

METRIC

DOD-E-1115C
24 February 1982
SUPERSEDING
DOD-E-1115B
21 November 1977
(See 6.7)

MILITARY SPECIFICATION

ENAMEL, INTERIOR AND EXTERIOR, ALKYD, WHITE

(FORMULA NO. 30) (METRIC)

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

1. SCOPE

1.1 Scope. This specification covers general purpose white alkyd enamel (Formula No. 30) for interior and exterior shipboard use. This product may be used where air pollution regulations apply.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

TT-R-266 - Resin, Alkyd; Solutions.

TT-T-291 - Thinner-Paint Mineral Spirits, Regular and Odorless.

PPP-P-1892 - Paint, Varnish, Lacquer, and Related Materials; Packaging, Packing, and Marking of.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 3112, Department of the Navy, Washington, DC 20362 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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STANDARDS

FEDERAL

- FED-STD-141 - Paint, Varnish, Lacquer, and Related Materials; Methods for Testing of.
- FED-STD-313 - Material Safety Data Sheets, Preparation and the Submission of.
- FED-STD-595 - Colors.

(Copies of specifications, standards, handbooks, drawings, and publications required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- D 34 - White Pigment, Chemical Analysis of. (DOD Adopted)
- D 79 - Zinc Oxide, Spec. for.
- D 93 - Flash Point by Pensky-Martens Closed Tester, Test for. (DOD Adopted)
- D 185 - Coarse Particles in Pigments, Pastes, and Paints, Tests for. (DOD Adopted)
- D 476 - Titanium Dioxide Pigments, Spec. for. (DOD Adopted)
- D 523 - Specular Gloss, Test for. (DOD Adopted)
- D 562 - Consistency of Paints Using the Stormer Viscosimeter, Test for. (DOD Adopted)
- D 563 - Phthalic Anhydride Content of Alkyd Resins and Resin Solutions, Test for. (DOD Adopted)
- D 600 - Liquid Paint Driers, Spec. for.
- D 1210 - Fineness of Dispersion of Pigment-Vehicle Systems, Test for. (DOD Adopted)
- D 1296 - Odor of Volatile Solvents and Diluents, Test for. (DOD Adopted)
- D 1306 - Phthalic Anhydride Content of Alkyd Resins and Esters Containing Other Dibasic Acids (Gravimetric), Test for. (DOD Adopted)
- D 1475 - Density of Paint, Varnish, Lacquer, and Related Products, Test for. (DOD Adopted)
- D 1542 - Rosin in Varnishes, Qualitative Tests for. (DOD Adopted)
- D 1729 - Visual Evaluation of Color Differences of Opaque Materials. (DOD Adopted)
- D 2369 - Volatile Content of Paints, Test for. (DOD Adopted)
- D 2805 - Hiding Power of Paints, Test for.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

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SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
Rules and Regulations - Rule 102

(Application for copies should be addressed to the South Coast Air Quality Management District, 9150 E. Flair Drive, El Monte, CA 91731.)

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Toxicity. The material shall have no adverse effect on the health of personnel when used for its intended purpose (see 4.6). Questions pertinent to this effect shall be referred by the contracting activity to the appropriate service medical department which will act as advisor to the contracting activity.

3.2 Formula. The enamel shall consist of ingredients conforming to the requirements of applicable specifications in the proportions as specified in table I, except that small amounts of tinting agents may be added as necessary to conform to the color requirement (see 3.5.2). Small quantities of antissettling, antisagging, and antiskinning agents may also be added to the formulation, provided that all other requirements of the specification are met. Test reports required by method 1031 of FED-STD-141 shall include the exact formula used (see 4.7).

3.2.1 The formula specified (see table I) is designated Navy Standard Formula No. 30. Whenever Formula No. 30 is specified, the enamel shall conform to this specification (see table IV).

TABLE I. Formula No. 30.

Ingredients	kg	(Pounds) ^{1/}
Titanium dioxide (ASTM D 476, type II)	113.1	(250.0)
Zinc oxide (ASTM D 79, American process)	33.9	(75.0)
Alkyd resin solution (TT-R-266, type I, class A)		
(see 6.6) ^{2/}	239.8	(530.0)
Paint thinner (TT-T-291, type II, grade A)	79.2	(175.0)
Lead naphthenic drier (ASTM D 600, class B)	2.7	(6.0)
Cobalt naphthenic drier (ASTM D 600, class B)	2.7	(6.0)

^{1/} The formula is given slightly in excess of 100 gallons to allow for normal manufacturing loss.

