

MIL-E-46096C(MR)
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SUPERSEDING
MIL-E-46096B(MR)
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MILITARY SPECIFICATION

ENAMEL, LUSTRELESS, QUICK DRYING, STYRENATED ALKYD TYPE,
SOLAR HEAT REFLECTING

1. SCOPE

1.1 Scope. This specification covers two types of quick drying lustreless enamel used as a finishing coat to minimize heat build up in the interior of Army weapons systems. It also provides for one composition which is suitable for use under AIR POLLUTION REGULATIONS (see 6.7).

1.2 Classification. Enamel covered by this specification shall be of the following types and compositions, as specified.

Type I - Spray and brush application.

Composition G - General use.

Composition L - Limited use (see 6.7).

Type II - Pressurized dispenser application.

Composition G - General use.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

FSC 8010

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SPECIFICATIONS

Federal

- QQ-A-250/4 - Aluminum Alloy 2024, Plate and Sheet.
- TT-E-489 - Enamel, Alkyd, Gloss (For Exterior and Interior Surfaces).
- TT-E-516 - Enamel, Lustreless, Quick Drying Styrenated Alkyd Type.
- TT-P-143 - Paint, Varnish, Lacquer and Related Materials; Packaging, Packing, and Marking of.
- TT-P-664 - Primer Coating, Synthetic, Rust-Inhibiting, Lacquer-Resisting.
- TT-T-306 - Thinner, Synthetic Resin Enamel.
- PPP-T-60 - Tape; Pressure Sensitive Adhesive, Waterproof, for Packaging and Sealing.

STANDARDS

Federal

- Fed. Test Method Std. No. 141 - Paint, Varnish, Lacquer, and Related Materials; Methods of Inspection, Sampling and Testing.
- Fed. Std. No. 595 - Colors.

PUBLICATIONS

Air Force Manual

- AFM 71-4 (TM 38-250; NAVSUP Pub 505; DSAM 4145.3; MCO P4030.19) - Packaging and Materials Handling: Packaging and Handling of Dangerous Materials for Transportation by Military Aircraft.

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

2.2 Other publications. The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on the date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials

- ASTM D 476 - Specifications for Titanium Dioxide Pigments

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

3. REQUIREMENTS

3.1 Qualification. Enamel furnished under this specification shall be products which are qualified for listing on the applicable Qualified Products List at the time set for opening of bids (see 4.3 and 6.4). Any change in the formulation of a qualified product will necessitate its requalification. The material supplied under contract shall be identical, within manufacturing tolerances, to the product receiving qualification.

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3.2 Color. The color of the enamel shall be olive drab No. 34087 or sand No. 33531 and shall match the standard color chip in Fed. Std. No. 595 when tested as in 4.4.8.

3.3 Composition.

3.3.1 Vehicle.

3.3.1.1 Composition G. The vehicle shall be a styrenated phthalic alkyd resin (see 6.6) together with the necessary amounts of driers and volatile solvents. The resin solution shall have a color value at 50 percent solids content no darker than 10 (Gardner Color Standard of 1953). Small amounts of antioxidants, wetting agents, and stabilizers may be present. The vehicle shall show a negative test for rosin and phenolic resin. The volatile solvents shall contain no benzol (benzene), chlorinated compounds except propellants for type II (see 3.3.3), or hydrolyzable chlorine derivatives.

3.3.1.2 Composition L. The vehicle shall be the same as 3.3.1.1 except the volatile solvents shall conform to the following requirements by volume when tested as in 4.4.3.

- (a) Aromatic compounds with eight or more carbon atoms except ethylbenzene: 8 percent maximum.
- (b) Ethylbenzene and toluene: 20 percent maximum.
- (c) Solvents with an olefinic or cyclo-olefinic type of unsaturation: negative test.
- (d) Ketones: negative.
- (e) Total of a + b: 20 percent maximum.

3.3.2 Pigment. The hiding pigments for olive drab No. 34087 shall be any combination of lead chromate, molybdate orange, phthalocyanine blue, titanium dioxide, quinacridone red, and carbazole dioxazine violet. For sand No. 33531 any combination of titanium dioxide, yellow and red iron oxide, and phthalocyanine blue. Organic blacks or antimony sulfide shall not be used. Hiding pigments shall be chemically pure and free from extenders. The titanium dioxide shall be rutile chalk resisting type conforming to types III or IV of ASTM D 476. Extender pigments shall be siliceous matter or siliceous matter and barytes and shall not exceed the amount specified in Table I. The amount of barytes shall not exceed 20 percent of the extender content by weight. Calcium sulfate or carbonate shall not be employed alone or as a component part of any pigment.

3.3.3 Propellant (type II). The propellant shall be a fluorinated hydrocarbon or blend of fluorinated hydrocarbons. No non-liquifiable gas such as nitrogen, nitrous oxide or carbon dioxide is to be used.

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3.4 Dispenser (type II).

3.4.1 Container. Container shall be a 6 ounce commercial type metal pressure container, generally known as an aerosol container, of such construction as to assure acceptance of the finished package by common carriers operating in interstate commerce. The capacity of the container shall be sufficient to contain the specified net contents of the enamel with outage in accordance with generally recognized safe commercial practice.

