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METRIC
MIL-DTL-15090E
12 October 2010
SUPERSEDING
MIL-DTL-15090D
6 November 1996

DETAIL SPECIFICATION

ENAMEL, EQUIPMENT, LIGHT GRAY (NAVY FORMULA NO. 111)

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

1. SCOPE

1.1 Scope. This specification covers a 250-gram per liter (maximum) (2.08 pounds per gallon [maximum]) volatile organic content (VOC) complying paint. The paint is a light gray equipment enamel (Navy Formula Number 111) for shipboard use as a topcoat on equipment, machinery, furniture and electrical equipment, such as switchboard installations. This product may be used wherever VOC air pollution regulations apply. The light gray equipment enamel covered by this specification is an air dry, solvent base coating for use in all interior dry areas including applications covered by reactor plant painting schedules. This product is supplied in a single can and used as supplied without thinning.

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.

FEDERAL SPECIFICATIONS

TT-P-645	-	Primer, Paint, Zinc-Molybdate, Alkyd Type

FEDERAL STANDARDS

FED-STD-141	-	Paint, Varnish, Lacquer and Related Materials: Methods of Inspection, Sampling and Testing
FED-STD-313	-	Material Safety Data, Transportation Data, and Disposal Data for Hazardous Materials Furnished to Government Activities
FED-STD-595/26307		Gray, Semigloss

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-680	-	Degreasing Solvent

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.daps.dla.mil.

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MIL-A-22262	-	Abrasive Blasting Media Ship Hull Blast Cleaning
MIL-DTL-24441	-	Paint, Epoxy-Polyamide, General Specification for
MIL-PRF-24635	-	Coating Systems, Weather-Resistant, Exterior Use
MIL-PRF-24763	-	Enamel, Emulsion Type, for Shipboard Use

(Copies of these documents are available online at https://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 or contract.

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910.1200, Subpart Z	-	Toxic and Hazardous Substances
29 CFR 1910.1200	-	Hazard Communication
29 CFR 1915.1001, Appendix K Method ID-191	-	Polarized Light Microscopy of Asbestos
40 CFR 60, Appendix A-7, Method 24	-	Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings
40 CFR 82	-	Protection of Stratospheric Ozone
40 CFR 261.24(a), Method 1311	-	Toxicity Characteristic Leaching Procedure (TCLP)
40 CFR 355, Appendices A and B	-	The List of Extremely Hazardous Substances and Their Threshold Planning Quantities
40 CFR 372.65, Subpart D	-	Specific 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.)

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 online at https://smcl.dt.navy.mil.)

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 from the Environmental Protection Agency, Ariel Rios Building, 1200 Pennsylvania Avenue, N.W., Washington DC 20460 or online at www.epa.gov.)

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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 D476	-	Standard Classification for Dry Pigmentary Titanium Dioxide Products
ASTM D522	-	Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings
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 D823	-	Standard Practices for Producing Films of Uniform Thickness of Paint, Varnish, and Related Products on Test Panels
ASTM D869	-	Standard Test Method for Evaluating Degree of Settling of Paint
ASTM D1210	-	Standard Test Method for Fineness of Dispersion of Pigment-Vehicle Systems by Hegman-Type Gage
ASTM D1296	-	Standard Test Method for Odor of Volatile Solvents and Diluents
ASTM D1364	-	Standard Test Method for Water in Volatile Solvents (Karl Fischer Reagent Titration Method
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 D2245	-	Standard Test Method for Identification of Oils and Oil Acids in Solvent-Reducible Paints
ASTM D2369	-	Standard Test Method for Volatile Content of Coatings
ASTM D2698	-	Standard Test Method for Determination of the Pigment Content of Solvent-Reducible Paints by High-Speed Centrifuging
ASTM D2805	-	Standard Test Method for Hiding Power of Paints by Reflectometry
ASTM D3278	-	Standard Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus
ASTM D3359	-	Standard Test Methods for Measuring Adhesion by Tape Test
ASTM D3363	-	Standard Test Method for Film Hardness by Pencil Test
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

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ASTM E1347	-	Standard Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry
ASTM F718	-	Standard for Shipbuilders and Marine Paints and Coatings Product/Procedure Data Sheet

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

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC-SP 10	-	Near-White Blast Cleaning

(Copies of this document are available from SSPC Publication Sales, 40 24th Street, 6th Floor, Pittsburgh, PA 15222-4656 or online at 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, 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 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.2.

3.2 Formula. The enamel shall consist of an alkyd resin, pigments, extender pigments, and solvent listed in table I and table II, that when combined, shall result in a paint conforming to the requirements of the applicable paragraphs of this specification.

3.2.1 Formula no. 111. The formula shown in table I is designated Navy Formula No. 111. When Formula No. 111 is specified, or when this specification is referenced without reference to the formula number, the enamel shall conform to the requirements of this specification. Manufacturers may use alternate ingredients as long as the alternate ingredients are specifically approved by the Naval Sea Systems Command and the enamel is shown to meet all the requirements of this specification by first article testing (see 6.4) and conformance testing. Conformance testing may be conducted by the Government at any time to verify that the product being acquired meets the requirements of this specification.

