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MIL-DTL-11195H
10 November 2011
SUPERSEDING
MIL-DTL-11195G
31 July 2003

DETAIL 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 exterior and interior metal surfaces. This enamel is formulated free of lead and chromate (hexavalent chromium), with a maximum VOC content of 420 grams/liter (g/l) (3.5 pounds/gallon (lbs/gal)) as applied. The specified type II coating contains corrosion inhibiting pigments, formulated free of hazardous air pollutants (HAP-free).

1.2 Part or identifying number (PIN). Use the following example to create the PINs to be used for coatings acquired to this specification.

M11195	-	X	-	XXXX	-	XXXXX
Specification Identifier		Coating type designator Type II = 2		Container size designator 1 pint = 001P 1 quart = 001Q 1 gallon = 001G 1ounce = 01OZ		Color designator FED-STD-595 color chip number

Comments, suggestions, or questions on this document should be addressed to: Director, U.S. Army Research Laboratory, Weapons and Materials Research Directorate, Materials Manufacturing Technology Branch, Specifications and Standards Office, ATTN: RDRL-WMM-D, Aberdeen Proving Ground, MD 21005-5069 or emailed to richard.j.squillacioti.civ@mail.mil. 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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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 STANDARDS

FED-STD-313 - Material Safety Data, Transportation Data, And Disposal Data For Hazardous Materials Furnished To Government Activities.
FED-STD-595/30117 - Brown, Flat or Lusterless.
FED-STD-595/31136 - Red, Flat or Lusterless.
FED-STD-595/31158 - Red, Flat or Lusterless.
FED-STD-595/33446 - Tan, Flat or Lusterless.
FED-STD-595/33538 - Yellow, Flat or Lusterless.
FED-STD-595/33655 - Yellow, Flat or Lusterless.
FED-STD-595/34079 - Green, Flat or Lusterless.
FED-STD-595/34082 - Green, Flat or Lusterless.
FED-STD-595/34088 - Olive Drab, Flat or Lusterless.
FED-STD-595/34108 - Green, Flat or Lusterless.
FED-STD-595/34540 - Green, Flat or Lusterless.
FED-STD-595/34558 - Green, Flat or Lusterless.
FED-STD-595/35044 - Blue, Flat or Lusterless.
FED-STD-595/35109 - Blue, Flat or Lusterless.
FED-STD-595/35193 - Blue, Flat or Lusterless.
FED-STD-595/36118 - Gray, Flat or Lusterless.
FED-STD-595/36231 - Gray, Flat or Lusterless.
FED-STD-595/36375 - Gray, Flat or Lusterless.
FED-STD-595/36440 - Gray, Flat or Lusterless.
FED-STD-595/37038 - Miscellaneous, Flat or Lusterless (Black).
FED-STD-595/37142 - Miscellaneous, Flat or Lusterless.
FED-STD-595/37875 - Miscellaneous, Flat or Lusterless (White).
FED-STD-595/37925 - Miscellaneous, Flat or Lusterless (White).

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

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2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA Method 311 - Analysis of Hazardous Air Pollutant Compounds in Paints and Coatings by Direct Injection into a Gas Chromatograph.

(Copies of this document are available online at http://www.epa.gov/ttn/emc/ or from the Environmental Protection Agency, Ariel Rios Building, 1200 Pennsylvania Avenue, N.W., Washington, DC 20460.)

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 D185 - Standard Test Methods for Coarse Particles in Pigments. (DoD adopted)
ASTM D476 - Standard Classification for Dry Pigmentary Titanium Dioxide Products. (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)
ASTM D562 - Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer Type Viscometer. (DoD adopted)
ASTM D610 - Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces. (DoD adopted)
ASTM D1210 - Standard Test Method for Fineness of Dispersion of Pigment Vehicle Systems by Hegman Type Gage. (DoD adopted)
ASTM D1364 - Standard Test Method for Water in Volatile Solvents (Karl Fischer Reagent Titration Method). (DoD adopted)
ASTM D1640 - Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature. (DoD adopted)
ASTM D1654 - Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments. (DoD adopted)
ASTM D1729 - Standard Practice for Visual Appraisal of Colors and Color Differences of Diffusely Illuminated Opaque Materials. (DoD adopted)
ASTM D2369 - Standard Test Method for Volatile Content of Coatings. (DoD adopted)
ASTM D2371 - Standard Test Method for Pigment Content of Solvent Reducible Paints. (DoD adopted)
ASTM D2805 - Standard Test Method for Hiding Power of Paints by Reflectometry. (DoD adopted)