3.4.2 Dispensing valve. The dispensing valve shall have a spray head which can be removed without releasing pressure from the aerosol. The valve shall have a metering orifice accessible to cleaning with a common pin after removal of the spray head. The removable spray head shall contain orifices of such dimensions as to produce spraying properties as required in 3.6.7.2. The lower end of the dip tube shall have a maximum clearance of one-eighth inch from the bottom ring of the can after storage for one week in the product. (This allows for swelling of the tube).

3.4.3 Agitator. Each dispenser shall contain one spherical agitator either 3/8, 5/8, or 3/4 inch in diameter or the equivalent volume in smaller spheres, or one or more rivets of irregularly shaped form made of materials chemically non reactive to mild acids or bases. For example a glass marble or plated steel ball or balls.

3.4.4 Cover cap. The valve shall be protected from accidental functioning and damage by a rigid fitting metal cover cap which shall be removable and replaceable.

3.4.4.1 The color of the cover cap shall be an approximate match to the color of the enamel.

3.4.5 Unless otherwise specified, type II aerosol containers shall meet the requirements of paragraph 9-7C of Air Force Manual 71-4 for air shipment of materials.

3.5 Quantative requirements. The enamel shall conform to requirements in Table I when tested as in 4.4.

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TABLE I. Quantitative requirements

Characteristics	Requirements	
	Minimum	Maximum
Total solids		
Type I, percent by weight of enamel	52	--
Type II, percent by weight of net contents, 6 oz.	16	--
Pigment, percent weight of enamel, Type I		
Olive drab	31	35
Sand	33	37
Pigment, percent by weight of net contents, Type II	9.5	11.5
Total lead, as lead sulfate (PbSO_4) (Olive drab only)	30	--
Total chromium, as lead chromate (PbCrO_4) (Olive drab only)	28	--
Antimony sulfide	Negative	
Extender pigment	--	55
Pigment volume, percent of total solids volume	--	39
Vehicle solids, percent by weight of enamel, Type I	17	--
Vehicle solids, percent by weight of net contents, Type II	5.5	--
Phthalic anhydride, percent by weight of vehicle solids	18	26
Rosin and rosin derivatives	Negative	
Phenolic resin	Negative	
Water, percent by weight of enamel	--	1.0
Coarse particles and skins, percent by weight of pigment	--	1.0
Hiding power (contrast ratio)	0.99	--
Viscosity (Type I)		
Package, Krebs Stormer shearing rate - 200 rpm		
Grams	125	175
Equivalent Krebs Units (K.U.)	67	77
Reduced, No. 4 Ford Cup, seconds	15	25
Fineness of grind	5	--
Specular gloss	2	8
Infrared reflectance, percent		
Olive drab	60	--
Sand	70	--
Drying time:		
Set to touch, minutes	3	6
Dry hard, minutes	--	10
Free from after tack, minutes	--	15
Dry through, minutes	--	20
Full hardness, hours	--	72
Total net contents (Type II) avd ounces	5.5	6.5
Pressure (Type II) psig @75.°F.	35	45

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3.6 Qualitative performance.3.6.1 Condition in container.

3.6.1.1 Type I. The enamel, tested in 4.4.15.1, shall be free from grit, seeds, skinning, or livering in a freshly opened full container and shall show no more pigment settling or caking than can be easily and completely reincorporated to a smooth homogeneous state.

3.6.1.2 Type II. When tested as in 4.4.15.2, the enamel shall be easily redispersed and shall meet the requirements of 3.6.7.2.

3.6.2 Storage stability.

3.6.2.1 Partially full container (type I). The enamel shall show no skinning when tested as in 4.4.16.1 and, after aging as specified in 4.4.16.1 shall show no livering, curdling, tough gummy sediment, or hard caking. The enamel shall mix readily to a smooth homogeneous state, and any skin formed shall be continuous and easily removed.

3.6.2.2 Full container.

3.6.2.2.1 Type I. The enamel shall show no skinning, livering, curdling, hard caking, or tough gummy sediment when tested as in 4.4.16.2.1. It shall remix readily to a smooth homogeneous state, shall have a maximum viscosity of 89 Krebs Units and shall meet all other requirements of this specification.

3.6.2.2.2 Type II. When tested as in 4.4.16.2.2 the aerosol shall meet all requirements of this specification.

3.6.3 Accelerated storage stability (type II). When tested as in 4.4.17 the enamel shall conform to the requirements of 3.6.1.2.

3.6.4 Dilution stability (type I). When tested as in 4.4.18 the enamel shall remain stable and uniform showing no precipitation, curdling, or separation. Slight pigment settling shall be permitted.

3.6.5 Suspension properties (type I). The enamel shall completely re-disperse to a smooth homogeneous state when tested as in 4.4.19.

3.6.6 Brushing properties (type I). The enamel, tested as in 4.4.20, shall brush satisfactorily in all respects and shall dry to a smooth, uniform film free from seeds, runs, sags, or streaks.

3.6.7 Spraying properties.

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3.6.7.1 Type I. The enamel, tested as in 4.4.21.1, shall spray satisfactorily in all respects and shall show no running, sagging, streaking, or blushing. The dried film shall show no dusting, mottling, or color separation, and shall present a smooth lustreless finish free from seeds.

3.6.7.2 Type II. When tested as in 4.4.21.2, the dispenser shall deliver a spray of normal particle size. Overspray shall not be excessive. The spray pattern shall be such as to deposit a uniform coating on a smooth vertical surface. The film shall dry free of grit, seeds, streaks, orange peel, sags, or any other surface irregularity. The color shall acceptably match the standard color chip.