3.2.2 Composition. The paint shall consist of the ingredients listed in table I footnotes in the proportions shown in table I and table II except that the amount of carbon black may be varied as necessary to meet color requirements. In addition, to assist in meeting drying times, brushing, condition in container, and storage stability requirements, driers, antisettling, antisagging, and antiskinning agents may be varied as necessary to meet the other requirements of this specification.

3.2.3 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 Toxicity. When evaluated in accordance with 4.8, the enamel 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 4.8 and 6.8). The materials content used in the enamel shall have no known reportable carcinogenic or potentially carcinogenic materials and shall have no extremely hazardous substances (EHS) or toxic chemicals identified in 40 CFR 355 and 372.65, respectively. The enamel shall not contain more than 0.005 percent cobalt compounds by weight in its formulation, unless a cobalt drier is used (see table V).

3.4 Manufacture. The component raw materials shall be mixed, ground, and blended as required to produce a product that is uniform, free from grit, lumps, skins, and floating pigment. The enamel shall be entirely suitable for the purpose intended and shall be in full conformance to the requirements of this specification.

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TABLE I. Formula no. 111.

Ingredients	Kilograms (kg)	Pounds (lb)	%WT
Alkyd resin solution 1/	291.44	642.52	56.41
Titanium dioxide 2/	56.23	123.96	10.88
Magnesium silicate 3/	62.97	138.83	12.2
Parachlorobenzotrifluoride 4/	45.22	99.7	8.75
Paint thinner 5/	36.35	80.15	7.04
Suspending agent 6/	9.0	19.83	1.74
Dispersant 7/	1.8	3.96	0.35
Calcium drier 8/	4.9	10.81	0.95
Zirconium drier 9/	2.45	5.4	0.47
Antiskinning agent 10/	0.9	1.98	0.17
Cobalt drier 11/	0.73	1.62	0.14
Yellow iron oxide 12/	2.70	5.95	0.52
Antifloat 13/	1.35	2.98	0.26
Carbon black 14/	0.63	1.4	0.12
Totals 15/	516.67	1139.1	100.0

NOTES:

1/ The alkyd resin complies with the table II requirements.
2/ ASTM D476, Types I or II.
3/ Talcron MP-1250, Specialty Minerals, Inc., Bethlehem, PA.
4/ Oxsol® 100, is no longer manufactured by the Occidental Chemical Corp., Dallas, TX. (Oxsol®100 was used for this formulation. There are chemically identical alternatives available from other manufacturers.)
5/ Mineral Spirits (see MIL-PRF-680).
6/ Bentone 38 (10%) Gel, NCP Coatings, Niles, MI.
7/ Spurso, OMG Mooney Chemicals; Cleveland, OH.
8/ Calcium Neodecanoate (6%), OMG Mooney Chemicals, Cleveland, OH.
9/ Zirconium Neodecanoate (18%), OMG Mooney Chemicals, Cleveland, OH.
10/ Exkin #2, OMG Mooney Chemicals, Cleveland, OH.
11/ Cobalt Neodecanoate (12%), OMG Mooney Chemicals, Cleveland, OH.
12/ Y25-LO, Elementis Pigments, Inc. Fairview Heights, IL.
13/ Troysol AFL, Troy Chemical Co., Newark, NJ.
14/ Raven 14, Colombian Chemical Co., Marietta, GA.
15/ This formula makes approximately 100 gallons of paint.

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TABLE II. Alkyd resin requirements.

Characteristics	Requirements	
	Minimum	Maximum
Nonvolatile resin, %WT of solution	49	51
Phthalic anhydride, %WT of non- volatile vehicle	30	-----
Drying oil acids, %WT of non- volatile vehicle	45	55
Acid number	5	12
Dihydric alcohol, %WT of non-volatile resin	----	7
Viscosity (G-H) at 25 C	U	Z
Color, gardener	-----	10
Weight per gallon, kg/liter (pounds/gallon)	1.16(9.7)	1.28 (10.7)
Soya oil	Positive (by certification)	
Rosin	Negative (by certification)	
Phenolic resin	Negative (by certification)	

3.5 Quantitative requirements. The enamel shall conform to the quantitative requirements in tables III, IV, V, 3.5.1, 3.5.2, and 3.6.

TABLE III. Formula no. 111 quantitative requirements.

Characteristics	Requirements	
	Minimum	Maximum
Pigment, %WT of enamel	22.0	25.0
Volatiles, %WT of enamel	46.0	49.0
Nonvolatile vehicle, %WT of enamel (calculated by difference)	28.0	31.0
Water, %WT of enamel	------	0.5
Coarse particles and skins (as residue on N. 325 sieve) %WT of enamel	------	0.2
Viscosity, Krebs units	75	85
Weight per gallon, kg/liter (pounds/gallon)	1.31 (10.9)	1.42 (11.9)
60° Specular gloss	35	50
Contrast ratio	0.97	-----
Color, ΔE	-----	0.5
Time to dry to touch (hours)	-----	2.0
Time to dry through (hours)	-----	8.0
Pencil hardness	HB	-----
Fineness of grind, Hegman units	5	------
Flashpoint, C (F)	38 (100)	------

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TABLE III. Formula no. 111 quantitative requirements - Continued.

