being tested, per manufacturer's instructions. For systems not requiring a prime coat, prepare steel panel to SSPC-SP 3 degree of surface cleanliness, and apply the coating system. Apply each coat to the minimum DFT allowed per manufacturer's instructions. Allow each intermediate coat to cure per manufacturer's instructions prior to applying the next coat. After the final coat of the system has been applied to each panel, air dry at room temperature for 7 days, or until the full cure-to-service time per manufacturer's instructions is reached, whichever is shorter. Coat all exposed surfaces. Expose the panels to 5-percent salt spray for 14 days in accordance with ASTM B117. Upon removal, wash the panels gently in warm running water (not more than 38 °C) until free from any visible salt deposits and examine immediately in accordance with ASTM D610.

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4.5.18 Resistance to condensation. Prepare one steel test panel to SSPC-SP 3, and coat with an epoxy primer meeting MIL-DTL-24441 or listed on QPL-23236, applied and cured per manufacturer's instructions. Prepare a second steel test panel to SSPC-SP 3 and apply the primer specified by the manufacturer for the system being tested, per manufacturer's instructions. For systems not requiring a prime coat, prepare steel panel to SSPC-SP 3 degree of surface cleanliness, and apply the coating system. Apply each coat to the minimum DFT allowed per manufacturer's instructions. Allow each coat to cure per manufacturer's instructions prior to applying the next coat. After the final coat of the system has been applied, air dry at room temperature for 7 days, or until the full cure-to-service time per manufacturer's instructions is reached, whichever is shorter. Coat all exposed surfaces. The test shall be conducted in accordance with ASTM D2247 for 100, 300, and 500 hours. Evaluation will be conducted and blisters rated in accordance with ASTM D714.

4.5.19 Pot life. Multi-component coatings shall be mixed from the components, in accordance with the manufacturer's instructions, in a container so as to result in approximately 1 liter (1 quart) of finished material. For single component coatings, 1 liter (1 quart) of the coating shall be poured into a separate container. For routine testing, ambient conditions above 21 °C (70 °F) and 50 percent relative humidity shall be satisfactory. For referee tests, 21±3 °C (70±5 °F) and 80±10 percent humidity shall prevail. The time between mixing and/or pouring and the loss of adequate brushing and spraying properties shall be determined. Report up to a 12-hour period the actual temperature, humidity and the time of loss of adequate brushing and spraying properties.

4.5.20 Gloss. 60-degree specular gloss shall be tested in accordance with ASTM D523.

4.5.21 Resistance to AFFF (Type IV only). Prepare one steel test panel to SSPC-SP 3, and coat with an epoxy primer meeting MIL-DTL-24441 or listed on QPL-23236, applied and cured per manufacturer's instructions. Prepare a second steel test panel to SSPC-SP 3 and apply the primer specified by the manufacturer for the system being tested, per manufacturer's instructions. For systems not requiring a prime coat, prepare steel panel to SSPC-SP 3 degree of surface cleanliness, and apply the coating system. Apply each coat to the minimum DFT allowed per manufacturer's instructions. Allow each coat to cure per manufacturer's instructions prior to applying the next coat. After the final coat of the system has been applied, air dry at room temperature for 7 days, or until the final cure-to-service time per manufacturer's instructions is reached, whichever is shorter. Coat all exposed surfaces. The test panels will be suspended in covered containers of 6 percent AFFF diluted with natural sea water, 35 percent AFFF diluted with natural sea water, and 100 percent AFFF for 30 days. On removal from the container, observe the panel for ASTM D1308 effects.

4.5.22 Serviceability. The deck coating shall be applied in NAVSEA designated or approved representative areas aboard a U.S. Naval vessel for a minimum service period of 6 months.

4.5.23 Viscosity. Viscosity shall be determined in accordance with ASTM D562. Test results shall demonstrate that the deck coating meets the requirements of table III.

4.5.24 Weight per gallon. Weight per gallon or density shall be determined in accordance with ASTM D1475. Test results shall be in accordance with table III requirements.

4.5.25 Fineness of grind. Fineness of grind shall be determined in accordance with ASTM D1210. Test results shall be in accordance with table III requirements.

4.5.26 Sag resistance. Sag resistance shall be determined in accordance with ASTM D4400 and the test results shall be in accordance with the requirements of table III.

4.5.27 Color/surface appearance. Color shall be determined by visual color match (see 6.2) in accordance with ASTM D1729 and surface appearance shall meet the requirements of 3.24.

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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.)