3.6.8 Valve operation (type II). When tested as in 4.4.22 the valve shall operate without excessive finger pressure. It shall close immediately upon release of finger pressure. The spray shall be continuous without sputtering or interruption. The valve shall not clog nor collect heavy deposits around the orifice.

3.6.9 Flexibility. A film of enamel tested as in 4.4.23 shall withstand bending without cracking or flaking.

3.6.10 Knife test. A film of enamel tested as in 4.4.24 shall adhere tightly and not flake, crack, or powder from the metal. The cut shall show beveled edges.

3.6.11 Adhesion. A film of enamel tested as in 4.4.25 shall show no removal of the coating by the adhesive tape beyond one-sixteenth inch on either side of the score line.

3.6.12 Water resistance. A film of enamel tested as in 4.4.26 shall show no wrinkling or blistering immediately after removal of the panel from the water. The enamel shall be no more than slightly affected when examined 2 hours after removal. After 24 hours air drying the portion of the panel which was immersed shall be almost indistinguishable with regard to hardness, color and gloss from a panel prepared at the time but not immersed.

3.6.13 Recoating. A film of enamel tested as in 4.4.27 shall not blister, wrinkle, or show other evidence of lifting when recoated with white enamel. The film shall contain no bleeding pigments which will discolor the white enamel.

3.6.14 Accelerated weathering. A film of enamel tested as in 4.4.28 shall show no more than slight chalking (No. 8, method 6411 of Fed. Test Method Std. No. 141) and a color change equivalent to a lightness-difference estimate not exceeding 4 units.

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3.6.15 Heat reflectance. When tested as in 4.4.29, the surface of the enamel shall not reach a temperature of more than 150°F. for olive drab and 140°F. for sand.

3.6.16 Weather resistance. A film of enamel prepared and exposed as in 4.4.30 shall show no checking, cracking, or appreciable film deterioration. There shall be no more than light chalking (No. 6, method 6411 of Fed. Test Method Std. No. 141). The film shall show no excessive change in value or chroma and no change in hue. After removal of any chalking which has occurred, the original color shall be substantially restored and the washed area shall show no more than slight fading or darkening.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier 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 that supplies and services conform to the prescribed requirements.

4.2 Sampling, inspection, and testing. Unless otherwise specified, sampling, inspection, and testing shall be in accordance with Method 1031 of Fed. Test Method Std. No. 141.

4.3 Classification of tests. Testing under this specification shall be for the purpose of:

- (a) Qualification.
- (b) Acceptance of individual lots.

4.3.1 Qualification testing shall consist of tests for all requirements specified in section 3 (see 6.4).

4.3.2 Acceptance tests shall normally consist of tests for all requirements specified in section 3 with the exception of storage stability in full container (see 3.6.2.2) and weather resistance (see 3.6.16).

4.4 Test methods.

4.4.1 Test conditions. The routine and referee test conditions shall be in accordance with section 7 of Fed. Test Method Std. No. 141 except as otherwise specified herein.

4.4.2 The following tests shall be conducted in accordance with applicable methods of Fed. Test Method Std. No. 141 or as hereinafter specified.

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TABLE II. Index

Tests	Test Methods		
	Applicable method in Fed. Std. No. 141	Paragraph of this specification giving further reference	Paragraph of this specification giving requirements
Color	4250	4.4.8	3.2
Isolation of vehicle (super centrifuge)	4032	--	--
Phthalic anhydride	7021	--	Table I
Rosin in isolated vehicle	5031	--	Table I
Phenolic resin	5141	--	Table I
Benzol	5091 or 7360	--	3.3.1
Solvent separation	7355	4.4.3.1	3.3.1
Chlorinated compounds	5132	--	3.3.1
Aromatic hydrocarbons	7356	4.4.3.2	3.3.1.2
Olefinic and cyclo-olefinic compounds	7356	4.4.3.2	3.3.1.2
Ketones	--	4.4.3.3	3.3.1.2
Total solids			
Type I	4041	--	Table I
Type II	--	4.4.4	Table I
Pigment solids	4022	--	Table I
Pigment analysis	4021	4.4.5	Table I
Extraction of pigment	4021	4.4.5	Table I
Total lead	7271	4.4.5.1	Table I
PbCrO ₄ - Lead chromate	7131	4.4.5.2	Table I
Antimony	--	4.4.5.3	Table I
Other permissible pigments	--	4.4.5.4	Table I
Extender pigment, total	5271	4.4.6.1	Table I
Extender pigment analysis	7281	4.4.6.2	3.3.2
Pigment volume	4312	--	Table I
Vehicle solids	4041	--	Table I
Water	4082	--	Table I
Coarse particles and skins	4092	--	Table I
Hiding power (contrast ratio)	4122	4.4.7	Table I
Infrared reflectance	6242	4.4.9	Table I
Viscosity (Type I)	--	4.4.10	--
Package	4281	4.4.10.1	Table I
Reduced	4282	4.4.10.2	Table I
Fineness of grind	4411	--	Table I
Specular gloss, 60°	6101	4.4.11	Table I

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TABLE 11. Index (continued)