Characteristics	Requirements	
	Minimum	Maximum
Sag resistance, mm (mils)	0.11 (5)	-----
VOC, g/L (pounds/gallon)	------	250 (2.09)
Asbestos content, %WT of dry film	------	0.5
Crystalline silica content, %WT of dry film	------	0.5

3.5.1 Hazardous metal content. When tested as specified in 4.7.2, the content of each soluble metal and total content of each metal of the enamel shall be less than the values as specified in table IV and table V. If the test for total metal results in a value less than the soluble metal limit, the soluble metal test need not be conducted. The total and soluble metal values shall be reported in table IV and table V results.

TABLE IV. Hazardous soluble metals content.

Soluble metal and/or its compounds	Maximum, mg/L
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	0.2
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

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TABLE V. Total hazardous metals content.

Metal	Maximum %WT
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
Cobalt and its compounds	0.005 [1/]
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 %WT (up to 0.2 %WT) 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 IV requirements.

3.5.2 Hazardous air pollutants (HAPS). When tested in accordance with 4.7.3, the content of HAPs solvents in the enamel shall not be greater than the VOC limit prescribed for the enamel (see 1.1). Within this limitation and the requirement that the finished enamel meet all the requirements of this specification, the solvent selection must comply with table I.

3.6 Qualitative requirements. The enamel shall conform to the qualitative requirements as specified in 3.6.1 through 3.6.10.

3.6.1 Odor. When tested as specified in table VI, the odor shall be characteristic of the volatiles permitted and used.

3.6.2 Color. When tested as specified in 4.7.6, the color shall match color number 26307 in accordance with FED-STD-595. The measured color deviation, ΔE, from color number 26307 of FED-STD-595 in Commission Internationale de l'Eclairage (CIE; International Commission on Illumination) LAB units shall not be greater than 0.5.

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3.6.3 Flexibility. When tested as specified in 4.7.7, a film of the enamel shall show no evidence of cracking or flaking.

3.6.4 VOC regulations. Thinning of this VOC compliant paint is not allowed. This paint is to be used as supplied without thinning.

3.6.5 Condition in container. When tested as specified in 4.7.8, a freshly opened, full container of enamel shall be free from lumps, abnormal thickening, or livering and shall show no more pigment settling or caking than can be readily reincorporated to a smooth, uniform state.

3.6.5.1 Storage stability.

3.6.5.1.1 Full container. When tested as specified in 4.7.9.1, the product shall be capable of being readily broken up with a paddle to a smooth uniform consistency. It shall be free from livering, curdling, gelling, pigment float, hard caking, gummy sediment, or other objectionable properties for at least 1 year after date of manufacture. The enamel shall conform in all respects to this specification.

3.6.5.1.2 Partially full container. When tested as specified in 4.7.9.2, enamel shall show no skinning at the end of 48 hours. In addition, the enamel shall show no livering, curdling, hard caking, or gummy sediment after being in a partially filled container at 26.67 °C (80 °F). The enamel shall mix readily to a smooth uniform state. Any skin formed shall be easily removed.

3.6.6 Application properties.

3.6.6.1 Rolling properties. When tested as specified in table VI, the enamel shall roll satisfactorily and shall dry to a uniform film, free from seed, runs, sags or streaks. The dried film shall show an even, smooth finish.

3.6.6.2 Brushing properties. When tested as specified in table VI, the enamel shall be capable of being brushed out and laid off without excess drag on the brush. When dry, the brushed surface shall be free of sags and runs and shall show a minimum of brush marks.

3.6.6.3 Spraying properties. When tested as specified in table VI, the enamel shall spray satisfactorily in all respects and shall show no running, sagging, streaking, or orange peel. The film shall air dry and show no seeding, dusting, floating, fogging, mottling, hazing, or other film defects.

3.6.7 Cross-cut adhesion test. When tested as specified in 4.7.11.1, 4.7.11.2, and table VI, a 0.025-mm (nominal) [0.001-inch (nominal)] dry film of enamel shall achieve a minimum classification of 4B.

3.6.8 Water resistance . When tested as specified in 4.7.10, a film of enamel shall show no wrinkling or blistering immediately after removal of the panel from water. The enamel shall be only slightly affected with regard to adhesion when observed 2 hours after removal from the water. After 24 hours air drying, the portion of the panel which was immersed shall be almost indistinguishable, with regard to adhesion (see 3.6.7) and general appearance (see 3.6.10) from the portion of the panel that was not immersed.

3.6.9 Compatibility.

3.6.9.1 Compatibility with topcoats. When tested as specified in 4.7.11.1, the enamel shall show no signs of incompatibility such as blistering, wrinkling or peeling when topcoated with coatings manufactured in accordance with MIL-PRF-24635 and MIL-PRF-24763. Visually examine for incompatibility immediately after topcoat application. After 48 hours, visually examine for compatibility and perform and meet 3.6.8 requirements.

3.6.9.2 Compatibility with primers and undercoats. When tested as specified in 4.7.11.2, the enamel shall show no signs of incompatibility such as blistering, wrinkling or peeling when applied over fully cured or dried films of coatings manufactured in accordance with TT-P-645 or MIL-DTL-24441, Type III and Type IV Formula 150 primer. Visually examine for incompatibility immediately after topcoat application. After 48 hours, visually examine for compatibility and conformance to 3.6.7 requirements.

