

NOT MEASUREMENT  
SENSITIVE

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SUPERSEDING  
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## MILITARY SPECIFICATION

ENAMEL, LUSTERLESS, FAST DRY, VOC COMPLIANT

(FOR USE ON AMMUNITION AND OTHER METALS)

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

### 1. SCOPE

1.1 Scope. This specification covers a fast drying, lusterless, low volatile organic compound (VOC) content alkyd enamel for use on primed exterior and interior metal surfaces. This enamel is lead and chromate free and contains no more than 420 grams per liter (3.5 pounds per gallon) of VOCs as applied.

### 2. APPLICABLE DOCUMENTS

#### 2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

## SPECIFICATIONS

### FEDERAL

- |            |   |
|------------|---|
| TT-C-490   | - Cleaning Methods and Pretreatment of Ferrous Surfaces.                            |
| TT-T-306   | - Thinner, Synthetic Resin, Enamel.   |
| PPP-P-1892 | - Paint, Varnish, Lacquer and Related Materials; Packaging, Packing and Marking of. |
| PPP-T-60   | - Tape, Packaging, Waterproof.  |

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: USA Belvoir Research, Development, and Engineering Center, ATTN: SATBE-TSE, Fort Belvoir, VA 22050-5606 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 8010

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## STANDARDS

## FEDERAL

- FED-STD-141 - Paint, Varnish, Lacquer and Related Materials: Methods of Inspection, Sampling and Testing.
- FED-STD-313 - Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities.
- FED-STD-595 - Colors Used in Government Procurement.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- B 117 - Salt Spray (Fog) Testing.
- D 185 - Coarse Particles in Pigments, Pastes and Paints.
- D 476 - Titanium Dioxide Pigments.
- D 523 - Specular Gloss.
- D 562 - Consistency of Paints Using the Stormer Viscosimeter.
- D 610 - Evaluating Degree of Rusting on Painted Steel Surfaces.
- D 1210 - Fineness of Dispersion of Pigment Vehicle Systems.
- D 1364 - Water in Volatile Solvents (Fischer Reagent Titration Method).
- D 1640 - Drying, Curing, or Film Formation of Organic Coatings at Room Temperature.
- D 1729 - Visual Evaluation of Color Differences of Opaque Materials.
- D 2369 - Volatile Content of Coatings.
- D 2371 - Pigment Content of Solvent Reducible Paints.
- D 2805 - Hiding Power of Paints by Reflectometry.
- D 3271 - Direct Injection of Solvent-Reducible Paints into a Gas Chromatograph of Lead, Cadmium and Cobalt in Paint by Atomic Absorption Spectroscopy.
- D 3335 - Low Concentration of Lead, Cadmium and Cobalt in Paint by Atomic Absorption Spectroscopy.
- D 3960 - Determining Volatile Organic Content (VOC) of Paints and Related Coatings.
- E 97 - Directional Reflectance Factor of Opaque Specimens.

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

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

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2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

## 3. REQUIREMENTS

3.1 Qualification. The coatings furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable Qualified Products List (QPL) at the time set for opening of bids (see 4.2.1.1 and 6.3). Any change in the formulation of a qualified product will necessitate its requalification. The material supplied under the contract shall be identical, within manufacturing tolerance, to the product receiving qualification.

3.2 Materials. The materials used in the coating shall be as specified herein. Materials not specified shall be selected by the contractor and shall be subject to all provisions of this specification.

3.2.1 Toxic products and formulations. The material shall have no adverse effect on the health of the personnel when used for its intended purpose. Questions pertinent to this effect shall be referred by the contracting activity to the appropriate departmental medical service which will act as an advisor to the contracting agency.

3.2.2 Hazardous material. The contractor shall comply with the hazardous material requirements of FED-STD-313 (see 6.5).

3.2.3 Prohibited material. The product shall not contain benzene, chlorinated solvents or ethylene based glycol ethers and their acetates. The lead content shall not exceed 0.06 percent of the nonvolatile content. Chromium (hexavalent) compounds shall not be used (see 3.4.1).