Tests	Test Methods		
	Applicable method in Fed. Std. No. 141	Paragraph of this specification giving further reference	Paragraph of this specification giving requirements
Drying time:	4061	4.4.12	Table 1
Set to touch	4061	--	Table 1
Dry hard	4061	--	Table 1
Free from after tack	4061	--	Table 1
Dry through	4061	4.4.12.1	Table 1
Full hardness	--	4.4.12.2	Table 1
Total net contents, Type II	--	4.4.13	Table 1
Pressure, Type II	--	4.4.14	Table 1
Condition in container			
Type I	3011	4.4.15.1	3.6.1.1
Type II	--	4.4.15.2	3.6.1.2
Storage stability	--	4.4.16	3.6.2
Partially full container			
Type I	3021	4.4.16.1	3.6.2.1
Full container			
Type I	3022	4.4.16.2.1	3.6.2.2.1
Type II	3022	4.4.16.2.2	3.6.2.2.2
Accelerated stability	--	4.4.17	3.6.3
Dilution stability	--	4.4.18	3.6.4
Suspension properties	--	4.4.19	3.6.5
Brushing properties	4321, 2141	4.4.20	3.6.6
Spraying properties			
Type I	4331, 2131	4.4.21.1	3.6.7.1
Type II	--	4.4.21.2	3.6.7.2
Valve operation	--	4.4.22	3.6.8
Flexibility	6221	4.4.23	3.6.9
Knife test	6304	4.4.24	3.6.10
Adhesion	--	4.4.25	3.6.11
Water resistance	6011	4.4.26	3.6.12
Recoating	--	4.4.27	3.6.13
Accelerated weathering	6152, 6122	4.4.28	3.6.14
Heat reflectance	--	4.4.29	3.6.15
Weather resistance	6160	4.4.30	3.6.16

4.4.3 Solvent analysis for composition L.

4.4.3.1 Separation of volatile portion. Separate volatile portion in accordance with method 7355 of Fed. Test Method Std. No. 141. Reserve collected distillate for the tests for chlorinated solvents, total aromatic content, toluene, ethyl benzene, olefinic or cyclo-olefinic compounds, and ketones.

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4.3.2 Aromatic content. Determine total aromatic content of volatile ion in accordance with procedure A, method 7356 of Fed. Test Method Std. 141. If the total aromatic content is between 8 and 20 percent determine percent of toluene and ethylbenzene in accordance with procedure B, method 7356 of Fed. Test Method Std. No. 141.

4.3.3 Test for ketones.

4.3.3.1 Reagent. Two grams of 2,4-dinitrophenylhydrazine + 4 mls. of concentrated sulfuric acid + 30 mls. methanol (add slowly) + 10 mls. water.

4.3.3.2 Procedure. Pipette 1 ml. of reagent into a 20 x 170 mm. test tube. Add 10 drops of distillate and shake for 30 seconds. A yellow precipitate or cloud in the reagent layer indicates the presence of ketones. Run blank using one milliliter of reagent and 10 drops of mineral spirits.

4.4 Analysis of type 11.

4.4.1 Total solids. Remove the cap, spray nozzle and paper label from aerosol pressure can and clean the sides of the can. Weigh on a balance sufficient capacity having a minimum sensitivity of 0.05 gram. Shake thoroughly for a minimum of 15 minutes. As soon as possible after agitation, remove 1 to 5 grams with the appropriate sampling device as illustrated in figures 2 and 3. The sampler in figure 2 is for use on cans having a recessed outlet; those with protruding outlets require the device shown in figure 3. Support the sample can at a 45 degree angle, attach the sampler with the perforated vent holes held in a topside position, then press down on the valve or rod quickly and firmly for approximately one second. Disengage the sampling device and rinse the contents into a weighed beaker with benzene. If a small amount of the paint spills onto the sample can, rinse that portion also into the beaker. Evaporate the sample in a water bath under a gentle stream of air to low volume then transfer to an oven at 105°C. for one hour. Cool the beaker in a desiccator and weigh. Re-weigh the aerosol can and calculate the percent total solids. Repeat for a duplicate determination and check for compliance with Table I.

$$\% \text{ Nonvolatile} = \frac{\text{Gain in weight of the beaker} \times 100}{\text{Loss in weight from the sample can}}$$

4.4.4.2 Percent pigment. Repeat the procedure followed in paragraph 4.4.1, substituting weighed centrifuge tubes for beakers and withdrawing 10 gram samples. Extract three times in a centrifuge using benzene as solvent. Dry and weigh the centrifuge tubes and calculate the percent pigment. Check for compliance with Table I.

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4.4.5 Analysis of pigment. Extract the pigment as in method 4021 of Fed. Test Method Std. No. 141 using extraction mixture C.

4.4.5.1 Total lead. Determine total lead as lead sulfate (PbSO_4) on the extracted pigment in accordance with method 7271 of Fed. Test Method Std. No. 141.

4.4.5.2 Lead chromate (PbCrO_4) content. Determine the lead chromate (PbCrO_4) content on the extracted pigment in accordance with method 7131 of Fed. Test Method Std. No. 141.