3.6.10 Surface appearance. When tested as specified in 4.7.12, a flow-out film on glass of the mixed enamel, after drying for 24 hours, shall exhibit a surface smooth in appearance and free of defects, such as loss of dry, color drift, seeding, pinholes, coarse particles, skins, or agglomerates of any kind.

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3.6.11 Film hardness. When tested in accordance with 4.7.13 the test enamel shall have a minimum pencil film hardness of HB.

3.7 Directions for use. The manufacturer shall provide directions for the mixing and application of the enamel. The directions shall comply with 29 CFR OSHA Hazard Communication Act.

3.8 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, Subpart Z. 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.

3.9 Ozone-depleting chemicals. The materials used in the enamel shall not contain Class I or Class II ozone-depleting chemicals as defined in 40 CFR 82.

3.10 Off-gassing. The enamel shall be certified for and assigned a usage category of either “Permitted” or “Limited” in accordance with NAVSEA S9510-AB-ATM-010 chapter titled “Material Control Program” (see 4.9 and 6.9).

4. VERIFICATION

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

a. First article inspection (see 4.2).

b. Conformance inspection (see 4.3).

4.2 First article inspection. First article inspection shall be performed on a random unit sample drawn from the first production batch of enamel. First article testing shall include all tests specified in table VI and 4.7, including those noted as “conformance inspection test”.

4.3 Conformance inspection. Conformance inspection shall be conducted in accordance with Methods 1011, 1022, and 1031 of FED-STD-141 and shall consist of all tests designated as “conformance inspection test” in table VI.

4.4 Lot acceptance. Lots shall be accepted by the Government inspector only upon receipt of a satisfactory test report (see 6.11.1).

4.5 Inspection conditions. Unless otherwise specified in the applicable test paragraphs of this specification, all inspections shall be performed in accordance with the test conditions specified in 4.6 and 4.7 (table VI).

4.6 Test panel preparation. Steel panels [minimum size 60 mm by 90 mm by 3 mm (2.4 inches by 3.6 inches by 0.12 inch) thick (nominal)] shall be prepared for testing by abrasive blasting to a near white metal surface in accordance with SSPC-SP 10 to achieve a minimum 0.051 mm (0.002 inch; 2.0 mil) surface profile. The blasted panels shall be solvent wiped to remove any traces of oil or residue, blown dry with dry air, wrapped in plastic and stored in a desiccator, oven, air-tight storage bag or use other means to prevent rusting prior to coating. The abrasive used for blasting shall be in accordance with MIL-A-22262 and be listed on the current qualified products list. Unless otherwise specified in the applicable test paragraphs of this specification, the test panels shall be coated with TT-P-645 primer applied in one coat at a wet film thickness that will yield a dry film thickness 50 percent greater than the blast profile. Unless otherwise specified in the applicable test paragraphs of this specification, dry time shall be 48 hours at 21 °C (70 °F).

4.7 Test procedures/methods. Test procedures/methods shall be in accordance with table VI.

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TABLE VI. Test procedures.

Test	Requirement	Test	FED-STD-141 test method	ASTM test method
Toxicity	3.3	4.8	----	----
Pigment content	Table III	----	4021.1	D2698
Volatiles vehicle content	Table III	----	----	D2369
Nonvolatile vehicle content	Table III	----	4053.1	----
Water content [2/]	Table III	----	----	D1364
VOC g/L [2/]	Table III	4.7.1	----	----
Metal and asbestos content [2/]	3.5.1	4.7.2	----	----
Hazardous air pollutant solvents [2/]	3.5.2	4.7.3	7356/7360	----
Phthalic anhydride [2/]	Table II	4.7.4	----	----
Rosin/rosin derivative [2/]	Table II	----	----	----
Phenolic resin [2/]	Table II	----	5141.1	----
Soya oil[2/]	Table II	----	----	D2245
Drying oil acids [2/]	Table II	4.7.5	----	----
Coarse particles/skins	Table III	----	4092.1	D185
Viscosity [1/]	Table III	----	----	D562
Weight per liter (gallon) [1/]	Table III	----	----	D1475
Drying time Dry to touch[1/] Dry through	Table III	----	----	D5895
Fineness of grind [1/]	Table III	Table IV	----	D1210
Flashpoint[1/]	Table III	----	----	D3278
Gloss [1/]	Table III	----	----	D523
Sag resistance[1/]	Table III	----	----	D4400
Odor	3.6.1	----	----	D1296
Color and Surface appearance [1/]	3.6.2 3.6.10	4.7.6 4.7.12	---- 3011.1	E1347/D2244 ----
Flexibility	3.6.3	4.7.7	6221	----
Condition in container	3.6.5	4.7.8	3011.1	D869
Storage stability Full container Partially full container	 3.6.5.1.1 3.6.5.1.2	 4.7.9.1 4.7.9.2	 3011.1 3021.1	 D869/D1849 F718
Brushing properties	3.6.6.2	----	4321.2	----
Spraying properties	3.6.6.3	----	2131.1/ 4331.1	----
Cross-cut adhesion test	3.6.7	----	----	D3359, Method B
Water resistance	3.6.8	4.7.10	----	----
Compatibility with topcoats with primer and undercoats	 3.6.9.1 3.6.9.2	 4.7.11.1 4.7.11.2	----	----

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TABLE VI. Test procedures - Continued.