3.3 Color. When tested as specified in 4.3.4, the color of the enamel shall match that of the standard color chip in FED-STD-595 (see 6.3.1). For color 37038, the color of the enamel may be darker or jetter than that of the actual standard color chip, and for color 37925, the enamel shall have a minimum directional reflectance of 83 (see 4.3.26).

<u>Color</u>	<u>FED-STD-595 Color Number</u>
Aluminum	17178
Red	31136
Orange	32246
Yellow	33538, 33655
Green	34088, 34108, 34558
Blue	35044, 35109
Black	37038
White	37875, 37925
Other Colors	36118, 36231, 36440, 37142

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3.4 Composition. The material shall meet the requirements of table I.

TABLE I. Composition - percent by weight.

	White	Black	All Other Colors
	Nonvolatile matter - minimum	75	72
Total pigment - % of nonvolatile - maximum	73	70	70
Extender pigment - % total pigment - maximum	65	90	85

3.4.1 Pigment. The pigments listed in table II, in any combination, shall be the only ones used to match the colors. The titanium dioxide shall conform to ASTM D 476, type III or type IV. Lead or chromate (hexavalent) pigments shall not be used. Extender pigments shall be siliceous matter and barium sulfate, in any ratio, and shall not exceed the amount specified in table I. The use of the specified pigments does not guarantee that a product will meet all the requirements of this specification, as the choice of vendors, amounts, methods of dispersion and incorporation can significantly affect the quality of the end product.

TABLE II. Pigmentation.

Pigment	Color Index Name	Color Index Number
Titanium Dioxide White	PW6	77891
Carbon Black	PBk7	77266
Iron Oxide Black	PBk11	77499
Iron Blue	PB27	77510
Phthalocyanine Blue	PB15	74160
Phthalocyanine Green	PG7	74260
Phthalocyanine Green	PG36	74265
Arylide Yellow	PY74	11741
Arylide Yellow	PY65	11740
Diarylide Yellow	PY83	21108
Benzimidazolone Yellow	PY151	13980
Iron Oxide Yellow	PY42	77492
DNA Orange	P05	12075
Pyrazolone Orange	P034	21115
Benzimidazolone Orange	P036	11780
Naphthol Red	PR170	12475
Quinacridone Red	PR202	73905
Quinacridone Red	PR122	73915
Quinacridone Violet	PV19	46500
Iron Oxide Red	PR101	77491
Iron Oxide Brown	PBr6	77491, 77492, 77499
Iron Oxide Brown	PBr11	77495
Aluminum	PM 1	77000

3.4.2 Lead and chromate (hexavalent) content. When tested as specified, the lead content shall not exceed 0.06 percent by weight of the total nonvolatile content (see 4.3.8) and the test for hexavalent chromium shall be negative (see 4.3.7).

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3.4.3 Vehicle. The vehicle shall be a drying oil alkyd, modified or unmodified.

3.4.4 Solvent analysis. When tested as specified in 4.3.9, solvents used shall meet the requirements of 3.2.3.

3.5 Quantitative requirements. When tested as specified in 4.3.2, the enamel shall conform to the quantitative requirements of table III.

TABLE III. Quantitative requirements of enamel.

CHARACTERICS	REQUIREMENTS	
	MINIMUM	MAXIMUM
VOC, grams volatile per liter of enamel reduced for spray (see 4.3.18)	-	420
Water, % by weight of enamel	-	0.5
Coarse particles and skins, % by weight of pigment	-	0.5
Specular gloss, 60 degree	2	8
Viscosity, reduced as specified in 4.3.11, KU	-	70
Fineness of grind	5	-
Drying time, air dry		
Set to touch, minutes	-	6
Dry hard, minutes	-	12
Contrast ratio		
37925 White	0.94	-
32246 Orange	0.92	-
33538 Yellow	0.90	-
33655 Yellow	0.88	-
31136 Red	0.92	-
All other colors	0.98	-

3.6 Qualitative requirements.

3.6.1 Condition in container. When tested as specified in 4.3.14, a freshly opened full container of the enamel shall be free from grit, coarse particles, skins, lumps, seeds, livering or abnormal thickening. The enamel shall show no pigment settling or caking that can not be readily reincorporated to a smooth homogeneous state.