4.4.5.3 Antimony sulfide. Add 25 ml. of 50 percent ammonium hydroxide to about 2 gr of pigment in a 50 ml. erlenmeyer flask. With agitation, saturate the mixture with hydrogen sulfide for about one minute. Filter through coarse paper into a 100 ml. beaker. Do not wash residue. Slowly and with stirring, add 6 N HCL to the filtrate until it is acidic. Formation of a yellow-brown precipitate indicates that antimony was in the original pigment mixture. A milky white precipitate of sulfur will form in the absence of Sb_2S_3 .

4.4.5.4 Other permissible pigments. Make appropriate qualitative and quantitative tests on the extracted pigment to determine if permissible pigments were used in formulating the specified color of enamel.

4.4.6 Extender pigment.

4.4.6.1 Total extender pigment content. Determine matter insoluble in acid in the extracted pigment by method 5271 of Fed. Test Method Std. No. 141.

4.4.6.2 Extender pigment analysis. Determine barium sulfate, siliceous material, and calcium (sulfate or carbonate) by the applicable portions of method 7281 of Fed. Test Method Std. No. 141.

4.4.7 Hiding power (contrast ratio). Determine the contrast ratio in accordance with method 4122 of Fed. Test Method Std. No. 141. Use a film applicator that will deposit a 3 inch wide film with a dry film thickness of 0.0015 inch maximum. Air dry for 72 hours. Determine the reflectance and verify the film thickness in the area in which the reflectance was measured. Calculate the contrast ratio and check for compliance with Table 1.

4.4.8 Color. In accordance with method 4250 of Fed. Test Method Std. No. 141, compare the color with the pigmented coating on the white carrara glass panel prepared for the hiding power test (4.4.7) and observe for compliance with 3.2.

4.4.9 Infrared reflectance. Using a Wratten 87 filter, determine infrared reflectance as in method 6242 of Fed. Test Method Std. No. 141, on the white carrara glass panel prepared for the hiding power test (4.4.7). Observe for compliance with Table 1.

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4.4.10 Viscosity (type I).

4.4.10.1 Package. Proceed as in method 4281 of Fed. Test Method Std. No. 141 except that the method of mixing shall be to agitate the can for 3 minutes on a paint shaker^{1/}. Check for compliance with Table I.

4.4.10.2 Reduced viscosity. Reduce 3 parts by volume of enamel with two parts by volume of thinner conforming to TT-T-306 except that the thinner used with composition L shall conform to Table III and determine viscosity as in method 4282 of Fed. Test Method Std. No. 141. Check for compliance with Table I.

TABLE III. Thinner for composition L

Ingredient	Percent by weight
M.P. Naphtha (8% max. aromatic)	65
n-butyl alcohol	20
toluene	15

4.4.11 60° specular gloss. Draw down the enamel using a 0.002 inch (0.004 inch gap clearance) film applicator. Measure the gloss as specified in method 101 of Fed. Test Method Std. No. 141 and check for compliance to Table I.

4.4.12 Drying time. Determine drying time in accordance with method 4061 of Fed. Test Method Std. No. 141 under referee conditions.

4.4.12.1 Dry through. Determine dry through in accordance with method 4061 except that the enamel shall be drawn down with a 0.002 inch (0.004 inch gap clearance) film applicator on a 4 by 12 inch steel panel that has been phosphoric acid etched as in method 2011 procedure B of Fed. Test Method Std. No. 141.

4.4.12.2 Full hardness. Determine full hardness on a panel prepared as in 4.4.12.1. The film shall be considered to have reached full hardness when it is very difficult to remove with a knife blade.

4.4.13 Total net contents (type II). Chill the aerosol can with the remaining sample from paragraph 4.4.4 in the freezing compartment of a refrigerator for an hour or longer and puncture the bottom of the can with a can opener. Drain out the sample and rinse with benzene until clean. Dry with a current of air or in an oven and weigh the empty can. Subtract this weight from the first weight recorded in the total solids determination (paragraph 4.4.4) and calculate the total net contents in ounces. Check for compliance with Table I.

^{1/}An apparatus of this type, powered by 1/4 hp motor, operates at a rate of 1350 shakes per minute, and is manufactured by Red Devil Tools, Irvington, NJ.

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4.4.14 Pressure (type II). Determine the pressure of the system at the outer orifice for compliance with Table I using a standard type pressure gage fitted with a suitable adaptor. Condition the aerosol container for three hours in a water bath at $75 \pm 2^{\circ}\text{F}$. before testing.

4.4.15 Condition in container.

4.4.15.1 Type I. Determine package condition for acceptance testing in accordance with method 3011 of Fed. Test Method Std. No. 141. For qualification testing determine pigment settling or caking as follows: Proceed as in method 3011 of Fed. Test Method Std. No. 141, but do not stir. Reseal and then agitate the can for 3 minutes on a paint shaker. On re-examination of the contents, the disclosure of any gel bodies or undispersed pigment indicates unsatisfactory settling properties. Observe for compliance with 3.6.1.1.

4.4.15.2 Type II. Shake the aerosol container until the agitator moves freely inside of can and mix contents thoroughly. Spray the enamel as in 4.4.21.2 and check for compliance with 3.6.1.2.

4.4.16 Storage stability.

4.4.16.1 Partially full container (type I). Determine 48 hour skinning in accordance with method 3021 of Fed. Test Method Std. No. 141 and observe for compliance with 3.6.2.1. Reseal and age for 7 days at 60°C . and observe for compliance with 3.6.2.1.