Test	Requirement	Test	FED-STD-141 test method	ASTM test method
Contrast ratio [1/]	Table III	----	-----	D2805
Pencil hardness	3.6.11 and table III	4.7.13	-----	D3363
Off-gassing	3.10	4.9	----	----

NOTES:
[1/] Conformance inspection test (see 4.3).
[2/] By data certification.

4.7.1 Volatile organic compounds (VOC). VOC content shall be determined in accordance with 40 CFR 60, Appendix A-7, Method 24. VOC content shall be as specified in table III.

4.7.2 Soluble and total metal content. Asbestos, soluble and total metal content, except tantalum and tungsten, shall be determined on a dry film of the enamel in accordance with the 40 CFR 261.24(a) and the appropriate test listed below (see table VII and table VIII). Asbestos shall be analyzed in accordance with 29 CFR 1915.1001, Appendix K and the results shall be recorded as percent by weight of the dry enamel film. Soluble metal content shall be analyzed as milligrams per liter (mg/L) (see table IV). Total metal content shall be analyzed as percent by weight of the dry enamel film. The test results for asbestos, each individual soluble metal, and total metal shall be as specified in 3.5.1. Tantalum and tungsten soluble metal content and total metal content shall be analyzed as specified in 4.7.2.1.

TABLE VII. 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
Metal/material	**SW-846 Analysis test method**
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 VIII. Test methods for chemical analysis of water and waste, EPA-600/4-79-020.

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

4.7.2.1 Tantalum and tungsten content. Determine the tantalum and tungsten content of the enamel 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. Test results for tantalum and tungsten shall be as specified in table IV and table V.

4.7.3 Hazardous air pollutant solvents content. Formulation data is to be used by manufacturers in lieu of testing to demonstrate compliance with hazardous air pollutant requirements of this specification. The coating manufacturer must provide for each individual HAP a formulation value that will not be exceeded if a sample from any quality control approved batch of the coating is evaluated in accordance with this paragraph. See 3.5.2.

4.7.4 Phthalic anhydride. Determine phthalic anhydride content of the nonvolatile vehicle.

4.7.5 Drying oil acids. The unsaponifiable, drying oil acids shall be determined on the isolated vehicle and shall conform to table II.

4.7.6 Color testing.

4.7.6.1 Instrumental color deviation determination. Test specimens shall be prepared in accordance with ASTM D823 Test Methods C or E using a nominal 0.006 in blade film applicator on to a clear plate glass of not less than ⅜-in (nominal) thickness, which has been ground to a uniform finish with 1F carborundum. A standard black and white Leneta chart is also acceptable. The color deviation shall be determined in accordance with ASTM D2244 using an instrument having a D_{65} light source (10-degree observer) or C (2-degree observer), a 45-degree illumination angle, a 0-degree viewing angle. The instrument shall be calibrated in accordance with manufacturer instructions and shall be demonstrated to read the color of National Institute for Science and Technology (NIST [formerly National Bureau of Standards; NBS]) traceable standards with color deviations not greater than allowed in 3.6.2. After calibration of the instrument, measure the CIE color values of not less than two color number 26307 of FED-STD-595 color cards which were received from the Government not greater than 1 year prior to the date of this use. Make at least three readings per card taken at 1-inch intervals on the long axis, 1 inch from the edge. Calculate ΔE for each color card. Determine the mean values of ΔE and the CIE color values for the color cards. If any individual CIE color value differs from the mean color value by more than 0.05, use a different color card and recalculate the mean values. These mean values will be used to calculate the color difference values. Measure the CIE color values of the test enamel using the values of three readings taken at 1-inch intervals on the long axis, 1 inch from the edge. Calculate the mean CIE color values of the test enamel. Calculate the color difference terms. If using an instrument that automatically calculates the color differences, enter the color card mean values as the base line for the color difference calculations. The results of the color difference calculations shall be in accordance with the requirements of 3.6.2.

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4.7.6.2 Referee color matching. If the enamel measured in accordance with 4.7.6.1 does not match the color card when visually examined, an independent laboratory certified to the NIST National Volunteer Laboratory Accreditation Program for paint testing shall resolve the discrepancy. When prepared and tested as in 4.7.6.1, the color shall be in accordance with the requirements of 3.6.2.

4.7.6.3 Alternative color measuring equipment. Manufacturers can propose alternative color measuring equipment to NAVSEA or GSA by demonstrating that the particular instrumentation to be used measures the color parameters with the accuracy needed for color deviation. The manufacturer shall demonstrate the alternate instrumentation can provide color parameters that result in the color defined in 3.6.2 and establish correlation factors for converting his instrument's color parameters into those of equipment meeting 4.7.6.1 by measuring an acceptable Navy Formula No. 111 enamel previously measured on an instrument meeting the requirements of 4.7.6.1.

