

METRIC

MIL-PRF-24596B(SH)
w/AMENDMENT 1

15 February 2011

SUPERSEDING

MIL-PRF-24596B(SH)
19 February 2009

PERFORMANCE SPECIFICATION
COATING COMPOUNDS, NONFLAMING, FIRE-RESISTANT

This specification is approved for use by the Naval Sea Systems Command and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers four classes and four grades of nonflaming, fire-resistant coatings which are suitable for use where volatile organic compound (VOC) content air pollution regulations apply for solvents in paints and for application over certain selected surfaces. Except for trace levels, all grades are free of lead, chromium, cadmium, and asbestos (see 3.5.4). All grades have levels of hazardous air pollutants (HAPs) that do not exceed applicable National Emission Standards for Hazardous Air Pollutants (NESHAP) levels (see 3.5.3 and 3.9). Dry coating residues and debris are non-hazardous waste under U.S. Environmental Protection Agency (EPA) regulations in effect on the date of this specification.

1.2 Classification. Coating compounds covered by this specification are nonflaming, fire-resistant, non-intumescent coatings of the following classes, grades, and applications, as specified (see 6.2).

1.2.1 Classes. The classes of coating compounds are as follows:

- Class 1 - Surface ship, general usage.
- Class 2 - Submarine, general usage.
- Class 3 - Submarine (underway use only) (see 6.1.2).
- Class 4 - Anti condensation coating (surface ships only).

1.2.2 Grades. The grades of coating compounds are as follows:

- Grade A - Water-based, air dry at temperatures less than 38 °C; maximum volatile organic content (VOC) not to exceed 175 grams per liter of paint.
- Grade B - Water-based, requiring baking at temperatures above 87 °C; VOC not to exceed 250 grams per liter of paint.
- Grade C - Solvent base, air dry at temperatures less than 38 °C; VOC not to exceed 250 solvent grams per liter of paint.
- Grade D - Grade D no longer used.
- Grade E - Solvent base, requiring baking at temperatures above 87 °C; VOC not to exceed 250 grams per liter of paint.

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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1.2.3 Applications. The applications of coating compounds are as follows:

Application A - Steel.

Application B - Aluminum.

Application C - Fiber reinforced plastics (FRP).

Application D - Wood.

Application E - Elastomeric foam insulation.

1.3 Part or identifying number (PIN). PINs to be used for nonflaming and fire-protective coatings acquired to this specification are created as follows:

M **24596** = **X** **X** **X**
Prefix for military Specification Class (see Grade (see Application
specification number code below) code below) (see code below)

Class code		Grade code		Application code	
Class	Code	Grade	Code	Application	Code
1	A	A	1	A	A
2	B	B	2	B	B
3	C	C	3	C	C
		E	4	D	D
				E	E

Examples:

- a. M24596-A2C
- b. M24596-C4B

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-C-492 - Coating Compound, Paint Antisweat
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

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- FED-STD-595 - Colors Used in Government Procurement
- FED-STD-595 - Orange, Semigloss (Rosewood)
color number 22519
- FED-STD-595 - Orange, Semigloss (Beach Sand)
color number 22563
- FED-STD-595 - Yellow, Semigloss (Sun Glow)
color number 23697
- FED-STD-595 - Green, Semigloss (Clipper Blue)
color number 24516
- FED-STD-595 - Green, Semigloss (Pastel Green)
color number 24585
- FED-STD-595 - Blue, Semigloss (Pastel Blue)
color number 25526
- FED-STD-595 - Gray, Semigloss (Bulkhead Gray)
color number 26307
- FED-STD-595 - Gray, Semigloss (Yellow Gray)
color number 26400
- FED-STD-595 - Gray, Semigloss (Pearl Gray)
color number 26493
- FED-STD-595 - Gray, Semigloss (Green Gray)
color number 26496
- FED-STD-595 - Miscellaneous, Semigloss (Soft White)
color number 27880

DEPARTMENT OF DEFENSE SPECIFICATIONS

- MIL-DTL-24607 - Enamel, Interior, Nonflaming (Dry), Chlorinated Alkyd Resin, Semigloss
- MIL-DTL-24441/20 - Paint, Epoxy-Polyamide, Green Primer, Formula 150, Type III
- MIL-DTL-24441/29 - Paint, Epoxy-Polyamide, Green Primer, Formula 150, Type IV

(Copies of these documents are available online at <https://assist.daps.dla.mil/quicksearch/> or <https://assist.daps.dla.mil> 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 are those cited in the solicitation or contract.

CODE OF FEDERAL REGULATIONS (CFR)

- 29 CFR 1910 - Occupational Safety and Health Standards
- 29 CFR 1910.1000, Subpart Z - Toxic and Hazardous Substances
- 29 CFR 1910.1200 - Hazard Communication

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- 29 CFR 1990 - Identification, Classification, and Regulation of Potential Occupational Carcinogens
- 40 CFR Chapter 1, Part 60, Appendix A, 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, Appendix II - Method 1311 Toxicity Characteristic Leaching Procedure (TCLP)
- 40 CFR 355, Appendixes A and B - The List of Extremely Hazardous Substances and Their Threshold Planning Quantities
- 40 CFR 372.65, Subpart D - Specific Toxic Chemical Listings
- 49 CFR 171-178 - Hazardous Materials Regulations

(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>.)

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

- ID-191 - Polarized Light Microscopy of Asbestos

(Copies of this document are available from the U.S. Department of Labor/OSHA, OSHA Publications, PO Box 37535, Washington DC 20013-7535 or online at www.osha.gov.)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EPA)

- EPA SW-846 - Test Methods for Evaluating Solid Waste, Physical/Chemical Methods
- EPA 600/4-020 - Methods for Chemical Analysis of Water and Wastes

(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.)

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 D93 - Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester (DoD adopted)
- ASTM D522 - Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings (DoD adopted)
- ASTM D523 - Standard Test Method for Specular Gloss (DoD adopted)

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- ASTM D562 - Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer (DoD adopted)
- ASTM D610 - Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces (DoD adopted)
- ASTM D714 - Standard Test Method for Evaluating Degree of Blistering of Paints (DoD adopted)
- 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 (DoD adopted)
- ASTM D1640 - Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature (DoD adopted)
- ASTM D1729 - Standard Practice for Visual Appraisal of Colors and Color Differences of Diffusely-Illuminated Opaque Materials (DoD adopted)
- ASTM D2243 - Standard Test Method for Freeze-Thaw Resistance of Water-Borne Coatings (DoD adopted)
- ASTM D2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity (DoD adopted)
- ASTM D2621 - Standard Test Method for Infrared Identification of Vehicle Solids From Solvent-Reducible Paints
- ASTM D2698 - Standard Test Method for Determination of the Pigment Content of Solvent-Reducible Paints by High-Speed Centrifuging (DoD adopted)
- ASTM D2805 - Standard Test Method for Hiding Power of Paints by Reflectometry (DoD adopted)
- ASTM D3272 - Standard Practice for Vacuum Distillation of Solvents from Solvent-Reducible Paints for Analysis
- ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber (DoD adopted)
- ASTM D3274 - Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation (DoD adopted)
- ASTM D3278 - Standard Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus (DoD adopted)
- ASTM D3723 - Standard Test Method for Pigment Content of Water-Emulsion Paints by Low-Temperature Ashing
- ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source (DoD adopted)
- ASTM E260 - Standard Practice for Packed Column Gas Chromatography
- ASTM E313 - Standard Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates

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- ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials (DoD adopted)
- ASTM E1252 - Standard Practice for General Techniques for Obtaining Infrared Spectra for Qualitative Analysis
- ASTM F683 - Standard Practice for Selection and Application of Thermal Insulation for Piping and Machinery
- 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.)

INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC)

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans

(Copies of this document are available from WHO Press, World Health Organization, CH-1211 Geneva 27, Switzerland or online at www.who.int/bookorders.)

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.ssptc.org.)

2.4 Order of precedence. 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. Coating compounds furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.2 and 6.3).

3.1.1 Qualification of commercial products specified as Navy formula 25A. Coating compounds certified to meet the requirements of Navy formula 25A by the manufacturer shall be accepted as meeting the requirements of Class 1, Grade A, all applications and FED-STD-595 colors 24585 (pastel green), 26307 (bulkhead gray), and 27880 (soft white), and shall be qualified without testing to Class 1, Grade A.

3.1.2 Formula 25A. See Appendix B.

3.1.3 Description of coatings. At the time of qualification submittal, all coatings and coating components constituting the coating being qualified shall be identified by (a) class, grade, application, and color for which qualification is sought and (b) unique product nomenclature. At a minimum, this unique product nomenclature shall consist of coating name, component identifier (if appropriate), alpha, numeric, or alpha-numeric identifier, and color.

3.2 Composition. Coatings shall be furnished in accordance with the requirements of the class, grade, and application specified (see 6.2). The composition of the coating furnished to this specification shall be the responsibility of the manufacturer, except as otherwise limited by this specification or 29 CFR 1910.1000, 29 CFR 1990, 49 CFR 171-178, 40 CFR 355, Appendixes A and B, 40 CFR 372.65, Subpart D, 40 CFR 82, and International Agency for Research on Cancer (IARC) Monographs (see 3.10).

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3.3 Color.

3.3.1 Color of coatings. Coatings shall be qualified FED-STD-595 color numbers 27880, 24585, and 26307 (see 4.3 for extension of qualification to other colors). Colors not listed in table I shall be qualified individually.

3.3.2 Colors. Colors shall be supplied as ready mixed products.

TABLE I. Colors.

Color name	FED-STD-595 color chip number
Soft white	27880
Pastel green	24585
Bulkhead gray	26307
Sun glow	23697
Green gray	26496
Yellow gray	26400
Pearl gray	26493
Pastel blue	25526
Beach sand	22563
Rosewood	22519
Clipper blue	24516

3.4 Identification characteristics. Coatings shall be identified by product name, color, and a unique alpha, numeric, or alpha-numeric identifier. Values for coating identification characteristics and the mixing, application instructions, and test methodology used to determine those characteristics indicated by an "X" in table II shall be provided by manufacturers seeking qualified product listing (QPL). The values shall be established for each coating system prior to qualification testing. The purpose of these values is to serve as a basis for determining that the material being offered is essentially the same as that which was approved under qualification testing. Subject to review by the Naval Sea Systems Command (NAVSEA), alternative identification characteristics (for example, infrared spectrographic examination and chemical analysis) may be substituted for the characteristics in table II, provided appropriate test methodology is submitted by the manufacturer.

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Characteristic	Single component materials
Chemical nature of resin(s)	X
Percent of principal constituents (5 percent by weight (wt%) or more of total)	X
Pigment, wt%	X
Nonvolatile vehicle, wt%	X
Total solids, wt%	X
Color (as descriptive name and FED-STD-595 number)	X
Volatile, wt%	X
Mass per unit volume in g/L (lb/gal)	X
Viscosity in Kreh units (KU) or Poise	X
Flash point as Setaflash or Pensky-Martin closed cup, °C	X
Drying time to touch and dry hard time or curing time in hr	X
Specular gloss (%)	X
Hiding power (contrast ratio)	X
Volatile organic content, g/L	X
Mixing instructions	X
Application instructions	X

3.5 Quantitative requirements. Unless otherwise stated in this section, the following tests apply to all classes, grades, and applications.

3.5.1 Volatile organic content (VOC) solvent. When tested in accordance with 4.6.2, the VOC of appropriate grades shall not exceed the value listed:

Grade	Maximum VOC
A	175 g/L
B	250 g/L
C	250 g/L
E	250 g/L

3.5.2 Class 3 volatiles. The volatile portion of the formulation for Class 3 coatings shall comply with the classified requirements for NAVSEA submarine atmosphere control (see 6.3.1), when tested in accordance with 4.6.2.1.

3.5.3 Hazardous air pollutant (HAP) content. When evaluated as specified in 4.6.3, the content of HAP solvents in each individual coating shall not be greater than the VOC limit prescribed for the specific grades. Within this limitation and the requirement that the finished coating meet all the requirements of this specification, solvent selection is the responsibility of the manufacturer.

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3.5.4 Hazardous pigments and additives. When tested in accordance with 4.6.4, the content of each soluble metal and the total content of each metal of the coating shall be less than the values listed in table III. In addition, crystalline silica, asbestos, and asbestos from pigment shall not exceed 0.1 percent by weight.

TABLE III. Metals content of coatings.

Metal and/or its compound in each coating dry film	Soluble metal, maximum, mg/L	Total metals content, maximum, wt%
Antimony	15	0.015
Arsenic	5	0.005
Barium (excluding barite)	100	0.10
Beryllium	0.75	0.0002
Cadmium	1	0.0005
Chromium (VI) compounds	1	0.001
Chromium (including chromium (III))	560	0.56
Cobalt ^{1/}	50	0.005
Copper	25	0.01
Fluoride salts	180	0.18
Lead	5	0.005
Mercury	0.2	0.0002
Molybdenum	350	0.35
Nickel	20	0.02
Selenium	1	0.002
Silver	5	0.001
Tantalum	100	0.100
Thallium	7	0.007
Tungsten	100	0.100
Vanadium	24	0.01
Zinc	250	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 III requirements.		

3.5.5 Flash point. When tested in accordance with table IV, the flash point of the coating shall not be less than 38 °C.

3.5.6 Gloss. When tested in accordance with 4.6.1, specular gloss shall be not less than 45 percent and shall not exceed 60 percent.