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ASTM D3271 - Standard Practice for Direct Injection of Solvent Reducible Paints Into a Gas Chromatograph for Solvent Analysis. (DoD adopted)
ASTM D3335 - Standard Test Method for Low Concentrations of Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectroscopy. (DoD adopted)
ASTM D3359 - Standard Test Methods for Measuring Adhesion by Tape Test.
ASTM D3363 - Standard Test Method for Film Hardness by Pencil Test. (DoD adopted)
ASTM D3891 - Standard Practice for Preparation of Glass Panels for Testing Paint, Varnish, Lacquer, and Related Products.
ASTM D3924 - Standard Specification for Standard Environment for Conditioning and Testing Paint, Varnish, Lacquer, and Related Materials. (DoD adopted)
ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings. (DoD adopted)
ASTM D5380 - Standard Test Method for Identification of Crystalline Pigments and Extenders in Paint by X Ray Diffraction Analysis.
ASTM D6677 - Standard Test Method for Evaluating Adhesion by Knife.
ASTM E1347 - Standard Test Method for Color and Color Difference Measurement by Tristimulus Colorimetry.

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

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. The coating furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable Qualified Products Database (QPD) at the time set for opening of bids (see 4.2 and 6.3). Any change in the formulation or processing of a qualified product shall necessitate its requalification. The material supplied under the contract shall be identical, within manufacturing tolerance, to the product that received 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 6.4).

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3.3 Color. When tested as specified in 4.6.4, the color of the enamel shall match that of the standard color chip in FED-STD-595. 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 4.6.26).

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	73
Total pigment - % of nonvolatile - maximum	73	70	70
Extender pigment - % total pigment - maximum	65	90	85
Percent of total pigment:			
Zinc phosphate, % total pigment - minimum	9.0	9.0	9.0

3.4.1 Pigment. The pigments listed in table II, in any combination, shall be used to match the colors specified. The titanium dioxide shall be a rutile chalk resistant type conforming to ASTM D476, type III or type IV. Lead or chromate (hexavalent) pigments shall not be used. Compounds of antimony, arsenic, beryllium, cadmium, cobalt, chromium, cyanide, lead, manganese, mercury, nickel and selenium shall be absent. 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. If other tinting pigments are used to match the spectral characteristics, these additional pigments shall be recommended for exterior exposure by the pigment supplier. Other corrosion inhibiting pigments, in addition to the specified zinc phosphate in table I can be used.

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 4.6.8) and the test for hexavalent chromium shall be negative (see 4.6.7).

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 4.6.9, solvents used shall be in accordance with the guidelines established by local, state and federal regulations and shall be volatile organic hazardous air pollutants-free (VOHAP-free).

3.5 Quantitative characteristics. When tested as specified in 4.6.2, the enamel shall conform to the quantitative requirements of table III.

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TABLE II. Pigmentation.

Pigment	Color Index Name	Color Index Number
Titanium Dioxide White	PW6	77891
Carbon Black	PBk7	77266
Iron Oxide Black	PBkll	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	PBr 11	77495
Aluminum	PM 1	77000

Note: Phthalocyanine pigments do not contain cyanide compounds.

3.6 Qualitative requirements.

3.6.1 Condition in container. When tested as specified in 4.6.14, 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 cannot be readily reincorporated to a smooth homogeneous state.

3.6.2 Storage stability.

3.6.2.1 Full container. When tested as specified in 4.6.15.1, 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 15 KU and shall meet all the requirements of this specification.