4.7.7 Flexibility. Flexibility shall be determined in accordance with ASTM D522. The enamel shall be applied to a flat metal plate of approximately 31 gauge coated with a dry film thickness of 0.025 mm (0.001 inch + 0.0003 inch) of TT-P-645 primer by means of a doctor blade capable of yielding a dry film thickness of 0.025 mm (0.001 inch + 0.0003 inch). The panel shall be allowed to air-dry for 2 hours then baked for 24 hours at 100 to 105 C (212 to 221 F). The panel shall then be removed from the oven and allowed to stand for 30 minutes at laboratory temperature [nominal 23 °C (73 °F)]. The panel shall then be bent over a 3.2-mm (⅛-inch) mandrel or a tapered mandrel where the minimum diameter is 3.2-mm (⅛-inch) and the film examined at the bent under a magnification of five diameters. Flexibility shall be as specified in 3.6.3.

4.7.8 Condition in container. A container of the product in the size ordered shall be inspected. The product shall be equilibrated to test laboratory conditions [nominal 23 °C (73 °F)]. Evidence of pressure or vacuum in the unopened container shall be noted. The container shall then be opened and examined in accordance with Method 3011.1 of FED-STD-141 for evidence of skinning, corrosion of container interior, odor of putrefaction, rancidity or souring, gel bodies, and hard settling. If the sample is in a 1-liter (1-quart) or smaller container, the character of the lower (or settled) layer shall be determined with a spatula as specified in ASTM D869. If the sample is larger than 1 liter (1 quart), this step shall be omitted. The enamel shall be hand-stirred 300 stirs in 2 minutes with a spatula appropriate to the container, stirring so as to ensure uniform distribution of any settled material. Immediately after stirring, the consistency of the enamel shall be measured using the Krebs-Stormer viscometer. The enamel shall be applied to a test panel and after it has dried, the enamel film shall be examined for grains 0.8 mm (1/32-inch) in diameter, even larger gelatinous lumps, and streaks caused by such grains or lumps. The condition of the product shall be as specified in 3.6.5.

4.7.9 Storage stability.

4.7.9.1 Full container. Storage stability shall be tested in accordance with ASTM D1849. A container of the product of the size ordered shall be stored at the temperature recommended in the manufacturer's data sheet or ASTM F718 for a period of 1 year. After completion of 1 year, the stored sample shall be equilibrated to test laboratory conditions [nominal 23 °C (73 °F)]. Evidence of pressure or vacuum in the unopened container shall be noted. The container shall then be opened and examined in accordance with Method 3011.1 of FED-STD-141 for evidence of skinning, corrosion of container interior, odor of putrefaction, rancidity, or souring. If the sample is in a 1-liter (1-quart) or smaller container, the character of the lower (or settled) layer shall be determined with a spatula as specified in ASTM D869. If the sample is larger than 1 liter (1 quart), this step shall be omitted. The enamel shall be hand-stirred 300 stirs in 2 minutes with a spatula appropriate to the container, stirring so as to ensure uniform distribution of any settled material. Immediately after stirring, the consistency of the enamel shall be measured using the Krebs-Stormer viscometer. The enamel shall be applied to a test panel and after it has dried the enamel film shall be examined for grains 0.8 mm (1/32 inch) in diameter, even larger gelatinous lumps, and streaks caused by such grains or lumps. The condition of the product shall be as specified in 3.6.5.1.1.

4.7.9.2 Partially full container. A sample of enamel shall be prepared and tested in accordance with Method 3021.1 of FED-STD-141. After 48 hours inspect for skinning, livering, curdling, hard caking, or gummy sediment. Examine for ease of mixing. The enamel shall be as specified in 3.6.5.1.2.

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4.7.10 Water resistance. Spray apply a 0.076 + 0.025 mm (0.003 + 0.001 inch) film of the enamel on a panel prepared as specified in 4.6. Cure at room temperature [approximately 22 °C (72 °F)] for 48 hours. Immerse 50 percent of the panel in room temperature distilled water for 24 hours. The condition shall be as specified in 3.6.8 and 3.6.10.

4.7.11 Compatibility.

4.7.11.1 Compatibility with topcoats. Prepare and prime three panels as specified in 4.6. To the first panel apply a 0.051- to 0.076-mm (0.002- to 0.003-inch; 2- to 3-mil) coating (topcoat) of paint manufactured to MIL-PRF-24635; to the second panel apply a 0.051- to 0.076-mm (0.002- to 0.003-inch; 2- to 3-mil) topcoat of paint qualified to MIL-PRF-24763, to the third panel apply a 0.051- to 0.076-mm (0.002- to 0.003-inch; 2- to 3-mil) topcoat of the MIL-DTL-15090 test enamel produced to this specification. After drying (curing the three panels for 48 hours at 50 C (122 F), cool to ambient laboratory conditions and apply a 0.051- to 0.076-mm (0.002- to 0.003-inch; 2- to 3-mil) topcoat of the test enamel. Examine for blistering, wrinkling, or peeling of the enamel immediately after topcoat application and 48 hours after topcoat application. Check adhesion 48 hours after topcoat application by Test Method B of ASTM D3359. Enamel condition shall be as specified in 3.6.7 and 3.6.9.1.