3.5.7 Yellowness. When tested in accordance with 4.6.5, the yellowness index of panels in light or dark storage shall not increase more than 3 units.

3.6 Qualitative requirements. Unless otherwise stated in this section, the following tests apply to all classes, grades, and applications.

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3.6.1 Condition in container. When tested in accordance with table IV, the coating or components of a coating system 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 paints shall also be free of rust staining, emulsion breakdown, spoilage, or rancidity. Container shall be free of corrosion.

3.6.2 Mixing properties. When tested in accordance with 4.6.6, the coating shall be free from grit, seeds, skins, or lumps, and shall result in a smooth, uniform mixture. After aging, the coating shall show no signs of gelation or separation.

3.6.3 Spraying properties. When tested in accordance with 4.6.7, the coating shall spray satisfactorily in all respects, and shall show no running, sagging, or streaking. The dried film shall show no dusting, mottling, or color separation and shall present a smooth finish.

3.6.4 Brushing properties. When tested in accordance with 4.6.8, the coating shall brush satisfactorily in all respects and shall dry to a smooth, uniform film, free from seeds, runs, or sags.

3.6.5 Flexibility. When tested in accordance with 4.6.9, a film of coating shall show no checking, cracking, or flaking.

3.6.6 Knife test adhesion. When tested in accordance with 4.6.10, the coating film shall be difficult to furrow off with the knife, shall not flake, chip, or powder, and shall show neither loss of inter-coat adhesion, nor loss of adhesion to the surface of the substrate. The knife cut shall show beveled edges.

3.6.6.1 Adhesion test. When tested in accordance with table IV, a film of coating shall adhere tightly to the test panel.

3.6.7 Fluid resistance (except Class 4).

3.6.7.1 Water resistance (does not apply to Grades A and B water-based coatings). When tested in accordance with 4.6.11, 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 almost indistinguishable with regard to hardness and adhesion from the portion which was not immersed. A slight discoloration of the portion of the panel covered by the wetted sponges shall be permitted.

3.6.7.2 Hydrocarbon fluid resistance (does not apply to Grades A and B water-based coatings). When tested in accordance with 4.6.12, 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 almost indistinguishable with regard to hardness, color, and gloss from a panel prepared at the same time, but not immersed.

3.6.7.3 Salt spray resistance (does not apply to application C, D, and E coatings). When tested in accordance with 4.6.13, 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.

3.6.7.4 Condensation blister resistance. When tested in accordance with 4.6.14, a film of coating shall show a maximum ASTM D714 blister rating of 8 and be rated few or better. Blisters within 12 millimeters of all edges shall be disregarded.

3.6.8 Resistance to exudate formation (Grades A and B water-based coatings only). When tested in accordance with 4.6.15, a film of coating shall exude no fluid (liquid) material from the paint film and paint film shall not be tacky.

3.6.9 Washability (except Class 4). When tested in accordance with 4.6.16, a film of coating shall retain a minimum of 50 percent of its original gloss.

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3.6.10 Flash rust resistance (Grades A and B, application A water-based coatings only). When tested in accordance with 4.6.17, there shall be no evidence of flash rust or pinhole corrosion.

3.6.11 Resistance to growth of mold. When tested in accordance with table IV, after 4 weeks the test panels shall have a minimum ASTM D3274 rating of 8.

3.6.12 Freeze-thaw resistance (Grades A and B only). When tested for five cycles in accordance with table IV, the coating shall not: (a) exhibit broken emulsion or (b) be agglomerated or coagulated. There shall be no change in: (a) hiding power, (b) gloss, (c) fineness of grind, or (d) speckiness. Color shall match the standard color card of the appropriate FED-STD-595 color. Viscosity shall be within 10 percent of the viscosity of the control. Brushability and sprayability shall be the same as the control.

3.6.13 Recoatability. When tested in accordance with 4.6.18, the paint shall not wrinkle, blister, or lift. When cut with a knife blade, the overcoat paint shall not lose adhesion or flake away from the test paint film. The surface of the recoat paint shall be smooth.

3.7 Thermal properties. Unless otherwise specified (see 6.2), all paints regardless of application shall be tested to these requirements.

3.7.1 Radiant panel. When tested in accordance with 4.6.19.2, coating systems shall have the following maximum flame spread indices:

Application	Maximum flame spread index
A	5
B	5
C	25
D	25
E	50

3.7.2 Smoke density. When tested in accordance with 4.6.19.3, coating systems shall have the following maximum smoke generation values:

Application	Maximum allowed smoke density
A	15
B	15
C	20
D	30
E	40

3.7.3 Resistance to ignition (application A only). When tested in accordance with 4.6.19.4, coatings shall not exhibit flaming, sparking, fumes or smoke, or burning drops in excess of that of the control MIL-DTL-24607.

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3.7.4 Hazardous emissions. When tested in accordance with the requirements of 4.6.19.3, emissions of the indicated compounds shall not exceed the value listed:

Compound	Maximum ILDH value, parts per million (ppm)
HCN	50
HCL	100
CO2	50,000
CO	1500

3.8 Condensation (Class 4 coating). There shall be no condensation on the dried film of the coating, and no condensation shall drip from the point of the coated receptacle within 6 hours when tested in accordance with 4.6.20.

3.9 Batch specific VOC certification. Manufacturer shall prepare label instruction in accordance with 29 CFR 1910. Each container shall be affixed with a hazardous chemical warning label in accordance with 29 CFR 1910.1200. To comply with NESHAP requirements for shipbuilding and ship repair, the two following statements shall appear on each paint can label:

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

3.10 Toxicity (all classes, all grades, and all applications). The coatings shall not contain the following materials in excess of 0.06 percent by weight of the dry coating: coal tar or coal tar derivatives, any American Conference of Governmental Industrial Hygienists (ACGIH) carcinogenic, or ACGIH suspected carcinogenic compounds. The coating components and mixed coating shall have no adverse effect on the health of personnel when used for its intended purpose in accordance with the manufacturer's instructions (see 6.7).

3.11 Off-gassing. For submarine usage only, the coating 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 4.7 and 6.8).

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 4.4).

4.2 Qualification inspection. Qualification inspection tests shall consist of the tests specified in 4.6. Applicants for qualification to Class 3 should review special instructions in 6.3.1.

4.2.1 Product qualification. Products shall be qualified to a specific class, grade, application, and color. The applicable class, grade, application, and color are supplied by the contractor and become a part of the application for qualification testing (see 6.3). Qualification approval for one class, grade, or application does not constitute approval of other classes, grades, or applications.

4.2.2 Navy formula 25A. Qualification shall be extended to certified coatings manufactured in accordance with the requirements of Navy formula 25A (see Appendix B) for Class 1, Grades A and B, applications A, B, C, D, and E, and colors 24585 (pastel green), 26307 (bulkhead gray), and 27880 (soft white) conforming to FED-STD-595 without testing. Other colors based on Navy formula 25A shall be qualified by testing in accordance with 4.2.1.