3.6.2 Storage stability.

3.6.2.1 Full container. When tested as specified in 4.3.15.1, a full quart of the enamel shall be free from coarse particles, grit, skins, lumps, seeds, livering, hard caking and tough, gummy sediment. The enamel shall remix readily to a smooth homogeneous state, shall show a maximum viscosity increase of 15KU and shall meet all the requirements of this specification.

3.6.2.2 Partially filled container. When tested as specified in 4.3.15.2, the enamel shall show no skinning. After being aged as specified in 4.3.15.2, the enamel shall show no livering, curdling, seeding, hard caking, or tough gummy sediment.

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3.6.3 Accelerated stability. When tested as specified in 4.3.16, the enamel shall show no livering, curdling, hard caking, or tough gummy sediment and shall mix readily to a smooth, homogeneous state.

3.6.4 Suspension properties. When tested as specified in 4.3.17, the enamel shall completely redisperse to a smooth, homogeneous state.

3.6.5 Spraying properties. When tested as specified in 4.3.18, the enamel shall show no running, sagging or streaking. The dried film shall show no dusting, mottling, color separation, flooding or floating, and shall present a smooth, uniform finish free from defects.

3.6.6 Flexibility. When tested as specified in 4.3.19, a film of the enamel shall withstand bending without cracking or flaking.

3.6.7 Knife test. When tested as specified in 4.3.20, the enamel shall adhere tightly to and not flake or crack from the metal surface. The film shall ribbon or curl from the metal on cutting and the cut shall show beveled edges.

3.6.8 Water resistance. When tested as specified in 4.3.21, the enamel shall show no wrinkling or blistering over the whole panel when examined immediately after removal from distilled water. When examined two hours after removal, there shall be only a slight softening, whitening or dulling. After 24 hours air drying, the panel which was immersed shall be almost indistinguishable with regard to hardness, adhesion and general appearance from a panel prepared at the same time but not immersed.

3.6.9 Hydrocarbon resistance. When tested as specified in 4.3.22, the enamel shall show no wrinkling or blistering over the whole panel when examined immediately after removal from the hydrocarbon solution. When examined two hours after removal, there shall be only a slight softening, whitening or dulling. After 24 hours air drying, the panel which was immersed shall be almost indistinguishable with regard to hardness, adhesion and general appearance from a panel prepared at the same time but not immersed.

3.6.10 Adhesion. When tested as specified in 4.3.23, films of the enamel shall show no removal of the primer by the adhesive tape beyond one-eighth inch on either side of the score line.

3.6.11 Salt spray resistance. When tested as specified in 4.3.24 and examined immediately after removal from the salt spray test, films of the enamel shall show no more than a trace of rusting (No. 9, ASTM D 610) and no more than five scattered blisters, none larger than 1 mm in diameter. On removal of the enamel, there shall be no more than a trace of rusting, pitting, or corrosion on the panels.

3.6.12 Weather resistance. When prepared and exposed as specified in 4.3.25, films of the enamel shall show no cracking, checking, flaking, or loss of adhesion, and no more than a trace of rusting (No. 9, ASTM D 610). On removal of the coating, the surface of the metal shall show no more than a trace of rusting, pitting, or corrosion on the panels.

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3.6.13 User instruction marking. In addition to the markings specified in 5.2, all containers shall include the VOC content in grams per liter of coating when reduced as specified with II-I-306, type II, and shall be legibly marked or labeled with the following:

CAUTION: The Surgeon General requires airline respirators to be used unless air sampling shows exposure to be below standards. Then, either chemical cartridge respirators or airline respirators are required. Avoid contact with skin and eyes. Use adequate ventilation. For other safety recommendations, refer to the Material Safety Data Sheet. Keep containers closed.

#### 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 (examinations and tests) 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 ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Hazardous material. Failure to comply with the hazardous material requirements of FED-STD-313 shall be cause for rejection.

4.2 Sampling, inspection, and testing. Unless otherwise specified, sampling, inspection, and testing shall be in accordance with FED-STD-141, method 1000.