^{2/} The solvent shall consist of mineral spirits conforming to type II, grade A of TT-T-291, except as modified by 3.4.1.

3.3 Manufacture. The enamel, as received in its filled original container, shall be free from skins, lumps, sediness, jelling, curdling, separation, and hard settling or caking. It shall be capable of being converted to a smooth, uniform condition by hand stirring.

3.3.1 Film appearance. Films of the enamel, prepared as specified (see 4.4.14), shall have a smooth and uniform appearance and shall show no evidence of wrinkling, seeding, or other nonuniformity.

3.4 Quantitative requirements. The enamel shall conform to the quantitative requirements shown in table II and as herein specified.

TABLE II. Quantitative requirements.

Characteristic	Requirements	
	Minimum	Maximum
Pigment, percent by mass of enamel	30.5	34.5
Volatiles percent by mass of enamel	29.0	33.0
Nonvolatile vehicle, percent by mass of enamel (calculated by difference)	35.0	39.0
Phthalic anhydride, percent by mass of nonvolatile vehicle	23.0	-----
Water, percent by mass of enamel	-----	0.5
Coarse particles and skins (as residue on No. 325 sieve), percent by mass of enamel	-----	0.1
Consistency, Krebs-Stormer shearing rate 200 RPM		
grams (g)	140	190
equivalent Krebs units	70	80
Mass per gallon, kg (pounds)	4.5 (9.9)	4.72 (10.4)
Drying time - set-to-touch, hours	-----	2.0
dry hard, hours	-----	8.0
Fineness of grind	7	-----
Flash point, °C (°F)	37.8 (100)	-----
Gloss, 60-degree specular	65	-----
Zinc oxide, percent by mass of pigment	22.0	-----

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3.4.1 Volatile portion. The volatile portion of the enamel shall conform by volume to the requirements controlling the emission of solvents into the atmosphere as follows:

- (a) A combination of hydrocarbons, alcohols, aldehydes, ethers, esters, or ketones having an olefinic or cycloolefinic type of unsaturation except perchloroethylene: 5 percent maximum.
- (b) A combination of aromatic compounds with eight or more carbon atoms to the molecule except ethylbenzene, methyl benzoate, and phenyl acetate: 8 percent maximum.
- (c) A combination of ethylbenzene, ketones having branched hydrocarbon structures, trichloroethylene, or toluene: 20 percent maximum.

The contractor shall provide certification to this effect (see 4.7).

3.5 Qualitative requirements. The enamel shall conform to the qualitative requirements specified (see table II) when tested in accordance with 4.4.

3.5.1 Odor. The odor shall be characteristic of the volatiles permitted when tested as specified (see 4.4).

3.5.2 Color. The color of the enamel shall match the dry color chip No. 17875 of FED-STD-595 when tested as specified (see 4.4.7).

3.5.3 Flexibility. The enamel shall show no evidence of cracking when tested as specified (see 4.4.13).

3.5.4 Compatibility with thinner. There shall be no evidence of incompatibility of any of the ingredients of the enamel as received, when tested as specified (see 4.4.6).

3.5.5 Shelf storage life. When original, unopened containers are stored as specified (see 4.4.15), the enamel shall meet the requirements of 3.3 and 3.5.2. Coarse particles and skins, viscosity, time of setting to touch, and time of drying hard shall not vary more than 10 percent from the values specified (see table II).

3.5.6 Skinning. The enamel shall not skin within 48 hours in a three-quarters filled container, when tested as specified (see 4.4.5).

3.5.7 Rosin and rosin derivatives. Rosin and rosin derivative shall not be present when tested as specified (see 4.4.10).

3.5.8 Phenolic resins. Phenolic resins shall not be present when tested as specified (see 4.4.11).

3.5.9 Application characteristics.

3.5.9.1 Brushing properties. The product, when tested as specified (see 4.4.8), shall be capable of being brushed out and laid off without excess drag on the brush. When dry, the brush-coated surface shall be free from sags, runs, wrinkles, excess brush marks, or other film defects. The film shall exhibit good adhesion and a smooth, uniform appearance.