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4.3 Extension of qualification. Qualification shall be only for the specific class, grade, and application and shall not extend to any other class, grade, or application. Qualification shall not be extended to paints in colors not listed in table I. Qualification without testing shall not be extended to Navy formula 25A in colors other than those listed in 4.2.2. Qualification to the colors of table I is extended for all paints provided the requirements of 3.3.1 are met. Any paints in colors not listed in table I shall be qualified separately as a commercial product.

4.4 Conformance inspection. Conformance inspection shall consist of all tests specified in table IV as conformance tests.

TABLE IV. Test procedures.

Item	Requirement	Test method	Conformance tests
Color	3.3, 3.4	4.6.1, ASTM D1729	X
Chemical nature of resin(s)	3.4	4.6.1, ASTM D2621, ASTM E1252	---
Principal constituents, %wt	3.4	4.6.1	---
Pigment, %wt	3.4	4.6.1, ASTM D2698, or ASTM D3723	---
Nonvolatile vehicle solids, %wt	3.4	4.6.1, ASTM D2698	---
Volatiles, %wt	3.4	4.6.1, ASTM D2698	---
Mass per unit volume	3.4	4.6.1, ASTM D1475	X
Viscosity	3.4	4.6.1, ASTM D562	X
Flash point	3.4, 3.5.5	4.6.1, table IV, ASTM D93, or ASTM D3278	X
Drying time	3.4	ASTM D1640	X
Set to touch	3.4	ASTM D1640	X
Dry hard	3.4	ASTM D1640	---
Specular gloss	3.4, 3.5.6	4.6.1, ASTM D523	X
Hiding power (contrast ratio)	3.4	4.6.1, ASTM D2805	---
Adhesion	3.6.6.1	4.6.10, FED-STD-141 Method 6301.2	---
Volatile content (VOC)	3.4, 3.5.1	4.6.2	---
Class 3 volatiles	3.5.2	4.6.2.1	---
Hazardous air pollutant (HAP) content	3.5.3	4.6.3	---
Hazardous pigments and additives	3.5.4	4.6.4	---
Yellowness	3.5.7	4.6.5, ASTM E313	---
Condition in container	3.6.1	4.4, FED-STD-141 Method 3011.2	---
Mixing properties	3.6.2	4.6.6	---
Spraying properties	3.6.3	4.6.7, FED-STD-141 Method 4331.1	---
Brushing properties	3.6.4	4.6.8, FED-STD-141 Method 4321.2	---

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w/AMENDMENT 1TABLE IV. Test procedures – Continued.

Item	Requirement	Test method	Conformance tests
Flexibility	3.6.5	4.6.9, ASTM D522	---
Knife test	3.6.6	4.6.10, FED-STD-141 Method 6304.1	---
Resistance to water	3.6.7.1	4.6.11, ASTM D1308	---
Resistance to hydrocarbons	3.6.7.2	4.6.12, ASTM D1308	---
Resistance to salt spray	3.6.7.3	4.6.13, ASTM B117	---
Condensation blister resistance	3.6.7.4	4.6.14, ASTM D2247, ASTM D714	---
Resistance to exudates formation	3.6.8	4.6.15	---
Washability	3.6.9	4.6.16, FED-STD-141 Method 6141.1	---
Flash rust resistance	3.6.10	4.6.17	---
Mold resistance	3.6.11	table IV, ASTM D3273, ASTM D3274	---
Freeze-thaw resistance	3.6.12	table IV, ASTM D2243	---
Recoatibility	3.6.13	4.6.18	---
Radiant panel	3.7.1	4.6.19.2, ASTM E162	---
Smoke density	3.7.2	4.6.19.3, ASTM E662	---
Resistance to ignition	3.7.3	4.6.19.4	---
Hazardous emissions	3.7.4	4.6.19.3	---
Condensation	3.8	4.6.20	---
Toxicity	3.10		---
Packaging	Contract	5.1	---

4.5 Test conditions.

4.5.1 Routine qualification and conformance testing. Unless otherwise specified (see 6.2), testing shall be conducted at normal (ambient) laboratory conditions of temperature, humidity, and all dimensions; temperatures, humidities, volumes, and weights are nominal quantities.

4.5.2 Referee testing. Referee testing shall be conducted at a temperature of 23 ± 1 °C and a relative humidity of 50 ± 4 percent.

4.5.3 Test panels. Unless otherwise specified (see 6.2), test panels shall be prepared as follows:

4.5.3.1 General. Two sets of panels shall be prepared and all tests conducted in duplicate.

4.5.3.1.1 Test panels. Metal panels shall have nominal dimensions of 150 by 300 by 3 millimeters. Glass reinforced plastic, wood, and elastomeric foam insulation in accordance with anti-sweat insulation conforming to ASTM F683, Supplement 1.26 may be up to 25 millimeters and shall be adhered with the smooth side up to a metal support panel.

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4.5.3.1.2 Priming of test panels. One set shall be primed with paint conforming to TT-P-645. The other set shall be primed with primer conforming to MIL-DTL-24441/20 or MIL-DTL-24441/29. Only the face(s) of the panels subject to test exposure are required to be primed. Application D and E panels shall not be primed unless required for compatibility or adhesion such as water-based primer on application E materials. Dry film thickness of primer shall be 0.042±0.012 millimeters.

4.5.3.1.3 Conditioning of primed test panels. Unless otherwise specified (see 6.2), primed panels shall be dried (cured) for 1 week at normal laboratory conditions.

4.5.3.1.4 Application of test coatings. Unless otherwise specified (see 6.2), test coatings shall be applied in accordance with the manufacturer's data sheet or ASTM F718.

4.5.3.2 Surface preparation.

4.5.3.2.1 Application A (steel). Panels shall be mild steel. Panels shall be degreased and abrasive blast cleaned with 100-grit aluminum oxide abrasive to SSPC-SP 10 Near-White metal with a surface profile not to exceed 0.050 to 0.075 millimeters. Dust shall be removed with clean, dry air or vacuumed away.

4.5.3.2.2 Application B (aluminum). Panels shall be aluminum. Panels shall be degreased and abrasive blast cleaned with 100-grit aluminum oxide abrasive to a uniform finish with a surface profile not to exceed 0.050 to 0.075 millimeters. Dust shall be removed with clean, dry air or vacuumed away.

4.5.3.2.3 Application C (fiber reinforced plastics (FRP)). The face (smooth side) of panels shall be degreased and abraded with 100-grit abrasive paper or cloth (sandpaper) to a uniform appearance. Dust shall be removed with clean, dry air or vacuumed away.