4.2.1 Classification of inspections. Inspection under this specification shall be for the following:

- a. Qualification (see 4.2.1.1 and 6.3).
- b. Quality conformance (see 4.2.1.2).

4.2.1.1 Qualification inspection. Qualification shall be conducted by the qualifying activity (see 6.3). Qualification inspection shall consist of tests for all requirements in section 3 and examination for user instruction marking (see 3.6.13). The results of each test shall be compared with the applicable requirement in section 3. Failure to conform to any requirement shall be counted as a defect, and the part represented by the sample test shall not be approved for inclusion on the QPL under this specification.

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4.2.1.1.1 Plant qualification. Different plants of the same manufacturer must be qualified individually in order to be listed on the QPL.

4.2.1.2 Quality conformance inspection. Quality conformance inspection shall consist of the following: VOC, condition in container, total solids, viscosity, color, contrast ratio, fineness of grind, gloss, and dry times as specified in sections 3 and 4.

4.2.2 Standard conditions. Unless otherwise specified herein, all test specimens shall be prepared and tested at a temperature of 21 to 17 °C and a relative humidity of 40-65 percent.

#### 4.3 Test methods.

4.3.1 Test conditions. The testing conditions shall be in accordance with FED-STD-141, section 9 or in accordance with the appropriate ASTM method except as otherwise specified herein. Failure of any test result to fall within the range specified in section 3 as applicable, shall constitute failure of the applicable test.

4.3.2 Test procedures. The following tests (see table IV) shall be conducted in accordance with FED-STD-141, ASTM, or as specified herein. The right is reserved to make any additional tests deemed necessary to determine that the coating meets the requirements of this specification.

4.3.3 Test panels. Except as otherwise specified, metal panels used for test purposes shall be of two types:

- a. Steel, cold rolled, 0.032 inches thick, SAE 1010. <sup>1/</sup>
- b. Steel, tinplated, 0.010 inches thick. <sup>2/</sup>

4.3.4 Color. Determine the color in accordance with ASTM D 1729 by applying films with a 0.002 inch (0.004 inch gap clearance) film applicator on a black and white hiding chart <sup>3/</sup> until complete hiding is obtained. Evaluate for compliance with 3.3. For colors 33538 and 33655 only, apply a single film and use the area over the white for color comparison.

4.3.5 Pigment analysis. Extract the pigment as specified in FED-STD-141, method 4021 using extraction mixture C. Make appropriate qualitative and quantitative tests on the extracted pigment. Nonconformance to the requirements of 3.4.1 shall constitute failure of this test.

4.3.6 Extender pigment. Determine siliceous matter and barium sulfate by the applicable portions of FED-STD-141, method 7281. Evaluate for compliance with table I.

<sup>1/</sup> Q-Panel Company, Cleveland, OH, S412, or equivalent.

<sup>2/</sup> Q-Panel Company, Cleveland, OH, DT-36, or equivalent.

<sup>3/</sup> Leneta Company, Ho-Ho-Kus, NJ, Form 2A, or equivalent.

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TABLE IV. Index.

TEST	TEST PARAGRAPH	REQUIREMENT PARAGRAPH	ASTM METHOD	FED-STD-141 METHOD
Color	4.3.4	3.3	D 1729	-
Pigment analysis	4.3.5	3.4.1	-	4021
Extender pigment	4.3.6	Table I	-	7281
Chromium content	4.3.7	3.4.2	-	-
VOC content	-	Table III	D 3960	-
Nonvolatile matter	-	Table I	D 2369	-
Pigment content	-	Table I	D 2371	-
Lead content	4.3.8	3.4.2	D 3335	-
Water	-	Table III	D 1364	-
Coarse particles	-	Table III	D 185	-
Solvent analysis	4.3.9	3.4.4	D 3271	-
Specular gloss	4.3.10	Table III	D 523	2021
Viscosity, reduced	4.3.11	Table III	D 562	-
Fineness of grind	-	Table III	D 1210	-
Drying time	4.3.12	Table III	D 1640	-
Contrast ratio	4.3.13	Table III	D 2805	-
Condition in container	4.3.14	3.6.1	-	3011
Storage stability				
Full container	4.3.15.1	3.6.2.1	-	-
Partially full container	4.3.15.2	3.6.2.2	-	-
Accelerated stability	4.3.16	3.6.3	-	-
Suspension properties	4.3.17	3.6.4	-	-
Spraying properties	4.3.18	3.6.5	-	4331
Flexibility	4.3.19	3.6.6	-	6221
Knife test	4.3.20	3.6.7	-	6304
Water resistance	4.3.21	3.6.8	-	-
Hydrocarbon resistance	4.3.22	3.6.9	-	-
Adhesion	4.3.23	3.6.10	-	-
Salt spray resistance	4.3.24	3.6.11	-	-
Weather resistance	4.3.25	3.6.12	-	-
Directional reflectance	4.3.26	3.3	E 97	-