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TABLE III. Quantitative requirements of enamel.

Characteristics	Requirements	
	Minimum	Maximum
VOC, grams volatile / liter of enamel reduced for spray (see 4.6.18)	-	420
Pigment: Hexavalent chromium, cadmium, cadmium compounds	Absent	
Inorganic HAP compounds	Absent	
VOHAP compounds	Absent	
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 4.6.11, KU	-	70
Fineness of grind	5	-
Drying time, air dry: Set to touch, minutes Dry hard, minutes	 - -	 6 12
Contrast ratio: 37925 White 33538 Yellow 33655 Yellow 31136 Red All other colors	 0.94 0.90 0.88 0.92 0.98	 - - - - -

3.6.2.2 Partially filled container. When tested as specified in 4.6.15.2, the enamel shall show no skinning. After being aged as specified in 4.6.15.2, the enamel shall show no livering, curdling, seeding, hard caking, or tough gummy sediment. The enamel shall show no pigment settling or caking that cannot be readily re-incorporated to a smooth homogeneous state.

3.6.3 Accelerated stability. When tested as specified in 4.6.16, the enamel shall show no livering, curdling, hard caking, or tough gummy sediment and shall mix readily to a smooth homogenous state.

3.6.4 Suspension properties. When tested as specified in 4.6.17, the enamel shall completely redisperse to a smooth, homogeneous state.

3.6.5 Spraying properties. When tested as specified in 4.6.18, 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 4.6.19, a film of the enamel shall withstand bending without cracking or flaking.

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3.6.7 Knife test. When tested as specified in 4.6.20, 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 4.6.21, a film of the coating shall show no blistering or wrinkling and no more than a slight whitening or softening immediately upon removal from the water. Film softening shall not exceed a 2 pencil hardness difference (see ASTM D3363) from an unexposed film with identical cure history prior to water exposure. After 2 hours air drying the portion of the panel, that was immersed, shall be almost indistinguishable with regard to adhesion, hardness, color, and gloss from an unexposed film with identical cure history prior to water exposure.

3.6.9 Hydrocarbon resistance. When tested as specified in 4.6.22, a film of the coating shall show no blistering or wrinkling when examined immediately after removal from the hydrocarbon test fluid. When examined 2 hours after removal, there shall be no excessive softening, whitening, or dulling. Film softening shall not exceed a 2 pencil hardness difference (see ASTM D3363) from an unexposed film with identical cure history prior to hydrocarbon exposure. After 24 hours drying the portion of 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 4.6.23, films of the enamel shall show no evidence of removal 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 4.6.24 and examined immediately after removal from the salt spray test, films of the coating shall have a minimum rating of No. 7, based on test method ASTM D1654, and the failure evaluation procedure for unscribed specimens, procedure B. Upon completion of the salt spray fog test, remove the coating film and inspect the substrate. 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 4.6.25, films of the enamel shall show no cracking, checking, flaking, or loss of adhesion, and no more than a trace of rusting shall be observed when visually comparing the surface with the photographic reference standard that illustrates minute surface corrosion, less than 0.03% rust grade No. 9, in accordance with ASTM D610. 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.

3.6.13 User instruction marking. All containers shall include the VOC content and VOHAP content in g/l or lbs/gal of coating when reduced as specified with the manufacturer's recommended HAP-free thinner. All containers shall be legibly marked or labeled with precautionary information as follows:

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

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safety recommendations, refer to the Material Safety Data Sheet (MSDS). Keep containers closed.

3.6.14 MSDS. A MSDS shall be prepared for the coating in accordance with FED-STD-313 and forwarded to the qualifying activity (see 6.4). The MSDS for the material covered by this specification shall be included with each shipment, and submitted to pertinent Government agencies as stated in FED-STD-313.

3.6.15 Toxic ingredients. Other than parachlorobenzotrifluoride (PCBTF), the coating shall contain no benzene, chlorinated solvents or ethylene based glycol ethers and their acetates (see 4.6.27). The coating shall have no adverse effects on the health of personnel when used for its intended purpose.