4.5.3.2.4 Application D (wood). Panels shall be solid wood, not plywood. Panels shall be degreased and abraded with 100-grit abrasive paper or cloth (sandpaper) to a uniform appearance. Dust shall be removed with clean, dry air or vacuumed away.

4.5.3.2.5 Application E (anti-sweat insulation conforming to ASTM F683, Supplement 1.26). The smooth side of the elastomeric foam shall be used for the test surface. Only the smooth side shall be prepared and painted. Panels shall be degreased. Dust shall be removed with clean, dry air or vacuumed away.

4.6 Test procedures. Tests shall be conducted in accordance with table IV.

4.6.1 Tests to verify ID characteristic values. Tests shall be conducted in accordance with the procedures of table IV. Test results shall be in accordance with the ID characteristics specified in 3.4.

4.6.2 VOC. VOC shall be determined in accordance with 40 CFR Chapter 1, Part 60, Appendix A, Method 24. Solvent content shall be in accordance with the requirements of 3.5.1 for the respective grade.

4.6.2.1 Class 3 submarine atmosphere volatiles. This test shall be conducted by NAVSEA in accordance with the classified requirements for testing products intended for use in the closed submarine atmosphere. Test results shall be in accordance with the requirements of 3.5.2 (see 6.3.1).

4.6.3 HAP content of coatings. Hazardous solvent content of each individual coating shall be determined in accordance with ASTM D3272 and ASTM E260. Solvent fractions shall be identified in accordance with ASTM E1252, with the results recorded as percent weight of the total paint. Alternate analysis shall be reviewed by NAVSEA. HAP content shall be as specified in 3.5.3.

4.6.4 Hazardous pigments and additives. Soluble and total metal content, except tantalum and tungsten, shall be determined on a dry paint film of the coatings in accordance with 40 CFR 261, Appendix II, Method 1311 and the appropriate test listed below. Asbestos shall be analyzed in accordance with OSHA Method ID-191. Test results shall be reported as percent by weight of the dry enamel film. Soluble metal content shall be reported as milligrams per liter (parts per million). Total metal content shall be reported as percent weight of the dry enamel film (1 percent equaling 10,000 parts per million). The test results metal shall be in conformance with the requirements of 3.5.4. Tantalum and tungsten soluble metal content and total metal content shall be analyzed as specified in 4.6.4.1.

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Metal/material	Digestion test method number
All metals, except chromium (VI)	3050
Chromium (VI)	3060

Metal/material	SW-846 analysis test method number
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

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

Metal/material	Test method number
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

4.6.4.1 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 instrument manufacturer's directions for the use of the instrument. The test results for tantalum or tungsten shall be in conformance with the requirements of 3.5.4.

4.6.5 Yellowness. Determine yellowness index of test paint in accordance with ASTM E313. One test panel shall be exposed to normal laboratory conditions of lighting, temperature, and humidity. The second test panel shall be wrapped in light impervious paper and stored at ambient laboratory conditions in an enclosed space away from light for 12 months. After aging, determine yellowness index. Test results shall be in accordance with the requirements of 3.5.7.

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4.6.6 Mixing properties. Thoroughly mix by hand (do not use paint shaker) in accordance with contractor's instructions. Place 130 grams of the material in a 225-gram glass jar and do not agitate or disturb for 2 hours. At the end of this period, examine for compliance with 3.6.2.

4.6.7 Spraying properties. Mix the coating in accordance with contractor's instructions. Spray on a test panel to a dry film thickness between 0.050 and 0.075 millimeters and observe for spraying properties in accordance with Method 4331.1 of FED-STD-141. For referee test, use automatic application in accordance with Method 2131.1 of FED-STD-141. Test results shall be in accordance with the requirements of 3.6.3.

4.6.8 Brushing properties. Apply the coating to a 150- by 300-millimeter Leneta chart (or equivalent) using a 75-millimeter brush; observe for brushing properties in accordance with Method 4321.2 of FED-STD-141. Test results shall be in accordance with the requirements of 3.6.4.

4.6.9 Flexibility. Using a 3.2-millimeter mandrel, determine flexibility on two test panels in accordance with Method 6221 of FED-STD-141. Test results shall be in accordance with the requirements of 3.6.5.

4.6.10 Knife test. Using a flat portion of one panel from the flexibility test, perform the knife test in accordance with Method 6304.1 of FED-STD-141. Any commercial sharp pocket, craftsman, razor, or utility knife may be used for the test. Test results shall be in accordance with the requirements of 3.6.6.1.

4.6.11 Water resistance (does not apply to Grades A and B water-based coatings). Using primed test panels, spray the coating to a wet film thickness specified by the manufacturer and allow the coating to air dry 48 hours. After the final coat of the system has been applied, air dry 30 days. 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. On removal of the sponge(s), observe the panel for ASTM D1308 effects after 2 and 24 hours. Test results shall be in accordance with the requirements of 3.6.7.1.

4.6.12 Hydrocarbon fluid resistance (does not apply to Grades A and B water-based coatings). Using primed test panels, spray the coating to a wet film thickness specified by the contractor and allow the coating to air dry 48 hours. After the final coat of the system has been applied, air dry 30 days. Coat all exposed surfaces. The test panel 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. On removal of the sponge(s), observe the panel for ASTM D1308 effects. Test results shall be in accordance with the requirements of 3.6.7.2.

4.6.13 Salt spray resistance (does not apply to applications C, D, and E coatings). Using primed steel test panels, spray the coating to a wet film thickness specified by the contractor and allow the coating to air dry 48 hours. After the final coat of the system has been applied, air dry 30 days. Coat all exposed surfaces. Expose the unscored 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. Test results shall be in accordance with the requirements of 3.6.7.3.

4.6.14 Condensation blister resistance. Using primed test panels, spray the coating to a wet film thickness specified by the contractor and allow the coating to air dry 48 hours. After the final coat of the system has been applied, air dry 30 days. Coat all exposed surfaces. The test shall be conducted in accordance with ASTM D2247 for 100 hours. Evaluation will be conducted and blisters rated in accordance with ASTM D714. Test results shall be in accordance with the requirements of 3.6.7.4.

4.6.15 Exudate formation (Grades A and B water-based coatings only). Two test panels shall be prepared in accordance with 4.5.3. Immediately after spraying, the test panels shall be placed in a cool place (2 to 7 °C) for 24 hours. After 24 hours, examine film surface for liquid residues and tackiness. Test results shall be in accordance with the requirements of 3.6.8.

4.6.16 Washability. Washability shall be determined in accordance with Method 6141.1 of FED-STD-141. Test results shall be in accordance with the requirements of 3.6.9.

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4.6.17 Flash rust resistance (Grades A and B, application A water-based paints only). One coat of the test paint shall be spray applied to unprimed, degreased, bare steel panels. Allow to dry overnight at ambient laboratory conditions. Inspect for rust spotting. Test results shall be in accordance with the requirements of 3.6.10.