4.3.7 Chromium (hexavalent) content.

- a. Reagents: 25 percent aqueous KOH.
- b. Procedure:

1. Add 5 mL of 25 percent aqueous KOH to 0.5 g of the extracted pigment contained in a 15 mL centrifuge tube.
2. Agitate by shaking the tube for a few minutes, then centrifuge.
3. The supernatant liquid should be colorless. A yellow color indicates the presence of chromate. Nonconformance to the requirement in 3.4.2 shall constitute failure of this test.

4.3.8 Lead content. Determine the percent of lead in accordance with ASTM D 3335 or by x-ray emission spectrometric analysis in accordance with the manufacturer's manual. Evaluate for compliance with 3.4.2.

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4.3.9 Solvent analysis. Evaluate for compliance to 3.4.4 in accordance with ASTM D 3271.

4.3.10 Specular gloss. Prepare a drawdown of the enamel using a 0.002 inch (0.004 inch gap clearance) film applicator on a glass panel according to FED-STD-141, method 2021 and air dry for 24 hours. Measure the 60 degree specular gloss in accordance with ASTM D 523 and evaluate for compliance with table III.

4.3.11 Viscosity (reduced). Reduce eight parts, by volume, of the enamel with one part, by volume, of thinner conforming to TT-T-306, type II. Measure the viscosity in accordance with ASTM D 562 and evaluate for compliance with table III.

4.3.12 Drying time. Prepare a drawdown of enamel using a 0.002 inch (0.004 inch gap clearance) film applicator on a glass panel and air dry for the specified time. Check the drying time in accordance with ASTM D 1640 and evaluate for compliance with table III.

4.3.13 Contrast ratio. Prepare a drawdown of the enamel using a 0.002 inch (0.004 inch gap clearance) film applicator and allow to air dry for 24 hours. For colors 33538 and 33655 use a 0.0025 (0.005 inch gap clearance) film applicator. Determine the contrast ratio in accordance with ASTM D 2805 and evaluate for compliance with table III.

4.3.14 Condition in container. Determine package condition of the enamel in accordance with FED-STD-141, method 3011 and observe for compliance with 3.6.1. Determine pigment settling by proceeding as specified in FED-STD-141, method 3011, but do not stir. Reseal and then agitate the can for 3 minutes on a paint shaker <sup>4/</sup>. On reexamination of the contents, the disclosure of any gel bodies or undispersed pigment indicates unsatisfactory settling properties. Observe for compliance with 3.6.1.

#### 4.3.15 Storage stability.

4.3.15.1 Full container. Allow a full standard quart can of the enamel to stand undisturbed for one year at standard conditions (see 4.2.2) and then examine the contents. Evaluate pigment settling or caking as specified in 4.3.14 except agitate the can for 5 minutes on the paint shaker prior to reexamination. Determine viscosity and make other applicable tests. Nonconformance to 3.6.2.1 shall constitute failure of this test.

4.3.15.2 Partially filled container. Fill a 1-pint friction top can three-fourths full with enamel. Secure the top tightly and invert the can momentarily. Store the can in an upright position for 48 hours and check for skinning. Reseal the can and age for 72 hours at 60 °C. After the aging period, evaluate for compliance with 3.6.2.2.