6.1 Intended use. The material covered by the specification is intended for use as high durability, wear resistant deck coating for use in high traffic areas, with minimal maintenance. The coating may be supplied with or without aggregate.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Type and class (see 1.2).
- c. Manufacturer's certificate of compliance stating no ozone-depleting substances (ODS) used (see 3.3).
- d. Toxicity conformance (see 3.4 and 6.6).
- e. Off-gassing conformance, when required (see 3.5 and 6.7).
- f. FED-STD-595 color required (see 3.24).
- g. Packaging requirements (see 5.1).
- h. Material Safety Data Sheet, when required (see 6.4).
- i. VOC certification sheets when requested by the contracting officer (see 6.10).

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. 32171 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 05B5, 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 <http://assist.daps.dla.mil>.

6.4 Material safety data sheets. When required, contracting officers will identify those activities requiring copies of completed Material Safety Data Sheets prepared in accordance with FED-STD-313. In order to obtain the MSDS, FAR clause 52.223-3 must be in the contract.

6.5 Product/procedure data sheet. Manufacturers of coatings will be required to provide ASTM F718 forms for the product being qualified to the qualifying activity as part of the final qualification package. No other versions or changes to the ASTM F718 sheets will be allowed to be used by any contractor involved in work onboard Naval vessels. The product/procedure data sheet will also be required to be included with each shipment of the material covered by this specification.

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6.6 Toxicity evaluation. The NEHC requires sufficient information to permit a Health Hazard Assessment (HHA) of the product. Any questions concerning toxicity, information required to conduct an HHA, and requests for HHAs should be addressed to the Commanding Officer, Navy Environmental Health Center, ATTN: Hazardous Materials Department, Industrial Hygiene Directorate, 620 John Paul Jones Circle, Suite 1100, Portsmouth, VA 20378-2103. Upon receipt of the HHA, a copy should be provided to Commander, Naval Sea Systems Command, SEA 05P23, 1333 Isaac Hull Ave., SE, Stop 5133, Washington Navy Yard DC 20376-5133.

6.7 Off-gassing. Type II materials to be installed in submarines are to be controlled to prevent off-gassing, which contaminates the atmosphere and results in health hazards to personnel or deleterious effects on machinery. These controls are accomplished through the Submarine Material Control Program, which is described in Chapter 7 of NAVSEA Technical Manual S9510-AB-ATM-010. Under the Submarine Material Control Program, all materials considered for use on submarines require certification and assignment of a usage category. Under the certification process, candidate materials are selected by Navy activities or contractors, and a request for certification is submitted to Commander, Naval Sea Systems Command, SEA 05Z9, 1333 Isaac Hull Ave., SE, Stop 5122, Washington Navy Yard DC 20376-5122. The certification request is accompanied by detailed information, including descriptions of the material, method of application, usage, and storage. A chemical analysis is conducted, which is normally accomplished through off-gas testing. The off-gas test is required to be conducted in a Government approved laboratory designated by the preparing activity. Information pertaining to this test requirement may be obtained from this same address. Based on the chemical analysis results, a usage category is assigned to the material defining whether, and to what extent, the material may be used on submarines.

6.8 Shelf life. This specification covers items where shelf life is a consideration. Specific shelf-life requirements should be specified in the contract or purchase order. The shelf-life codes are contained in the Federal Logistics Information System Total Item Record. Additive information for shelf-life management may be obtained from DoD 4140.27-M, Shelf-life Management Manual, or the designated shelf-life Points of Contact (POC). The POC should be contacted in the following order: (1) the Inventory Control Points (ICPs), and (2) the DoD Service and Agency administrators for the DoD Shelf-life Program. Appropriate POCs for the DoD Shelf-Life Program can be contacted through the DoD Shelf-Life Management website: <http://www.shelflife.hq.dla.mil/>.

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.

6.10 Suggested packaging requirements. Suggested packaging is contained in tables VIII and IX.

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TABLE VIII. Suggested packing and packaging.