3.7 Toxicity clearance. All new chemicals and materials being added to the Army supply system shall have a toxicity clearance. A toxicity clearance involves a toxicological evaluation of materials prior to introduction into the Army supply system. The Army program manager shall be responsible for identifying technically feasible materials and requesting a toxicity clearance for use of that material within their program (see 6.3.4).

4. VERIFICATION

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

a. Qualification inspection (see 4.2 and 6.3).
b. Extension of qualification inspection (see 4.3).
c. Conformance inspection (see 4.4).

4.2 Qualification inspection. Qualification shall be conducted by the qualifying activity (see 6.3). The qualification test sample shall consist of four quarts of the paint. The samples shall be legibly identified (see 6.3.1). Qualification inspection shall consist of tests for all requirements in section 3 and table V 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 paint represented by the sample test shall not be approved for inclusion in the QPD under this specification.

4.3 Extension of qualification inspection. After successful completion of full qualification testing for QPD listing, for colors shown in the left column or right column of table IV, whichever color sample is received for testing first, then their respective extended colors shall be evaluated for the extension test program. The extension test program shall consist of the tests specified in 4.4. The extension test program can include limited extension testing. Limited extension testing for only VOC content, condition in container, color, gloss, spray properties and dry time shall be determined on a case by case basis and formalized prior to testing through test service agreements. While the testing is limited it is the prerogative of the evaluator to conduct additional testing to confirm qualification. Colors in the extension test program that successfully satisfy the qualification requirements shall be listed in the QPD. The qualification test sample

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shall consist of a one quart paint sample. The sample and necessary paperwork (see 6.3.1) shall be sent to the qualifying activity (see 6.3).

TABLE IV. Colors tested by full qualification testing or extension testing for qualification.

Primary Colors	Secondary Colors
30117	-
31136	31158
33538	33655
34079	-
34088	34082, 34108
34540	-
35044	35109, 35193
37038	-
37925	33446, 34558, 36118, 36231, 36375, 36440, 37142, 37875

4.4 Conformance inspection. The manufacturer shall forward from each production lot (see 4.4.1) a batch validation letter detailing the batch number, manufacturer's code, specification and type number, QPL number and batch volume to U.S. Army Research Laboratory (ARL), ATTN: RDRL-WMM-C, Organic Coatings Team, Building 4600, Deer Creek Loop, Aberdeen Proving Ground (APG), MD 21005-5066. The manufacturer shall perform conformance inspection testing on each production lot and have these test results on file when requested by the contracting officer. Conformance inspection shall consist of tests for VOC content, condition in container, total solids, viscosity, color, contrast ratio, fineness of grind, gloss, salt spray resistance, and dry time as specified in sections 3 and 4. There shall be no failures (see 6.5).

4.4.1 Lot and batch formation. For purposes of conformance inspection, a lot shall consist of all coatings of the same type, composition and color, from a single uniform batch, produced and offered for delivery at one time (see 6.3.2). A batch shall consist of all coating material (in U.S. gallons) manufactured during one continuous operation and forming part of one contract or order for delivery (see 6.3.2). When required, the manufacturer shall furnish with each lot and/or batch a certified test report showing that the material has passed the conformance inspection, and that there has been no formulation or process change from that which resulted in the production of the qualification inspection sample. The addition of any substance to a batch shall constitute a new lot.

4.4.2 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with ASTM D3924. Also, unless otherwise stated in the test method or paragraph, room temperature shall be 73 ± 4 °F (23 ± 2 °C) and a 40 - 70 percent relative humidity.

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

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4.6 Test methods.

4.6.1 Test conditions. Except as otherwise specified herein, the routine testing and referee testing shall be conducted in accordance with ASTM D3924. A dry film thickness of 1.5 ± 0.2 mils (37.5 ± 5 microns) shall be used whenever film thickness is requested in any test, unless otherwise required by the test. Failure of any test result to fall within the specified ranges in section 3 shall constitute failure of the applicable test.

TABLE V. Test method index.