4.3.16 Accelerated stability. Fill an 8 ounce wide-mouth glass jar, approximately 4-1/2 inches high and 2 inches in diameter, with the packaged enamel. Secure the cover tightly and invert the jar momentarily to check for leaks. Place the sample in a 60 ± 2 °C (140 ± 4 °F) oven in an upright position for 7 days. After

<sup>4/</sup> An apparatus of this type, powered by a 1/4 HP motor, operates at a rate of 6 cycles per minute and is manufactured by Red Devil Tools, Irvington, NJ.

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this period, allow to cool to room temperature and examine the contents. Nonconformance to 3.6.3 shall constitute failure of this test.

4.3.17 Suspension properties. Reduce the enamel as specified in 4.3.11. Place six ounces of the reduced material in an 8 ounce glass jar. Allow the stoppered jar to remain undisturbed for 24 hours and then place the unopened jar on a paint shaker as specified in 4.3.14 and agitate the contents for 20 seconds. Reexamine the material for any evidence of non-homogeneity or undispersed pigment. Nonconformance to 3.6.4 shall constitute failure of this test.

4.3.18 Spraying properties. Reduce the enamel as specified in 4.3.11. Holding the spray gun 8-10 inches from a smooth steel panel, spray to a dry film thickness of 0.0013 to 0.0017 inches according to FED-STD-141, method 4331. Allow to air dry for 24 hours and evaluate for compliance to 3.6.5.

4.3.19 Flexibility. Using methyl ethyl ketone and a soft cloth, clean the steel tinplated panels and prepare drawdowns using a 0.002 inch film applicator (0.004 inch gap clearance). Air dry the panels for two days and force dry 24 hours at  $60 \pm 2$  °C. Condition the panels for 1 hour at standard conditions and bend over a 1/8-inch mandrel. Evaluate according to FED-STD-141, method 6221. Check for compliance with 3.6.6.

4.3.20 Knife test. Using the flat portion of the panel used for the flexibility test (see 4.3.19), perform this test in accordance with FED-STD-141, method 6304 and check for compliance with 3.6.7.

4.3.21 Water resistance. Prepare drawdowns on steel tinplated panels as specified in 4.3.19. Air dry the panels for 7 days and immerse halfway in distilled water for 18 hours. Evaluate for compliance with 3.6.8.

4.3.22 Hydrocarbon resistance. Prepare drawdowns on steel tinplated panels as specified in 4.3.19. Air dry the panels for 7 days and immerse halfway in a hydrocarbon mixture consisting of 70 percent by volume of iso-octane and 30 percent by volume of toluene for 4 hours. Evaluate for compliance with 3.6.9.

4.3.23 Adhesion. Prepare panels as specified in 4.3.19 but air dry for 7 days and force dry for 48 hours at  $60 \pm 2$  °C. Condition the panels for 1 hour at standard conditions and then score a line through to the metal across the width of the film using a sharp pointed knife. The film shall then be taped perpendicular to and across the score line with water resistant, pressure sensitive adhesive tape (3/4-inch width) conforming to PPP-T-60, type IV. The tape shall be pressed down with two passes of a 4-1/2 pound rubber covered roller, approximately 3-1/2 inches in diameter by 1-3/4 inches in width. The surface of the roller shall have a durometer hardness value within the range of 70 to 80<sup>5/</sup>. Allow 10 seconds for the test area to return to room temperature. Grasp a free end of the tape and at a rapid speed, strip it from the specimen by pulling the tape back upon itself at 180 degrees and check for film removal. Nonconformance to 3.6.10 shall constitute failure of this test.

<sup>5/</sup> A roller of this type is available from the Pressure Sensitive Tape Council, 1201 Waukegan Road, Glenview, IL 60025.

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4.3.24 Salt spray resistance. Prepare three 4 x 12 inch steel panels in accordance with to TT-C-490, type I <sup>9/</sup>. Reduce the enamel as specified in 4.3.11 and spray the panels to a dry film thickness of 0.0013 to 0.0017 inches on the ground side and air dry for 7 days. Coat edges and uncoated metal surfaces with wax or other suitable coating, but do not score. Expose the panels to 5 percent salt spray for 120 hours as specified in ASTM B 117. Remove the panels, wash gently in running water no warmer than 100 °F (38 °C) until free from any visible salt deposits. Examine immediately for compliance with 3.6.11. Strip the enamel from the panels and inspect the panels for rust, pitting or corrosion. Nonconformance to 3.6.11 shall constitute failure of this test.