4.4.16.2 Full container.

4.4.16.2.1 Type I. In accordance with method 3022 of Fed. Test Method Std. No. 141, allow a full standard quart can of the packaged enamel to stand undisturbed for 6 months and then examine the contents. Determine viscosity and examine for compliance with 3.6.2.2.1.

4.4.16.2.2 Type II. In accordance with method 3022 of Fed. Test Method Std. No. 141, allow an aerosol container of the enamel to stand undisturbed for 6 months. Then examine for compliance with 3.6.2.2.2.

4.4.17 Accelerated storage stability (type II). Place an aerosol container of enamel in a water bath maintained at $120^{\circ} \pm 5^{\circ}\text{F}$. for 14 days. At the end of this period, remove, cool to room temperature and examine for compliance with 3.6.3.

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4.4.18 Dilution stability (type I). By slowly adding thinner to the enamel with constant stirring, reduce one volume of packaged enamel with one volume of thinner conforming to TT-T-306 except that thinner used with composition L shall conform to Table III. Allow to stand 24 hours, thoroughly remix, and using a 0.0005 inch (0.0010 inch gap clearance) film applicator, draw down a film of the mixture on clear plate glass. Before and after the film is dry, examine by transmitted light for compliance with 3.6.4.

4.4.19 Suspension properties (type I). Reduce five parts by volume of enamel with two parts by volume of thinner conforming to TT-T-306 except that thinner used with composition L shall conform to Table III. Place 6 ounces of the reduced enamel 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 in 4.4.10.1 and agitate the contents for 20 seconds. Re-examine the material for any evidence of nonhomogeneity or undispersed pigment. Observe for compliance with 3.6.5.

4.4.20 Brushing properties (type I). Apply the enamel to a 4 by 12 inch steel panel using a 1-1/2 inch brush and observe for brushing properties in accordance with method 4321 of Fed. Test Method Std. No. 141 for compliance with 3.6.6.

4.4.21 Spraying properties.

4.4.21.1 Type I. Reduce five parts by volume of enamel with two parts by volume of thinner conforming to TT-T-306 except that thinner used with composition L shall conform to Table III. Spray on a steel panel to give a dry film thickness of 0.0009 to 0.0011 inch and observe for spraying properties in accordance with method 4331 of Fed. Test Method Std. No. 141 and observe for compliance with 3.6.7.1. For referee test, use automatic application per method 2131 of Fed. Test Method Std. No. 141.

4.4.21.2 Type II. Spray the enamel on a steel panel set at an angle of approximately 15° from the vertical by holding the dispenser in an upright parallel position to the panel at a distance of 10 to 12 inches. With the valve fully open move the dispenser horizontally from one side of the panel to the other. Spray in overlapping horizontal strokes from the top to the bottom of the panel. Apply two thin coats (each coat between 0.0004 and 0.0006 inch dry film thickness) one after the other. The second coat shall be applied by spraying vertically in overlapping strokes. After application of the second coat, place the panel in a vertical position, allow to dry 30 minutes, and examine for compliance with 3.6.7.2.

4.4.22 Valve operation (type II). Spray from the dispenser with the valve fully open for 15 seconds time, once per day, on any seven days over a period of 10 days and observe for compliance with 3.6.8.

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4.4.23 Flexibility. Determine flexibility in accordance with method 6221 of Fed. Test Method Std. No. 141. Apply a 2-inch wide film of enamel with a film applicator that will give a dry film thickness of 0.0009 to 0.0011 inch on a smooth finish steel panel prepared in accordance with method 2011 of Fed. Test Method Std. No. 141 using the aliphatic naphtha-ethylene glycol monoethyl ether mixture. The panel shall be prepared from new cold rolled carbon steel rust-free 0.010 ± 0.001 inch thick with a Rockwell 15-T maximum hardness of 82 and finished with a surface roughness of 8 to 12 microinches. Air-dry the enamel in a horizontal position for 1/2 hour and then bake for 24 hours at $105^\circ \pm 2^\circ\text{C}$. ($221^\circ \pm 4^\circ\text{F}$.). Condition the panel for 1/2 hour under referee conditions. Bend over a 1/4 inch mandrel. Examine the coating for cracks over the area of the bend for compliance with 3.6.9.

4.4.24 Knife test. Perform the knife test in accordance with method 6304 of Fed. Test Method Std. No. 141 using a flat portion of the baked panel from the flexibility test. Observe for compliance with 3.6.10.

4.4.25 Adhesion, tape test.

4.4.25.1 Panel preparation. Using a 0.0020 inch (0.0040 inch gap clearance) film applicator, draw down a 2 inch wide film of the enamel on a steel panel, solvent cleaned and phosphoric acid etched in accordance with procedure B, method 2011 of Fed. Test Method Std. No. 141.

4.4.25.2 Procedure. Air dry the specimen for 1 hour under referee 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 waterproof, pressure-sensitive adhesive tape (3/4 inch wide) conforming to PPP-T-60, type IV. The tape shall be pressed in firm contact with the film and shall extend for approximately 1 inch on each side of the score line. All air bubbles shall be rolled out by firm pressure of the thumb. Allow approximately 10 seconds for the test area to return to room temperature. Grasp a free end of the tape, at a rapid speed, strip it from the specimen by pulling the tape back upon itself at an angle of 180° . Observe the specimen for compliance with 3.6.11.