Test	Test Paragraph	Requirement Paragraph	ASTM Method
Color	4.6.4	3.3	D1729
Pigment analysis	4.6.5	3.4.1	D2371
Extender pigment	4.6.6	Table I	D5380
Chromium content	4.6.7	3.4.2	-
VOC content	-	Table III	D3960
Nonvolatile matter	-	Table I	D2369
Pigment content	-	Table I	D2371
Lead content	4.6.8	3.4.2	D3335
Water	-	Table III	D1364
Coarse particles	-	Table III	D185
Solvent analysis 1/	4.6.9	3.4.4	D3960, D3271
Specular gloss	4.6.10	Table III	D3891, D523
Viscosity, reduced	4.6.11	Table III	D562
Fineness of grind	-	Table III	D1210
Drying time	4.6.12	Table III	D1640
Contrast ratio	4.6.13	Table III	D2805
Condition in container	4.6.14	3.6.1	-
Storage stability Full container Partially full container	4.6.15 4.6.15.1 4.6.15.2	- 3.6.2.1 3.6.2.2	- - -
Accelerated stability	4.6.16	3.6.3	-
Suspension properties	4.6.17	3.6.4	-
Spraying properties	4.6.18	3.6.5	-
Flexibility	4.6.19	3.6.6	D522
Knife test	4.6.20	3.6.7	D6677
Water resistance	4.6.21	3.6.8	-
Hydrocarbon resistance	4.6.22	3.6.9	-
Adhesion	4.6.23	3.6.10	D3359
Salt spray resistance	4.6.24	3.6.11	B117
Weather resistance	4.6.25	3.6.12	-
Directional reflectance	4.6.26	3.3	E1347

1/ EPA Method 311.

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4.6.2 Test procedures. Tests shall be conducted in accordance with table V. The right is reserved to make any additional tests deemed necessary to determine that the coating meets the requirements of this specification.

4.6.3 Test panels. Unless otherwise specified, metal panels used for test purposes shall be two types:

a. Steel, cold rolled, pretreated with zinc phosphate coating B-952 with P60 chrome rinse or equivalent, 0.032 inches (0.8128 mm) thick, for all tests except flexibility.
b. Steel, tinplated, 0.010 inches (0.254 mm) thick, for flexibility only.

4.6.4 Color. Determine the color in accordance with ASTM D1729 by applying films with a 0.002 inch (0.004 inch gap clearance) film applicator on a black and white hiding chart 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.

4.6.5 Pigment analysis. Extract the pigment as in ASTM D2371, except use ethanol for the extraction. Make appropriate qualitative and quantitative tests on the extracted pigment to determine if only permissible pigments were used. Nonconformance to 3.4.1 shall constitute failure of this test.

4.6.5.1 Antimony, arsenic, beryllium, cadmium, cyanide, manganese, mercury, nickel and selenium. Manufacturers need to review applicable environmental and safety regulations and comply with material shipment requirements (see 6.2). The MSDS needs to include a notarized statement that verifies that the composition of the material (coating formulation) is free of the antimony, arsenic, beryllium, cadmium, cyanide, manganese, mercury, nickel, selenium and their compounds.

4.6.6 Extender pigment. Determine siliceous matter and barium sulfate by the applicable portions of ASTM D5380. Evaluate for compliance with table I.

4.6.7 Chromium (hexavalent) content. Determine the presence or absence of hexavalent chromium by either of the following chemical reagent screening techniques:

a. Weigh approximately 250 mg of pigment into a small glass test tube. Add 5 ml of 25 percent aqueous KOH and shake vigorously for 1-2 minutes. Decant a one ml aliquot into a plastic micro-centrifuge tube and centrifuge for five (5) minutes at 17,000 rpm, balancing the centrifuge with a tube containing one ml of the KOH solution. The resulting supernatant liquid shall be nearly colorless. Use the tube containing the KOH solution as a reference. A distinct yellow color indicates the presence of hexavalent chromium and therefore shall constitute failure of the test requirement.