4.6.18 Recoatability (except Class 4). Five test panels shall be prepared by applying the paint to a nonporous substrate to the recommended film thickness. Four of the test panels shall be heated in an oven for 7 days at 38 to 43 °C. One panel shall be aged at ambient conditions for the period recommended by the manufacturer before overcoating and then overcoated with itself to the manufacturer's recommended wet film thickness. The four oven dried panels shall be individually overcoated with one of the following: (a) the originally applied paint, (b) a water-based coating qualified to this specification, (c) a solvent based paint qualified to this specification, and (d) paint in conformance with MIL-DTL-24607. Allow all recoated panels to dry at least 48 hours at normal laboratory conditions. Inspect dry overcoated paint film for wrinkling, blistering, or lifting of the test paint film. When dry, cut with a knife blade and inspect overcoat for loss of and for flaking away from the test paint film. Inspect the surface of the recoat for smoothness, blistering, and uncoated areas. Test results shall be in accordance with the requirements of 3.6.13.

4.6.19 Thermal properties.

4.6.19.1 Painting of test specimens. Primed test specimens shall be painted to either: (a) 0.076 millimeters dry film thickness of test enamel in at least two, but not more than four coats to achieve the thickness, or (b) to that thickness and number of coats recommended by the manufacturer's product data sheet. Final coating thickness shall be whichever of these values is greater. If multiple coats are required to achieve the test thickness, at least 24 hours, but no more than 48 hours, shall lapse between coats. Fully coated test specimens shall be aged 14 days before testing. Application of test coatings may be by brush, roller, or spray. Test specimens, unless otherwise specified in the specific test method, shall be of material corresponding to the application for which qualification is being sought.

4.6.19.2 Radiant panel test. The radiant panel test shall be conducted in accordance with ASTM E162. Test panels shall be prepared in accordance with 4.6.19.1. Test results shall be in accordance with the requirements of 3.7.1.

4.6.19.3 Smoke density chamber test. This test shall be conducted in accordance with ASTM E662 in both burning and non-burning modes for smoke density and flashover. The test sample appropriate to the application for which qualification is sought shall be prepared in accordance with 4.6.19.1 on an applicable substrate. Substrates shall be primed where appropriate. Test results shall be in accordance with the requirements of 3.7.2. Smoke shall be analyzed to demonstrate compliance with 3.7.4.

4.6.19.4 Resistance to ignition. The test shall be conducted in accordance with Appendix A. Test results shall be in accordance with the requirements of 3.7.3.

4.6.20 Condensation (Class 4 coating only). Three copper cylinders with conical end pieces shall be filled with ice water maintained between 32 and 38 °F and suspended on laboratory ring stands in a suitable cabinet maintained at a temperature of 68±2 °F and a relative humidity of 67±2 percent. One cylinder shall be the uncoated control and the other two cylinders shall be coated with anti-condensation coating in accordance with the coating manufacturer's instructions. Any condensate on each cylinder shall be observed and/or collected and reported for conformance with 3.8. An acceptable alternate test procedure is that which is described in TT-C-492.

4.7 Off-gassing. For submarine usage only, the coating 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 3.8 and 6.8).

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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. These coatings are intended for application as a nonflaming coating for steel, aluminum, and nonmetallic substrates. Wherever possible, the coating should be applied over a surface that has been cleaned and primed to promote adhesion and serviceability when used on metals.

6.1.1 Fire resistance. The paints qualified to this specification will neither actively support combustion nor contribute to the spread of a fire.

6.1.2 General submarine interior use. Class 2 materials are designed for use in the enclosed volume of a submarine and are compatible with the operation of the atmosphere control system (emission of volatiles and thermal degradation products). Class 3 coatings are specifically designed for use while a submarine is submerged and underway.

6.1.3 Military unique properties. The paint described by this specification is military unique because of the requirements that the paint be non-burning, non-hazardous, and low-smoke producing when applied to metals. Commercial products are not designed for application to metals, but are intended for use on wood or plaster board.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of the specification.
- b. Class, grade, application, and color of coating (see 1.2 and table I).
- c. If required, the specific issue of individual documents referenced (see 2.2.1 and 2.3).
- d. Thermal properties (see 3.7).
- e. Laboratory conditions including dimensions, temperatures, humidities, volumes, and weights (see 4.5.1).
- f. Test panel preparation (see 4.5.3).
- g. Conditioning of primed test panels (see 4.5.3.1.3).
- h. Application of test coatings (see 4.5.3.1.4).
- i. Packaging requirements (see 5.1 and 6.8).
- j. Material safety data sheet required (see 6.4).
- k. Acceptance test report (see B.3).

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 QPL No. 24596, 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 05M2, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160.

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6.3.1 Class 3 qualification. Class 3 products supplied under this specification will comply with the requirements of NAVSEA S9510-AB-ATM-010/(U), Submarine Atmosphere Control Manual. Since the requirements are classified, the Naval Sea Systems Command will conduct testing of Class 3 products. Copies of this document are available from Commander, Naval Sea Systems Command, SEA 05Z9, 1333 Isaac Hull Ave., SE, Stop 5122, Washington Navy Yard DC 20376-5122.

6.4 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. Additional required government information is contained in FED-STD-313. In order to obtain the MSDS, federal acquisition regulation (FAR) clause 52.223-3 must be in the contract. The contracting activity should be provided a material safety data sheet (MSDS) at the time of contract award. The MSDS should be included with each shipment of the material covered by this specification.

6.4.1 Product user information sheets. Users of coatings procured to this specification need information on the proper use, storage, and disposal of these materials. Contracting officers should identify those activities requiring copies of completed product use sheets prepared in accordance with ASTM F718. In order to obtain these documents, an appropriate federal acquisition regulation (FAR) clause must be in the contract.

6.5 Volatile content. Coatings to this specification may be used anywhere a product complying with 1.2 is allowed. This includes other air pollution control districts or similar areas controlling the emission of solvents volume into the atmosphere under volatile organic content (VOC) regulations.

6.6 Unit of purchase. The coating covered by this specification should be purchased by volume, the unit being 4 liters or 1 U.S. liquid gallon (231 cubic inches) at 20 °C.

6.7 Toxicity. Questions pertinent to this toxicity requirement should be referred by the contracting activity to the qualifying activity. The qualifying activity will act as advisor to the contracting activity. The qualifying activity will arrange for review of questions by the appropriate departmental medical service.

6.8 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 05B5, 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 05B5, 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.

6.9 Suggested packaging. Recommended packaging requirements are provided in table VII.

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TABLE VII. Packaging.