Packaging	Recommended requirements for direct Government acquisitions
Unit of procurement	The paints covered by this specification should be purchased by volume. The unit of procurement should be in multiples of 1 U.S. liquid gallon or 1 Liter at 15.5 °C (60 °F).
Containers	<p>(a) The paint should be furnished in cans of appropriate volume such as 3.78 Liters (1 gallon) or multiples thereof.</p> <p>(b) Multiple friction plug containers should be in accordance with PPP-C-96, Type V, Class 2. Interior coatings should be as specified therein. Exterior coatings, including side seam stripping, should be as specified therein for plan B. 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.</p> <p>(c) Pails should be to PPP-P-704.</p> <p>(d) All containers should comply with the requirements of the Uniform Freight Classifications (UFC), the National Motor Freight Classification (NMFC), and the applicable requirements of the Code of Federal Regulations 49 CFR, Department of Transportation (DOT).</p>
Intermediate containers	<p>(a) Paints should be packaged in intermediate containers.</p> <p>(b) Intermediate containers should be close-fitting corrugated fiberboard boxes in accordance with UFC, NMFC, and 49 CFR requirements. Fiberboard used in the construction of interior (unit and intermediate) and exterior containers, including interior packaging forms, should conform to ASTM D4727. ASTM D4727 classes should be domestic fire-retardant or weather resistant fire-retardant as specified.</p>
Commercial packaging	<p>(a) Commercial packaging should be to ASTM D3951.</p> <p>(b) All containers should comply with the requirements of the Uniform Freight Classifications (UFC), the National Motor Freight Classification (NMFC), and the applicable requirements of the Code of Federal Regulations 49 CFR, Department of Transportation (DOT).</p>
Packing	<p>Packing should be specified as follows:</p> <p>(a) Overseas delivery (Level A) packing. Intermediate containers of paint should be packed in close-fitting wood boxes conforming to ASTM D6251, overseas type. Box closure and strapping should be as specified in the applicable box specification or the appendix thereto except that strapping should be flat and the finish B.</p> <p>(b) Domestic delivery (Level B) packing. Level B packing should be as for level A, except that boxes should be domestic type or class and the strapping should be finish A or B.</p> <p>(c) Commercial packing. The paint, in the specified unit and intermediate containers should, as applicable, be packed in multiples of like sizes in accordance with UFC, NMFC, and 49 CFR requirements.</p>
Palletization	Intermediate containers should be palletized in accordance with MIL-HDBK-774. Only one size unit or intermediate container should be placed on a pallet.
Packing for Navy acquisitions	<p>Treated lumber and plywood. All lumber and plywood, including laminated veneer materials, used in shipping container and pallet construction, member, blocking, bracing, and reinforcing should be fire-retardant treated material in accordance with MIL-L-19140 as follows:</p> <p>(a) General use, weather resistant: MIL-L-19140, Type II, Category I.</p> <p>(b) General use, non-weather resistant: MIL-L-19140, Type I, Category I.</p>

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TABLE VIII. Suggested packing and packaging – Continued.

Material safety data sheets (MSDS) and ASTM F718	A copy of the MSDS and ASTM F718 should be attached to the shipping document for each destination (see 6.6).
VOC certification sheets	VOC certification sheets for each batch of coating will be provided when requested by the procuring activity (see 6.2).

TABLE IX. Suggested marking.

Marking type	Recommended marking
Bar codes	Marking should include bar codes.
Hazardous warnings	(a) Labels should be in accordance with 29 CFR Parts 1910, 1915, 1917, 1918, 1926, and 1928. (b) All individual containers should have the following marking: CAUTION: This paint 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. (c) Each paint container, shipping container, and palletized load should be marked with the appropriate hazardous symbol in accordance with FED-STD-313.
Volatile organic content (VOC)	“Contains a maximum of 250 grams of solvent of volatile organic compounds (VOC) per liter of paint per 40 CFR 60, Ch. 1, Appendix A (EPA), Method 24.”
OSHA Hazard Communication Act and FED-STD-313	Markings should include all information necessary to comply with OSHA Hazard Communication Act and FED-STD-313.
Mixing and use instructions	Directions should include mixing, application equipment directions, limitations on thinning, temperature range for use and surface preparation recommendations. Directions should refer user to data sheets, MSDS, and ASTM F718 for information.

6.11 Lot rejection criteria. Failure of a sample to pass any test should be cause for rejection of the lot.

6.12 Definition of a lot. A lot should consist of all material manufactured at one time (batch) or all material produced by mixing multiple batches into one uniform unit of material.

6.13 Subject term (key word) listing.

AFFF stations

Arsenic

Barium

Benzene

Cadmium

Chloroform

Ethylbenzene

Lead

Mercury

Paint

Perchloroethylene

Tetrachloroethylene

Toluene

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Trichloroethylene

Xylene

6.11 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.

Custodians:

Army – MI

Navy – SH

Air Force – 11

Preparing activity:

Navy – SH

(Project 8010-2009-030)

Review activities:

Army – MR

Navy – AS, CG

Air Force – 84, 99

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 <http://assist.daps.dla.mil>.