b. Weigh approximately 50 mg of pigment into a small glass test tube. Add 5ml of 10 percent aqueous H_2SO_4 and shake vigorously for 1-2 minutes. Decant a one ml aliquot into a plastic micro-centrifuge tube and centrifuge for five (5) minutes at 17,000 rpm, balancing the centrifuge with a second tube containing one ml of the H_2SO_4 solution. The solution in the second tube shall act as the test “blank”. Immerse a chromate ion

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(CrO_4^{2-}) test strip into the supernatant from each tube. Shake off the excess liquid and after approximately one minute compare the color change in the reaction zone of the strips to the color scale (concentration levels) provided by the manufacturer. The appearance of a purple/violet color from the "sample" strip is indicative of hexavalent chrome and therefore shall constitute failure of the test requirement. If a color change is apparent from the "blank" strip rerun the test using fresh, chromium-free reagents. The appearance of a pronounced color change is indicative of hexavalent chrome and therefore shall constitute failure of the test requirement.

4.6.8 Lead content. Determine the presence or absence of lead by weighing 50 mg of pigment into a small glass test tube. Add 5 ml of dilute HNO_3 and shake vigorously for 1-2 minutes. Decant a one ml aliquot into a plastic micro centrifuge tube and centrifuge for five (5) minutes at 17,000 rpm, balancing the centrifuge with a second tube containing one ml of the dilute HNO_3 solution. The solution in the second tube shall act as the test "blank". Immerse a lead ion test strip into the supernatant from each tube. Shake off the excess liquid and after approximately one minute compare the color change in the reaction zone of the strips to the color scale (concentration levels) provided by the manufacturer. If a color change is apparent from the "blank" strip rerun the test using fresh, lead-free reagents. Confirmation of the exact lead concentration in the coating's solids shall be quantified using ASTM D3335. Nonconformance to the 3.4.2 requirements shall constitute failure of this test.

4.6.9 Solvent analysis.

4.6.9.1 Solvent analysis for VOC content determination. Determine the VOC content in accordance with ASTM D3960. Check for compliance with table III.

4.6.9.2 VOHAP content of coatings. Hazardous solvent content of each individual coating shall be determined in accordance with ASTM D3271 or EPA Method 311, as applicable. Check for compliance with table III.

4.6.10 Specular gloss. Prepare a 0.002 inch dry film thickness drawdown of the enamel using a film applicator with the appropriate gap clearance on a glass panel according to ASTM D3891, and air dry for 24 hours. Measure the 60 degree specular gloss in accordance with ASTM D523 and evaluate for compliance with table III.

4.6.11 Viscosity (reduced). Reduce eight parts, by volume, of the enamel with one part, by volume, of HAP-free thinner recommended by the manufacturer. Measure the viscosity in accordance with ASTM D562 and evaluate for compliance with table III.

4.6.12 Drying time. Prepare a 0.002 inch dry film thickness drawdown of enamel using a film applicator with the appropriate gap clearance on a glass panel and air dry for the specified time. Check the drying time in accordance with ASTM D1640 and evaluate for compliance with table III.

4.6.13 Contrast ratio. Prepare a 0.002 inch dry film thickness drawdown of the enamel using a film applicator with the appropriate gap clearance and allow to air dry for 24 hours. For colors

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33538 and 33655 use a 0.0025 inch dry film thickness using a film applicator with the appropriate gap clearance. Determine the contrast ratio in accordance with ASTM D2805 and evaluate for compliance with table III.

4.6.14 Condition in container. Upon opening a full previously unopened container the condition of the contents shall be examined for compliance with 3.6.1. Reseal, then agitate the container for 3 minutes on a paint shaker and examine for compliance with 3.6.1. On re-examination of the contents, the disclosure of any gel bodies or undispersed pigment indicates unsatisfactory settling properties.

4.6.15 Storage stability.

4.6.15.1 Full container. Allow a full standard quart can of the enamel to stand undisturbed for one year at standard conditions (see 4.4) and then re-examine for pigment settling or caking as specified in 4.6.14. Determine viscosity and perform other applicable tests. Nonconformance to 3.6.2.1 shall constitute failure of this test.