4.4.26 Water resistance. Prepare two panels in accordance with 4.4.25 and air dry for 72 hours. Coat all exposed, uncoated metal surfaces with wax or other suitable coating and immerse one of the panels for 18 hours in distilled water at $23 \pm 1^\circ\text{C}$. ($73.4 \pm 2^\circ\text{F}$.) in accordance with method 6011 of Fed. Test Method Std. No. 141. At the end of the test period remove the panel from the water and inspect for compliance with the requirements of 3.6.12.

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4.4.27 Recoating. Prepare two test panels in accordance with 4.4.25 and air dry for 24 and 96 hours respectively. At the end of its drying period, immerse each panel to a depth of 2-1/2 inches in a white enamel conforming to TT-E-516 which has been reduced with one part by volume of thinner conforming to TT-T-306 to four parts by volume of package material. At the end of 5 seconds remove the panel, dry in a vertical position, and examine for compliance with 3.6.13.

4.4.28 Accelerated weathering. Draw down a 2 inch wide film of the enamel with a suitable film applicator that will give a dry film thickness of 0.0009 to 0.0011 inch on a flat tin plate panel prepared in accordance with method 2012 of Fed. Test Method Std. No. 141 using the aliphatic naphtha-ethylene glycol monoethylether mixture. Air dry for 72 hours. Measure the directional reflectance and expose the panel for 168 hours to accelerated weathering in accordance with method 6152 of Fed. Test Method Std. No. 141 using a twin arc apparatus. Examine the exposed panel for chalking by rubbing with a piece of velvet or cheesecloth wrapped around the finger. Using moderate pressure, draw the cloth across the width of the panel in two different directions. Measure the directional reflectance (method 6121) on an unrubbed area of the exposed panel and determine the amount of color change, expressed as lightness index difference (ΔL), using method 6122 of Fed. Test Method Std. No. 141. Check accelerated weathering test results for compliance with 3.6.14.

4.4.29 Heat reflectance.

4.4.29.1 Test apparatus. The test apparatus shall consist of an infrared heater equipped with two 250 watt infrared industrial reflector type lamps (General Electric No. 25, 40/4 or equal) mounted on a support stand in such a manner as to allow the heater to be raised or lowered. The base of the stand shall be covered with a block of styrofoam with minimum dimensions of 18 x 10 x 1 inch.

4.4.29.2 Panel preparation. Solvent clean three 20 gage 3 by 6 inch aluminum panels conforming to QQ-A-250/4. On two panels spray a film of black enamel conforming to TT-E-489 to a dry film thickness between 0.0014 and 0.0016 inch. On the other panel spray a film of enamel under test to the same dry film thickness and air dry both panels 72 hours.

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4.4.29.3 Test procedure. Conduct the test under referee conditions. Attach a size 30 AWG or equal thermocouple by means of tape or adhesive to the center of the underside of the test panels and connect to a pyrometer or recording potentiometer. Place the two black panels on the styrofoam painted side up and center under the lamps two inches apart (figure 1). Adjust the lamps to a height of 24 inches from the panels, turn on the heater and by adjusting the height of the lamps, bring the panels to an equilibrium temperature of $190 \pm 2^\circ\text{F.}$ within 30 minutes. When the equilibrium temperature has been reached, remove one black panel and replace with the enamel under test. After 15 minutes, record the temperature of both panels. If the temperature of the black panel is $190 \pm 2^\circ\text{F.}$, check the temperature of the test enamel for compliance with 3.6.15. If not, readjust the lamps and repeat the test.

4.4.30 Weather resistance. Spray two 4 by 12 inch steel panels solvent cleaned and phosphoric acid etched in accordance with procedure B method 2011 of Fed. Test Method Std. No. 141 with a coat of primer conforming to TT-P-664 to a dry film thickness between 0.0008 and 0.0010 inch. Air dry 4 hours and then spray with a coat of enamel having a uniform dry film thickness between 0.0010 and 0.0012 inch. Air dry 72 hours and place on outdoor exposure for 18 months at an angle of 45° south in the climate of Washington, D.C. At the conclusion of the exposure period inspect the panels for compliance with 3.6.16. Determine chalking as in 4.4.28. Wash the panels with a warm soap solution using a soft sponge or cloth; rinse, dry, and examine for color change.

5. PREPARATION FOR DELIVERY

5.1 Packaging, packing, and marking. The enamel shall be packaged, packed, and marked in accordance with TT-P-143. 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). The enamel shall be furnished in 6 ounce pressurized dispensers, 1 quart or 1 gallon multiple friction top containers, in 5 gallon lug cover steel pails or in 55 gallon steel drums, as specified (see 6.2).

5.2 Special marking. In addition to markings required by TT-P-143, type I containers shall be marked as follows: Warning - The heat reflecting property of this paint is quickly destroyed by contamination with small amounts of black or other pigments. To preserve this property use only absolutely clean mixing paddles, containers, and other equipment in thinning and application. Type II containers shall be marked with directions and precautions for use and storage.

6. NOTES

6.1 Intended use. The enamel covered by this specification is intended for use as a low visibility solar heat reflecting finish coat for missiles, vehicles, and other weapons systems components to minimize the effects of solar heating.

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6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Type and composition required.
- (c) Color required.
- (d) Size of container required (see section 5).
- (e) Level of packaging and packing required (see section 5).