3.5.9.2 Spraying properties. The enamel, when tested as specified (see 4.4.9), shall show no running, sagging, streaking, dusting, mottling, color separation, or any other film defects. The film shall exhibit good adhesion and a smooth, uniform appearance.

3.5.10 Dry opacity. A maximum of 7.0 milliliter (mL) per 930 square centimeters (cm²) of the enamel shall be required to obtain a dry film constrast ration of 0.92, when tested as specified (see 4.4).

3.5.11 Material Safety Data Sheet. The contracting activity shall be provided a material safety data sheet (MSDS) at the time of contract award. The MSDS is DD Form 1813 and found in and part of FED-STD-313. The MSDS shall be included with each shipment of the material covered by this specification.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Quality conformance inspection. Quality conformance inspection shall be provided in accordance with method 1031 of FED-STD-141 and as herein supplemented.

4.3 Additional inspection.

4.3.1 Ingredient materials. When requested by the testing laboratory or other controlling authority, 1 pint of each ingredient in the formula specified (see table I) shall be supplied for test purposes.

4.3.2 The contractor shall submit to the contracting officer certification (see 4.7) indicating that the enamel complies with storage stability requirement as specified in 3.5.5. When certificates of compliance are submitted, the Government reserves the right to check test such items to determine the validity of the certificate.

4.4 Test procedures. Test shall be conducted in accordance with table III.

TABLE III. Test procedures.

Test	Applicable method in FED-STD-141	Applicable ASTM test method
Pigment content	4021	-----
Volatiles	----	D 2369
Nonvolatile vehicle content	4053	-----
Phthalic anhydride	----	D 563
Water	4081	-----
Coarse particles and skins	----	D 185
Consistency	----	D 562
Mass per gallon	----	D 1475
Drying time	4061	-----
Fineness of grind	----	D 1210
Flash point	----	D 93
Gloss	----	D 523
Zinc oxide	----	D 34
Brushing properties	4321	-----
Spraying properties	4331	-----
Flexibility	6221	-----
Color	----	D 1729
Condition in container	3011	-----
Stability in partially full container	3021	-----
Dilution stability	4203	-----
Rosin and rosin derivatives	----	D 1542
Phenolic resin	5141	-----
Odor	----	D 1296
Dry opacity	----	D 2805

4.4.1 Pigment content. Extract the pigment from a weighed sample of enamel in accordance with method 4021 of FED-STD-141, using extraction mixture. Dry and weigh extracted pigment. Calculate percent pigment in the enamel.

4.4.2 Phthalic anhydride. Determine phthalic anhydride content of the nonvolatile vehicle in accordance with ASTM D 563, applying the correction procedure described in paragraph 4.2 of the test method. If dibasic acids other than phthalic are present, ASTM D 1306 shall be used.

4.4.3 Drying time. Drying time shall be determined in accordance with method 4061 of FED-STD-141, except that the specified conditions of temperature and humidity shall apply only for referee tests in case of dispute. All other tests shall be conducted under prevailing laboratory conditions.

4.4.4 Condition in container. Determine the condition of the enamel, as received in its container, in accordance with method 3011 of FED-STD-141 and observe for compliance with 3.5.5. The Government, at its

option and at any time not to exceed 1 year after manufacture, may test enamel stored in its original containers for product condition, viscosity, and dry hard time. (Any action by the Government to disqualify enamel after prior acceptance shall be based on the examination of enamel stored in its original containers.)

4.4.5 Skinning. Determine skinning characteristics of the material in partially filled container in accordance with method 3021 of FED-STD-141.

4.4.6 Compatibility with thinner. Determine compatibility with thinner in accordance with method 4203 of FED-STD-141. Fifty mL of enamel shall be mixed with 50 mL of mineral spirits conforming to type II, grade A of TT-T-291. Observations shall be made immediately after mixing and repeated in 30 minutes.