Packaging	Recommended requirements for direct Government acquisitions
Commercial packaging	<ol style="list-style-type: none"> 1. Commercial packaging should be to ASTM D3951. 2. All containers should comply with the requirements of the Uniform Freight Classifications (UFC), the National Motor Freight Classification (NMFC), and the applicable requirements of 49 CFR, Department of Transportation (DOT).
Containers	<ol style="list-style-type: none"> 1. 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 3.78 L container. Closure of the properly filled and sealed cans should be as specified in the appendix thereto. Pails should be to PPP-P-704. 2. All containers should comply with the requirements of UFC, NMFC, and the applicable requirements of 49 CFR. 3. Container lining: Solvent-resistant baked phenolic lining materials have been successfully used in containers for paints covered by this specification. The paint, as specified herein, may gel if stored in contact with metal. In properly lined containers, however, the coating is stable for over 2 years. 4. Unit of procurement: The paints covered by this specification should be purchased by volume. The unit of procurement should be in multiples of 1 L or 1 U.S. liquid gallon at 15.5 °C.
Packing	<p>Packing should be specified as follows:</p> <ol style="list-style-type: none"> 1. Overseas delivery (level A) packing. Intermediate containers of like size kit intermediate containers of paint should be packed in close-fitting wood boxes conforming to PPP-B-601, overseas type, or PPP-B-621, Class 2. Box closure and strapping should be as specified in the applicable box specification or the appendix thereto except that strapping should be flat and the finish B. 2. 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. 3. Commercial packing. The paint, in the unit kit and intermediate containers should, as applicable, be packed in multiples of like sizes in accordance with UFC, NMFC, and 49 CFR 178 requirements.
Palletization	<p>Intermediate containers should be palletized in accordance with MIL-STD-147. Only one size unit or intermediate container should be placed on a pallet.</p>
Intermediate containers	<p>Paints should be packaged in intermediate containers. 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 the PPP-F-320. PPP-F-320 classes should be domestic fire-retardant or weather resistant fire-retardant (see 6.2).</p>
Packing for acquisitions involving direct delivery to Navy ships or installations	<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 must be fire-retardant treated material in accordance with MIL-L-19140.</p>
Material safety data sheets (MSDS) and product / procedure data sheets	<p>A copy of the MSDS and company product data/procedure sheets should be attached to the shipping document for each destination (see 6.4).</p>

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TABLE VII. Packaging – Continued.

Packaging	Recommended requirements for direct Government acquisitions
VOC certification sheets	VOC certification sheets for each batch of coating will be provided when requested by the procuring activity. VOC certification sheets will be provided by the manufacturer for each batch when requested by the procuring activity.
Marking type	Recommended marking: 1. General use, weather resistant: MIL-L-19140, Type II, Category I. 2. General use, non-weather resistant: MIL-L-19140, Type I, Category I.
Bar codes	Marking should include bar codes.
Hazardous warnings	1. Labels should be in accordance with 29 CFR Parts 1910, 1910.1200, 1915, 1917, 1918, 1926, and 1928, as well as PPP-P-1892. 2. 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.” 3. Each component 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 (insert VOC content) g/L of volatile organic content per 40 CFR Chapter 1, Part 60, Appendix A, Method 24.”
Shelf life	Each unit container, intermediate container where applicable, and shipping container should be marked as follows: “Date of first re-inspection (insert here date 3 years after date of manufacture).”

6.9 Subject term (key word) listing.

Hazardous materials

Solvent base

Thermal properties

Volatile organic content

Volatiles

Water-based

6.10 Changes from previous issue. Marginal notations are used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

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APPENDIX A

RESISTANCE TO IGNITION

A.1 SCOPE

A.1.1 Scope. This procedure determines whether a paint will ignite into flames when the sole ignition source is the heated metallic substrate to which the paint adheres. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

A.1.2 Auto-ignition resistance. The test yields information on the ability of the coating to resist auto-ignition, running, and dripping when subjected to a very rapid heat rise, and information on the ability of the paint to resist spread of the flame across the test specimen, as well as the tendency of a paint to ignite secondary fires by flaming drips.

A.1.3 Test conditions. The conditions of the test have been standardized so that paints passing this test may be safely used on ships' bulkheads and overheads where nonflaming paints are required to prevent fires from spreading from one sealed compartment to the next during a severe shipboard fire.

A.2 TEST APPARATUS

A.2.1 Test apparatus. The recommended apparatus consists of a high amperage direct current (DC) generator capable of 300 to 400 amps, electrodes for holding the test specimen, an ammeter attached across an in-line shunt, a voltmeter, and a switch capable of handling the voltages and currents involved. The wiring diagram is shown in figure A-1. The current from the DC generator is shunted directly through the test specimen to cause rapid heating. 3/0 stranded welding cable is recommended for wiring.

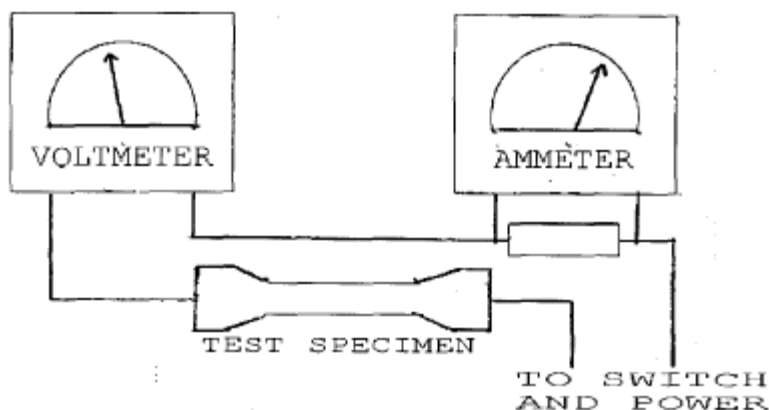


FIGURE A-1. Wiring diagram.

The test apparatus shall be arranged in a shielded cabinet or room to reduce air current effects. Air moving past the specimen shall be regulated to that caused only by convection heating of the test specimen.

A.2.2 Test panels preparation. Test specimens shall be coated to either 0.076 millimeters dry film thickness of test enamel in as many coats as necessary to achieve 0.076 millimeters, or to that thickness recommended by the manufacturer's data sheet, whichever is greater. If multiple coats are required to achieve the test thickness, at least 24 hours, but no more than 48 hours shall lapse between coats. Fully coated test specimens shall be aged 14 days before being tested.

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A.3 PROCEDURE

A.3.1 Test procedure. Using a test specimen (figure A-2 provides recommended specimen) made of mild steel, the apparatus is calibrated to give a temperature rise in the test specimen of 1000 °C in 60 seconds of the start of the test. A timing device accurate to 1 second shall be used to determine test duration. The test specimen shown in figure A-2 is recommended and has been used by most testing organizations. The only required dimensions is that the center narrow bar shall not be less than 150 millimeters in length, 25 millimeters in width, and not less than 1.6 millimeters thickness. The 1.6-millimeter or greater thickness will allow the full time of test without the test bar burning through.