4.7.11.2 Compatibility with primers. Prepare and prime three panels as specified in 4.6. To the first panel apply a 0.051 to 0.076 mm (2 to 3 mils) primer coating TT-P-645; the second panel with 0.051 to 0.076 mm (2 to 3 mils) of MIL-DTL-24441, F.150, Type III paint and to the third panel apply 0.051 to 0.076 mm (2 to 3 mils) of MIL-DTL-24441, F.150, Type IV paint. Apply one coat at 0.051- to 0.076-mm (2-3 mils) DFT of the test enamel. Examine for blistering, wrinkling, or peeling of the enamel immediately after topcoat application and 48 hours after topcoat application. Check adhesion 48 hours after topcoat application by Test Method B of ASTM D3359. Enamel condition shall be as specified in 3.6.7 and 3.6.9.2.

4.7.12 Surface appearance. Prepare a flow-out film of the enamel by pouring approximately 15 mL of the mixed enamel across a glass panel near the upper edge, while the panel is lying flat. Then tilt the panel to allow the coating to spread over all but the upper edge. Next, place the panel in an almost vertical position and allow to drain. After 24 hours, examine the film for compliance with 3.6.10. Coarse particles, skins, and agglomerates are characterized by being larger than the dispersed pigment in particle size and extending beyond the plane of the film.

4.7.13 Film hardness. To a steel panel prepared and primed in accordance with 4.6, apply 0.051 to 0.076 mm (2 to 3 mils) of the test enamel and dry for seven days at laboratory conditions [21±2 °C (70±5 °F) and 50±5 percent relative humidity]. Test in accordance with table VI and evaluate for compliance with 3.6.11.

4.8 Toxicity. The enamel shall be evaluated by the Navy and Marine Corps Public Health Center (NMCPHC) using the administrative Health Hazard Assessment (HHA). Sufficient data to permit an HHA of the product shall be provided by the manufacturer/distributor to the NMCPHC. To obtain current technical information requirements specified by the NMCPHC, see 6.8. A manufacturer of material shall disclose the formulation of his product to the Navy and Marine Corps Public Health Center (NMCPHC), ATTN: Industrial Hygiene Department, Acquisition Technical Support Division, 620 John Paul Jones Circle, Suite 1100, Portsmouth, VA 23708-2103. The disclosure of proprietary information, which shall be held in confidence by the NMCPHC, shall include:

a. Name, formula, and approximate percentage by mass and volume of each ingredient in the product;

b. Results of any toxicological testing of the product;

c. Identification of its pyrolysis products; and

d. Any such other information as may be needed to permit an accurate appraisal of any toxicity problem associated with the handling, storage, application, use, removal, or disposal of the material.

4.9 Off-gassing. The enamel shall be tested by a Government approved testing facility in accordance with NAVSEA S9510-AB-ATM-010 chapter titled "Material Control Program." The results shall be submitted to the Government for evaluation and approval for use (see 3.10 and 6.9).

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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 enamel covered by this specification is intended for use as a finish or topcoat on equipment, machinery, furniture and electrical equipment in marine service where fire-retardancy is not required. This product may be applied where air pollution regulations apply. This enamel is a non-lead, non-chromate, non-asbestos material. The dried paint film has been tested to U.S. EPA standards and the paint debris is, as of the time of this specification, a non-hazardous waste. It may be applied by brush or spray and is suitable for any metal or wood structure. During development, this enamel was easily sprayed with a Binks #7 HTES (high transfer efficiency special) gun. Spraying with a high volume, low pressure (HVLP) gun was successful using an AIRVERTER® HVLP Sprayer available from Smith Eastern Corporation. The basic formulation provides an enamel of a gray color. This enamel has been formulated to comply with air pollution regulations which allow a maximum VOC of 250 grams of solvent minus water per liter of paint (2.08 lb/gal) as delivered, and does not require thinning for brush, roller, or spray application.

6.1.1 Baking enamel. Baking enamel has been deleted from the previous version of this specification. Baking enamel intended for use on furniture, equipment, and so forth in non-reactor plant painting applications is now described by ASTM F1178. Color requirement of paragraph 3.6.2 is applicable.

6.1.2 Powder. Coating in the appropriate color of 3.6.2 is also an option for a baking version. Consult NAVSEA for powders acceptable in submarine applications.

6.2 Acquisition requirements. Acquisition documents should specify the following:

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

b. Specific issue of individual documents referenced (see 2.2.1, 2.2.2, and 2.3).

c. When first article is required (see 3.1).

d. Toxicity conformance (see 3.3 and 6.8).

e. Off-gassing conformance (see 3.10 and 6.9).

f. Packaging requirements (see 5.1).

g. Whether MSDSs are required with each shipment (see 6.6).

6.3 NAVSEA approval and direction. Deviations from specified materials, procedures, and requirements and selection of specific alternative materials and procedures will be submitted to NAVSEA for evaluation and direction. Requests should include supporting documentation.

6.4 First article inspection. First article inspection is required for all manufacturing sources. The contracting officer should specify to offerors that the item is a first article sample from the first production batch (see 3.1) to be tested. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspections to those bidders offering a product which has been previously tested by the government, and that bidders offering such product, who wish to rely on such tests, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

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6.5 Volatile content. Although the container marking specifically refers to the Federal regulations, the paints may be used anywhere else a product complying with 3.2 is allowed. This includes other air pollution control districts or similar areas controlling the emission of solvents into the atmosphere.