4.4.7 Color. Prepare test panel by applying a single drawdown coat of the enamel to a planar piece of opaque white glass using a doctor blade with a clearance of 0.152 millimeters (mm) (0.006 inch) [designed to give a wet film thickness of approximately 0.076 mm (0.003 inch)]. The coated panel shall be allowed to dry 24 hours under prevailing laboratory conditions before comparing with the standard color card as specified in ASTM D 1729 (see 3.5.2).

4.4.8 Brushing properties. Determine brushing properties of the enamel in accordance with method 4321 of FED-STD-141 and observe for compliance with 3.5.9.1.

4.4.9 Spraying properties. Determine spraying properties of the enamel in accordance with method 4331 of FED-STD-141. Reduce eight parts by volume of enamel with one part by volume of thinner conforming to TT-T-291, type II, grade A. Spray coat the steel panel to a dry film thickness of $0.0254 \text{ mm} + 0.00254 \text{ mm}$ ($0.001 + 0.0001$ inch) and observe for compliance with 3.5.9.2. For referee test, the automatic film application described in method 2131 of FED-STD-141 shall be used.

4.4.10 Rosin and rosin derivatives. Conduct test for rosin and rosin derivatives in accordance with ASTM D 1542. A portion of the separated, nonvolatile vehicle shall be used for the test.

4.4.11 Phenolic resins. Conduct test for phenolic resins in accordance with method 5141 of FED-STD-141. A portion of the nonvolatile vehicle shall be used for the test.

4.4.12 Gloss. Determine 60-degree specular gloss in accordance with ASTM D 523. Prepare the panels for test by applying a single drawdown coat of enamel using a doctor blade designed to give a dry film thickness of $0.0254 \text{ mm} + 0.0076 \text{ mm}$ ($1.0 + 0.3$ mils). Dry the panels for 48 hours under prevailing laboratory conditions of temperature and humidity in a room free from dust and fumes.

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4.4.13 Flexibility. Determine flexibility in accordance with method 6221 of FED-STD-141. Draw down a 5.08-cm (2-inch wide) film of the enamel with a suitable film applicator that will give a dry film thickness of $0.0254 \text{ mm} \pm 0.0076 \text{ mm}$ ($0.0010 \pm 0.0003 \text{ inch}$) on a flat tin panel prepared in accordance with method 2012 of FED-STD-141, using the aliphatic naphtha-ethylene glycol monoethyl ether mixture. Air dry the test specimen for 2 hours in a horizontal position; then bake for 24 hours in an air-

circulating oven at 100°C to 105°C (212°F to 221°F). At the end of the baking period, condition the panel for 30 minutes at $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ($77^{\circ}\text{F} \pm 9^{\circ}\text{F}$) and bend over a 3.2-mm (1/8-inch) mandrel. The coated surface of the panel shall be uppermost during the bending which shall be accomplished at a uniform rate over approximately 2 seconds. The panel shall be examined at the bend, using a seven-power lens and any cracking shall be noted.

4.4.14 Film appearance. On a clean, smooth glass plate draw the enamel down to a dry film thickness of $0.00508 \text{ cm} \pm 0.0005 \text{ cm}$ ($0.002 \pm 0.0002 \text{ inch}$). Dry for 48 hours in a horizontal position at $23^{\circ}\text{C} \pm 1^{\circ}\text{C}$ ($74^{\circ}\text{F} \pm 2^{\circ}\text{F}$) and 50 ± 5 percent relative humidity. The examine for conformance with 3.3.1.

4.4.15 Storage stability. A 1-gallon container of enamel shall be stored in the original, unopened container or containers for 12 months from the date of manufacture at standard conditions and then shall be tested to determine compliance with the requirement of 3.5.5.

4.5 Inspection of preparation for delivery. Packaging, packing, and marking of the enamel shall be inspected to determine compliance with the requirements of section 5.

4.6 Toxicity. A manufacturer of material shall disclose the formulation of his product to the Navy Bureau of Medicine and Surgery, Navy Department, Washington, DC 20372. The disclosure of proprietary information, which shall be held in confidence by the Bureau of Medicine and Surgery, shall include: the name, formula, and approximate percentage by mass and volume of each ingredient in the product; the results of any toxicological testing of the product; identification of its pyrolysis products; and any such other information as may be needed to permit an accurate appraisal of any toxicity problem associated with the handling, storage, application, use, or disposal of the material.