4.6.15.2 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 (140 ºF). After the aging period, evaluate for compliance with 3.6.2.2.

4.6.16 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 this period, allow to cool to room temperature and examine the contents. Non-conformance to 3.6.3 shall constitute failure of this test.

4.6.17 Suspension properties. Reduce the enamel as specified in 4.6.11. 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 4.6.14 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.

4.6.18 Spraying properties. If reduction is necessary for spray application, reduce the enamel as specified in 4.6.11. Spray the coating on a solvent cleaned test panel (see 4.6.3) to a dry film thickness of 1.5 ± 0.2 mils (37.5 ± 5 microns). Observe the spraying properties for compliance with 3.6.5.

4.6.19 Flexibility. Determine flexibility in accordance with ASTM D522, method B. Spray the coating on a steel panel, tinplated 0.010 inches (0.254 mm) thick to a dry film thickness of 1.5 ± 0.2 mils (37.5 ± 5 microns). Air dry for 168 hours. Bend the coated panels over a ¼ inch mandrel. Examine the coating for cracks over the area of the bend for compliance with 3.6.6.

4.6.20 Knife test. Using the flat portion of the panel used for the flexibility test (see 4.6.19), perform this test in accordance with ASTM D6677 and check for compliance with 3.6.7.

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4.6.21 Water resistance. Spray the coating on a test panel (see 4.6.3) to a dry film thickness of 1.5 ± 0.2 mils (37.5 ± 5 microns) and air dry for 168 hours. Coat all exposed unpainted metal surfaces with wax or suitable protective coating and immerse in deionized water at 25 ± 1 °C (77 ± 2 °F) for 168 hours. Panels shall be immersed at a minimum depth of 50%. At the end of the test period, remove and examine for compliance with 3.6.8.

4.6.22 Hydrocarbon resistance. Spray the coating on a test panel (see 4.6.3) to a dry film thickness of 1.5 ± 0.2 mils (37.5 ± 5 microns) and air dry for 168 hours. 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.

4.6.23 Adhesion. Spray the coating as in 4.6.18 on a steel panel pretreated as in 4.6.3. Air dry specimen for seven (7) days. Perform adhesion testing as specified in ASTM D3359, method B and examine for compliance with 3.6.10.

4.6.24 Salt spray resistance. Prepare three 4 x 12 inch steel panels as specified in 4.6.3. Reduce the enamel as specified in 4.6.11 and spray the panels to a dry film thickness of 1.5 ± 0.2 mils (37.5 ± 5 microns) and air dry for 7 days. Coat edges and uncoated metal surfaces with wax or other suitable coating, but do not score. The enamel-coated panels shall be exposed to a 5 percent salt spray fog test in accordance with ASTM B117. Panels shall be exposed for 240 hours. Upon completion of the test, panels shall be removed and washed gently in running water, no warmer than 100 °F (38 °C), until surface is free from any visible salt deposits and then immediately examined 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.

4.6.25 Weather resistance. Prepare two panels as specified in 4.6.24. Allow to air dry for a minimum of 7 days. Panels shall be placed outdoors for 24 months. The exposure racks shall be weathered at latitude 33° 23’ north and 112° 35’ west. At the end of the exposure, strip the enamel film from the surface of the metal and examine it for conformance with 3.6.12. Nonconformance to 3.6.12 shall constitute failure of this test.

4.6.26 Directional reflectance. For color 37925 only, prepare a test panel for evaluation and using the green filter, check for compliance with 3.3.

4.6.27 Toxic ingredients. Other than PCBTF, the manufacturer shall certify that the coating contains no benzene, chlorinated solvents or ethylene based glycol ethers and their acetates. Check for compliance with 3.6.15. Nonconformance to 3.6.15 shall constitute failure of this test.