6.6 Material safety data sheet (MSDS). The contracting activity should be provided a material safety data sheet at the time of contract award. The MSDS should be provided in accordance with OSHA section 1910.1200, 29 CFR Chapter XVII and found as part of FED-STD-313. OSHA section 1910.1200 requires reporting threshold criteria for known or suspected human carcinogens on MSDS 0.1 percent or greater, and 1 percent or greater for other health hazards. The MSDS should be included with each unit of issue of material covered by the specification, when specified (see 6.2).

6.6.1 Material safety data sheets. Contracting officers will identify those activities requiring copies of completed material safety data sheets prepared in accordance with FED-STD-313. The pertinent Government mailing addresses for submission of data are listed in FED-STD-313.

6.7 Directions for use. The manufacturer should provide written directions on each container for the mixing and application of the enamel supplied and this direction should include all information necessary to comply with OSHA Hazard Communication Act and FED-STD-313. In addition, the manufacturer should prepare an ASTM F718 data sheet (see 6.6), which should separately detail requirements for small unit (pint, quart, gallon) and large unit (five-gallon) containers.

6.8 Toxicity evaluation. The Navy and Marine Corps Public Health Center (NMCPHC) requires sufficient information to permit an HHA of the product. Any questions concerning toxicity and requests for HHA should be addressed to the Commanding Officer, Navy and Marine Corps Public Health Center (NMCPHC), ATTN: Industrial Hygiene Department, Acquisition Technical Support Division, 620 John Paul Jones Circle, Suite 1100, Portsmouth, VA 23708-2103. Upon receipt of the HHA, a copy should be provided to the Naval Sea Systems Command, ATTN: SEA 05S, 1333 Isaac Hull Ave., SE, Stop 5160, Washington Navy Yard, DC 20376-5160 or emailed to commandstandards@navy.mil.

6.8.1 Toxicological product formulations. The contractor should have the toxicological product formulations and associated information available for review by the NMCPHC or appropriate departmental medical service to evaluate the safety of the material for the proposed use.

6.9 Material certification. Materials to be installed in submarines are to be controlled to prevent off-gassing, which contaminates the atmosphere and can result in health hazards to personnel or deleterious effects on machinery. These controls are accomplished through the Submarine Material Control Program, which is described in the Nuclear Powered Submarine Atmosphere Control Manual, NAVSEA S9510-AB-ATM-010 chapter titled "Material Control Program." 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 the Naval Sea Systems Command, SEA 05S, 1333 Isaac Hull Ave., SE, Stop 5160, Washington Navy Yard, DC 20376-5160 or emailed to commandstandards@navy.mil. 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 the Naval Sea Systems Command, SEA 05S, 1333 Isaac Hull Ave., SE, Stop 5160, Washington Navy Yard, DC 20376-5160 or emailed to commandstandards@navy.mil. 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.

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6.10 Suggested packaging. Suggested packaging requirements are contained in table IX and table X.

TABLE IX. 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 L at 60EF (15.5EC).
Containers	a. The paint should be furnished in cans of appropriate volume such as 3.78L (1-gallon) or multiples thereof. b. 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. c. Pails should be to PPP-P-704. 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 49CFR, Department of Transportation (DOT).
Intermediate containers	a. Paints should be packaged in intermediate containers. b. Intermediate containers should be close-fitting corrugated fiberboard boxes in accordance with UFC, NMFC and 49CFR requirements. Fiberboard used in the construction of interior (unit and intermediate) and exterior containers, including interior packaging forms, should conform to the best commercial practice. Such classes should be domestic fire-retardant or weather resistant fire-retardant as specified.
Commercial packaging	a. Commercial packaging should be to ASTM D3951. 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 49CFR, Department of Transportation (DOT).
Packing	Packing should be specified as follows: a. Overseas delivery (Level A) packing. Intermediate containers of paint should be packed in close-fitting wood boxes conforming to the best commercial practice. 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. 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. 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 49CFR requirements.
Palletization	Intermediate containers should be palletized in accordance with the best commercial practice. Only one size unit or intermediate container should be placed on a pallet.

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TABLE IX. Suggested packing and packaging - Continued.

Packaging	Recommended requirements for direct Government acquisitions
Packing for Navy acquisitions	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: a. General use, weather resistant: MIL-L-19140, Type II, Category I. b. General use, non-weather resistant: MIL-L-19140, Type I, Category I.
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.

TABLE X. 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 content (VOC) per liter of paint per 40 CFR 60, CH. 1, Appendix A-7 (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 Definitions.

6.11.1 Lot. A lot consists of all material manufactured at one time (batch) or all material produced by mixing multiple batches into one uniform unit of material.

6.12 Subject term (key word) listing.

Alkyd

Chromium free

Cobalt compounds

Equipment paint

Lead free

Pigment

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Shipboard surfaces

Volatile organic content (VOC)

6.13 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 – CR4
Navy – SH
Air Force – 99

Preparing Activity:
Navy – SH
(Project 8010-2009-034)

Review activity:
Misc – DS

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.daps.dla.mil.