4.3.25 Weather resistance. Prepare two panels as specified in 4.3.24. Allow to air dry for 7 days and place on outdoor exposure for 24 months at an angle of 45 degrees facing south in the latitude of Washington, DC. After exposure, examine for compliance with 3.6.12. Then strip the enamel film from the metal and inspect the surface. Nonconformance to 3.6.12 shall constitute failure of this test.

4.3.26 Directional reflectance. For color 37925 only, prepare a panel according to ASTM E 97. Using the green filter, evaluate for compliance with 3.3.

4.4 Inspection of packaging. The preservation, packing and marking specified in 5.1 and 5.2 shall be examined for quality conformance in accordance with the applicable requirements of PPP-P-1892.

## 5. PACKAGING

5.1 Packaging and packing. The enamel shall be packaged and packed in accordance with PPP-P-1892. The level of packaging and packing shall be level A, B, or C as specified (see 6.2). The enamel shall be furnished in 1-pint cans, 1-gallon cans, 5-gallon pails, or 55-gallon drums as specified (see 6.2).

5.2 Marking. Marking of each container, intermediate containers, shipping containers, and palletized loads shall be in accordance with PPP-P-1892. Special markings shall be as specified in the contract or purchase order (see 6.2).

## 6. NOTES

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

6.1 Intended use. This specification covers an alkyd enamel that when reduced as specified shall have a maximum volatile organic compound (VOC) content of not more than 420 grams per liter. The intended use is on primed or pretreated metal surfaces where exposure to lead or chromate pigments is not permitted.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of the specification.
- b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).

<sup>9/</sup> Bonderite 37, 40 or equivalent.

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- c. Level of packaging and packing required (see 5.1).
- d. Size of container required (see 5.1).
- e. Any special marking required (see 5.2).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of contractors is called to this requirement 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. The activity responsible for the Qualified Products List is the US Army Research Laboratory, ATTN: AMSRL-MA-E, Fort Belvoir, VA 22060-5606, and information pertaining to qualification of products may be obtained from this activity.

6.3.1 Qualification colors. Upon successful completion of qualification testing of colors shown in the left column of table V, qualification will be extended to the respective colors listed in the right column (see 3.3).

TABLE V. Colors approved by extension of qualification.

Color Qualified	Additional Colors to Which Approval is Extended
17178	-
31136	-
32246	-
33538	33655
34088	34108
35044	35109
37038	-
37925	34558, 36118, 36231, 36440, 37142, 37875

6.4 Basis of purchase. The enamel covered by this specification should be purchased by volume, the unit being one US liquid gallon of 231 cubic inches at 20 °C (68 °F).

6.5 Material Safety Data Sheets. Contracting officers will identify those activities requiring copies of completed Material Safety Data Sheets prepared in accordance with FED-STD-313. The pertinent Government mailing addresses for submission of data are listed in FED-STD-313, appendix B.

6.6 Subject term (key word) listing.

- Alkyd enamel
- Lead and chromate free
- Low VOC coating
- Volatile organic compounds (VOCs)

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

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Custodians:

Army - ME  
Navy - SH  
Air Force - 84

Preparing activity:

Army - ME  
Project 8010-0459 -

Review activities:

Army - AR, ER  
Air Force - 99

User activity:

Army - AL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-E-11195E	2. DOCUMENT DATE (YYMMDD) 930127
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3. DOCUMENT TITLE  
 Enamel, Lusterless, Fast Dry, VOC Compliant (for Use on Ammunition and Other Metals)

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (if applicable) (2) AUTOVON	7. DATE SUBMITTED

8. PREPARING ACTIVITY

a. NAME Betty Taylor	b. TELEPHONE (Include Area Code) (1) Commercial (703) 704-3466 (2) AUTOVON 654-3466
c. ADDRESS (Include Zip Code) US Army Belvoir RDE Center ATTN: SATBE-TSE Fort Belvoir, VA 22060-5606	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3400 Telephone (703) 756-2340 AUTOVON 289-2340