A.3.1.1 Calibration of temperature. Calibration of the 1000 °C in 60 seconds time-temperature curves for the particular test specimens and power source shall be conducted. The time-temperature curve is determined by the cross section and resistivity of the actual test specimens used. Temperature-indicating crayons, temperature indicating paints, or optical pyrometers are recommended. Thermocouples are not recommended due to the current flowing in the test specimen.

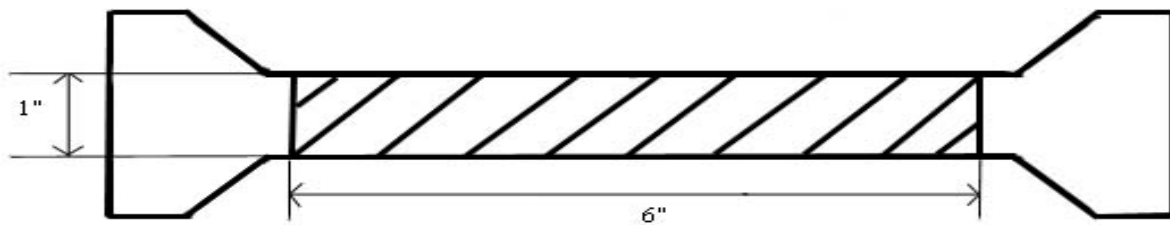


FIGURE A-2. Test specimen.

A.3.2 Data acquisition. The test specimen shall be observed and data recorded for:

- a. Flaming (ignition) of the paint before reaching 1000 °C.
- b. Fumes or smoke from the paint and the time at which fumes/smoke began.
- c. Volume of smoke (light moderate or heavy).
- d. Other characteristics, such as sloughing, dripping, softening, or color changes.
- e. Color pictures and video shall be taken during and after the test, particularly at the time of ignition and at the point of maximum involvement, and after the completion of the test.

A.3.3 Data analysis. The performance of the test paint is then compared to the performance of MIL-DTL-24607 tested at 150 μ thickness when prepared and tested under identical conditions. Test results shall be in accordance with the requirements of 3.6.8.

A.4 SUMMARY

A.4.1 Summary. This test procedure provides a relatively simple, straightforward, and reproducible method to determine the ignition potential of materials used to paint the interior surfaces of a compartment. In addition, important data on the reaction of the paint to heating of the substrate is determined. The fact that the data is of a “go” or “no-go” form makes the error of operation relatively small.

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APPENDIX B

NAVY FORMULA 25A

B.1 SCOPE

B.1.1 Scope. This appendix defines the formulation requirements for Navy formula 25A paints, including chemical composition and test requirements. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

B.2 NAVY FORMULA 25A

The following is a list of materials included in Navy formula 25A.

Raw Material	Pounds	Gallons
Chlorinated emulsion ^{1/}	699.86	71.78
Titanium dioxide ^{2/}	199.96	5.93
Water	67.78	8.16
Aluminum trihydrate ^{3/}	49.99	2.48
Propylene glycol ^{4/}	30.21	3.50
Coalescing solvent ^{5/}	21.52	2.75
Fungicide ^{6/}	12.75	1.48
Plasticizer ^{7/}	10.00	0.94
Thickener ^{8/}	9.12	1.00
Dispersant ^{9/}	8.73	0.95
Defoamer ^{10/}	5.59	0.72
Bactericide ^{11/}	1.27	0.13
Yellow oxide tint ^{12/}	1.16	0.09
Rust preventive ^{13/}	1.00	0.09
TOTALS	1118.94	100.00

NOTES:

- ^{1/} Polyvinylidene chloride acrylic emulsion, 55 percent solids in water. Morkote 777, Rohm & Haas, Philadelphia, PA 19106-2399.
- ^{2/} The titanium dioxide conforms to ASTM D4761, Types II or III. This formulation uses Tioxide TR-92. Tioxide Americas, Inc., Lisle, IL.
- ^{3/} Aluminum hydroxide with a mean particle diameter of 3-4 microns. This formulation uses SB-632. Solem Industries, Solem, GA.
- ^{4/} Propylene Glycol, CAS # 57-55-6. Ashland Chemicals, Columbus, OH.
- ^{5/} Texanol. 2,2,4-Trimethyl-1, 3-Pentanediol. CAS # 25265-77-5. Ashland Chemicals, Columbus, OH.
- ^{6/} Polyphase P-20T. Troy Chemical, Newark, NJ.
- ^{7/} A mixture of cyclic phosphate esters. This formulation uses Antiblaze NT L-20. Albrecht & Wilson Americas, Inc., Richmond, VA.
- ^{8/} A blend of polyurethane resin, propylene glycol, and water. This formulation uses RM-8. Rohm & Haas, Inc., Philadelphia, PA.
- ^{9/} Tamol 850. Rohm & Haas, Inc., Philadelphia, PA.
- ^{10/} Colloids 77. Ashland Chemicals, Columbus, OH.
- ^{11/} Troysan 174. 2((Hydroxymethyl) amino) ethanol. CAS # 34375-28-5. Troy Chemical, Newark, NJ.
- ^{12/} UCD 1625Q. Morton International, Chicago, IL.
- ^{13/} Butrol 25. Buckman Laboratories, Inc., Memphis, TN.

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APPENDIX B

B.3 ACCEPTANCE TEST REPORT

B.3.1 Acceptance test report. When specified (see 6.2), an acceptance test report shall be provided to verify the table II identification characteristics submitted.

Test procedures

Item	Requirement	Result
Color	Color shall match the designated 595 color standard. Delta E-1.0 maximum.	
Total solids	table II	
Vehicle solids	table II	
Mass per unit volume	table II	
Flash point (°F)	100 °F minimum	
Specular gloss (60°)	45-60	
Drying time – set to touch – dry hard	3 hours maximum 6 hours maximum	
Hiding power (contrast ratio)	table II	
Condition in container	Coating shall be free from grit, seeds, and skins. It shall show no heavy pigment settling or caking.	
Mixing properties	When mixed, the coating shall result in a smooth uniform mixture. After aging, the coating shall show no heavy settling, caking, or gelation.	
Spraying properties	The coating shall spray satisfactorily with no running, sagging, or streaking. The dry film shall show no dusting, mottling, or color separation and shall present a smooth finish.	
Brushing properties	The coating shall brush satisfactorily and shall dry to a smooth uniform film, free from seeds, runs, and sags.	

Other Test Data

Hegman grind	5 minimum	
VOC, g/L (lb/gal)	175 (1.45) maximum	
Leneta sag resistance	4 minimum	
Viscosity (krebs units)	105 KU maximum	

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Preparing Activity:
Navy – SH
(Project 8010-2011-011)

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>.