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 command. Packaging data retrieval is available from the managing Military Department’s or Defense Agency’s automated packaging files, CD-ROM products, or

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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. This specification covers an alkyd enamel formulation containing corrosion inhibiting pigments. This enamel can be used on interior and exterior metal surfaces and ammunition. Products are formulated to regulatory air quality volatile emission limits that will yield, when reduced as specified by the manufacturer, a maximum VOC content of not more than 420 g/l (3.5 lbs/gal). This coating, as packaged, is HAP-free. These enamels are used on primed or pretreated metal surfaces in areas that do not permit exposure to lead or chromate pigments.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of the specification.
b. Part or identifying number (PIN) (see 1.2).
c. Color required and FED-STD-595 color number (see 3.3).
d. Required markings (see 3.6.13).
e. Whether a MSDS is required with each shipment (see 3.6.14 and 4.6.5.1).
f. If a toxicity clearance is required (see 3.7).
g. If qualification samples are required and where to send them (see 4.2 and 6.3).
h. If extension of qualification samples are required and where to send them (see 4.3 and 6.3).
i. If conformance samples are required and where to send them (see 4.4).
j. Lot and batch formation (see 4.4.1).
k. Packaging requirements (see 5.1).

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

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 the QPD, 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 purchase orders for the products covered by this specification. Samples for QPD testing (see 4.2) and for the extension testing program (see 4.3) should be submitted to ARL, ATTN: RDRL-WMM-C, Organic Coatings Team, Building 4600, Deer Creek Loop, APG, MD 21005-5066. Listings of qualified products can be obtained online through ASSIST.

6.3.1 Sample identification for qualification inspection. Samples for QPD testing and for the extension testing program are to be identified in a cover letter with the following information:

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Manufacturer's name and product number.
Submitted by (name and date).
Specify the number of samples.
Specify the reason for submitting the samples.
Specification MIL-DTL-11195H; Type II, Color ____, Color Number____.
"Enamel, Lusterless, Fast Dry, VOC Compliant, (For Use On Ammunition And Other Metals)".
Provide a copy of the MSDS.
Provide a copy of the notarized statement of composition.
Provide a copy of the technical data sheet.
Provide a copy of the test report.

6.3.2 Conformity to qualified sample. All lots of coatings supplied under this specification must be manufactured using the same formulation, raw materials and supplier(s) of raw materials, methods of manufacture, equipment, and geographic location as the qualification sample, unless changes have been approved by the qualifying activity.

6.3.3 Retention of qualification. To retain qualification of products approved for listing in the QPD, the manufacturer will be requested to verify by certification to the qualifying activity that its product(s) comply with the requirements of this specification. Unless otherwise specified by the qualifying activity, the time of periodic verification by certification will be in two year intervals from the date of original qualification and will be initiated by the qualifying activity.

6.3.4 Toxicity clearance request. Department of the Army Regulation (AR) 40-5, Preventive Medicine, (AR) 70-1, Acquisition Policy, and Department of the Army Pamphlet 70-3, Acquisition Procedures, require a toxicity clearance. Army toxicity questions and/or a toxicity clearance request should be addressed to: Commander, US Army Center for Health Promotion and Preventive Medicine, ATTN: MCHB-TS-TTE, 5158 Blackhawk Road, APG, MD 21010-5403.

6.4 MSDS. Contracting officers will identify those activities requiring copies of a completed MSDS prepared in accordance with FED-STD-313. The pertinent Government mailing addresses for submission of data are listed in FED-STD-313.

6.5 Conformance rejection and retest. Failure in any conformance inspection will result in the rejection of the batch from which it was obtained. Rejected material cannot be resubmitted for acceptance without written approval from the qualification activity (see 4.4). The application for resubmission will contain all details concerning previous rejections and measures taken to correct these deficiencies.

6.6 Subject term (key word) listing.

Alkyd
Chromate
Color
Lead
Pigment

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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 extent of the changes.

CONCLUDING MATERIAL

Custodians:
Army - MR
Navy - SH
Air Force - 99

Preparing activity:
Army – MR

Project 8010-2011-016

Review activities:
Army - MD1, MI
Navy - AS, CG, MC
Air Force - 11, 84

Civil agency:
GSA/FAS

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/.