4.7 Certification data/report. The contractor shall furnish certification/data reports for each lot of enamel in accordance with the data ordering document included in the contract or purchase order (see 6.2.2). In addition to the requirements covered by the data ordering document, the certification/data report shall include the following information:

- (a) Conformance of each lot of ingredient material, stating test results and source, as applicable (see 3.2 and 4.3.2).
- (b) Certification that volatility requirements are met (see 3.4.1).
- (c) Certification that storage stability requirements are met (see 4.3.2).

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5. PACKAGING

(The preparation for delivery requirements specified herein apply only for direct Government acquisitions.)

5.1 Packaging, packing, and marking. The enamel shall be packaged, packed, and marked in accordance with PPP-P-1892. The level of packaging shall be A or C and the level of packing shall be A, B, or C as specified (see 6.2.1). The enamel shall be furnished in 1-gallon cans or 5-gallon pails as specified (see 6.2.1).

5.1.1 Special marking. In addition to other markings required on the containers, there shall be the following statement: "The volatile content of the material in this container is not photochemically reactive as defined by Rule 102 of the South Coast Air Quality Management District." (See 6.4).

5.1.2 Shelf life marking. In addition to markings specified by 5.1 and 5.1.1, each unit container, intermediate container where applicable, and shipping container shall be marked as follows: "Date of first reinspection (Insert date 1 year after date of manufacture)".

6. NOTES

6.1 Intended use. This enamel is intended for general purpose use on interior and exterior shipboard surfaces where fire-retardancy is not required. This product may be applied where air pollution regulations apply.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Level of packaging and level of packing required (see 5.1).
- (c) Size of container required (see 5.1).
- (d) Special marking required (see 5.1).

6.2.2 Data requirements. When this specification is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of DAR 7-104.9(n)(2) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification is cited in the following paragraphs.

Paragraph No.	Data requirement title	Applicable DID No.	Option
4.7	Certification data/ report	UDI-A-23264	-----

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(Data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DoD 5000.19L., Vol. II, AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.2.2.1 The data requirements of 6.2.2 and any task in section 3, 4, or 5 of the specification required to be performed to meet a data requirement may be waived by the contracting/acquisition activity upon certification by the offeror that identical data were submitted by the offeror and accepted by the Government under a previous contract for identical item acquired to this specification. This does not apply to specific data which may be required for each contract, regardless of whether an identical item has been supplied previously (for example, test reports).

6.3 Paint should be purchased under this specification by volume, the unit being 1 U.S. gallon (231 cubic inches) at 15.5°C (60°F).

6.4 Volatile content. Although the container marking specifically refers to the South Coast Air Quality Management District, the paint may be used anywhere else a paint complying with 3.4.1 is allowed. This includes all other air pollution control districts or similar areas controlling the emission of solvents into the atmosphere. Information regarding Los Angeles County Air Pollution Rules 102, 442, and 443 may be obtained from: South Coast Air Quality Management District, 19150 E. Flair Drive, El Monte, CA 91731.

6.5 Composition by volume. For information only and with the understanding the mass volume relationships of ingredients may vary slightly, the approximation of composition by volume is included in table IV.

TABLE IV. Composition by volume.

Ingredients	Gallons
Titanium dioxide	7.14
Zinc oxide	1.61
Alkyd resin solution	66.25 (42.00) ^{1/}
Paint thinner	26.50
Lead naphthenic drier	0.63
Cobalt naphthenic drier	0.75
Total volume	102.88

^{1/} Figure in parentheses refers to volume of resin solids (nonvolatile).

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6.6 Alternate resin. If it is desired to use an alkyd resin solution conforming to the requirements for type I, class B of TT-R-266, the mass of the alkyd resin solution as specified in table I of this specification should be multiplied by 1.17 and the mass of paint thinner (petroleum spirits) reduced by 0.17 times the specified mass of alkyd resin solution. The resin solution used in any case should contain as solvent paint thinner conforming to type II, grade A of TT-T-291.

6.7 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:

Navy - SH

Air Force - 99

Review activity:

Navy - SA

User activity:

Navy - MC

Preparing activity:

Navy - SH

(Project 8010-0994)

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