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

6.4 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 suppliers 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 U.S. Army Mobility Equipment Research & Development, Coating and Chemical Laboratory, Aberdeen Proving Ground, Maryland 21005, and information pertaining to qualification of products may be obtained from that activity.

6.5 The following hiding pigment combinations have produced an olive drab color conforming to this specification. However, the Government assumes no responsibility for the acceptance of a product claimed to be manufactured under the identical pigmentation.

Olive Drab Pigmentation - I

Lead chromate	84.0 lbs.
Phthalocyanine blue	6.6 lbs.
Quinacridone red (yellow shade)	9.7 lbs.
Molybdate orange	37.5 lbs.
Titanium dioxide, rutile	11.0 lbs.

Olive Drab Pigmentation - II

Lead chromate	136.9 lbs.
Carbazole dioxazine violet	4.0 lbs.
Phthalocyanine blue	2.5 lbs.
Titanium dioxide, rutile	5.4 lbs.

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6.6 The styrenated alkyd resin used in this formulation is a copolymer of styrene and phthalic alkyd resins modified with drying vegetable oils.

6.7 Type I composition L enamels should be specified for use in areas with regulations controlling the emission of solvents into the atmosphere.

Custodian:
Army - MR

Preparing activity:
Army - MR

(Project No. 8010-A074)

Review activities:
Army - MI, MR

MIL-E-46096C(MR)

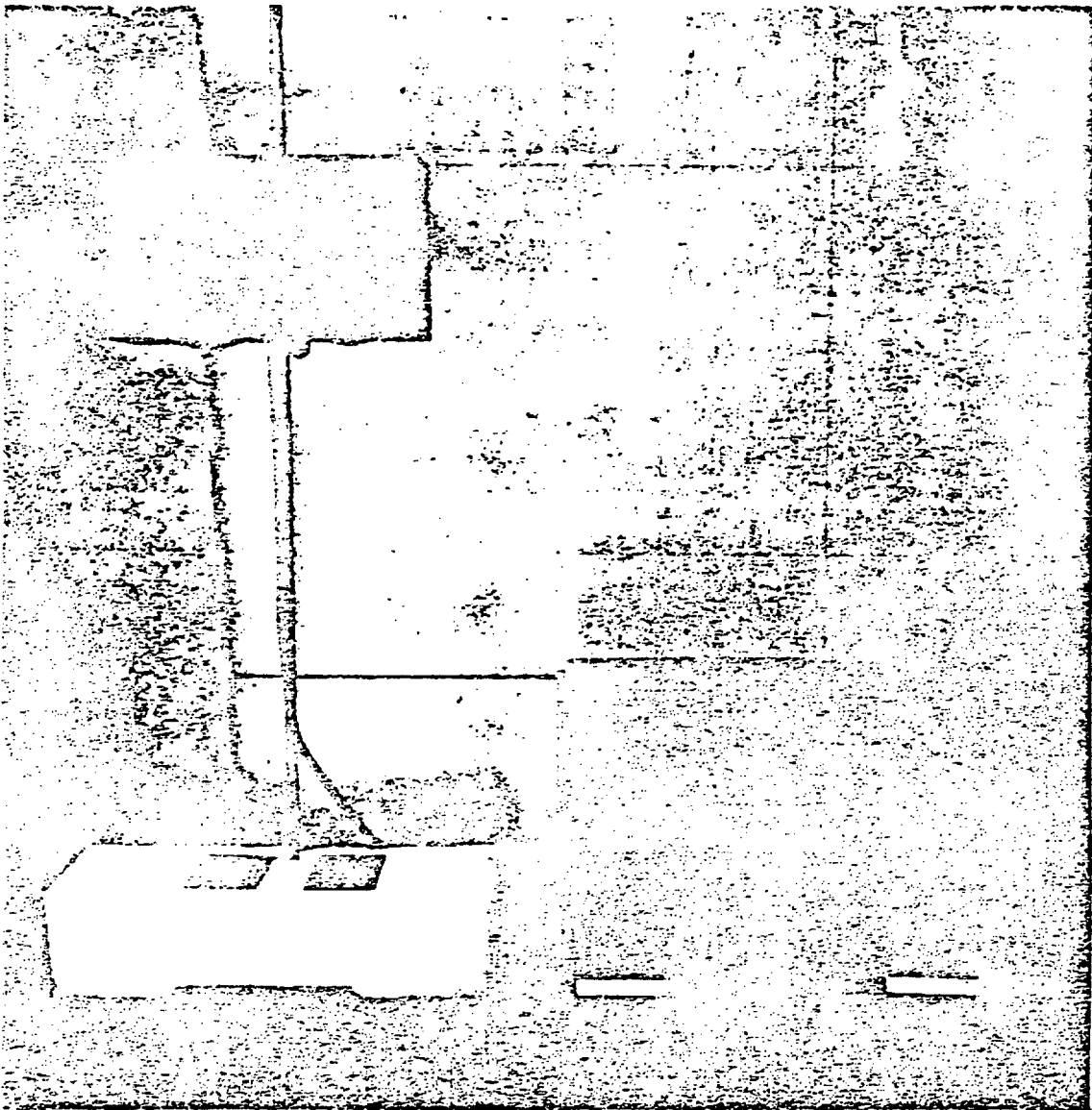


FIGURE I

MIL-E-46096C(MR)

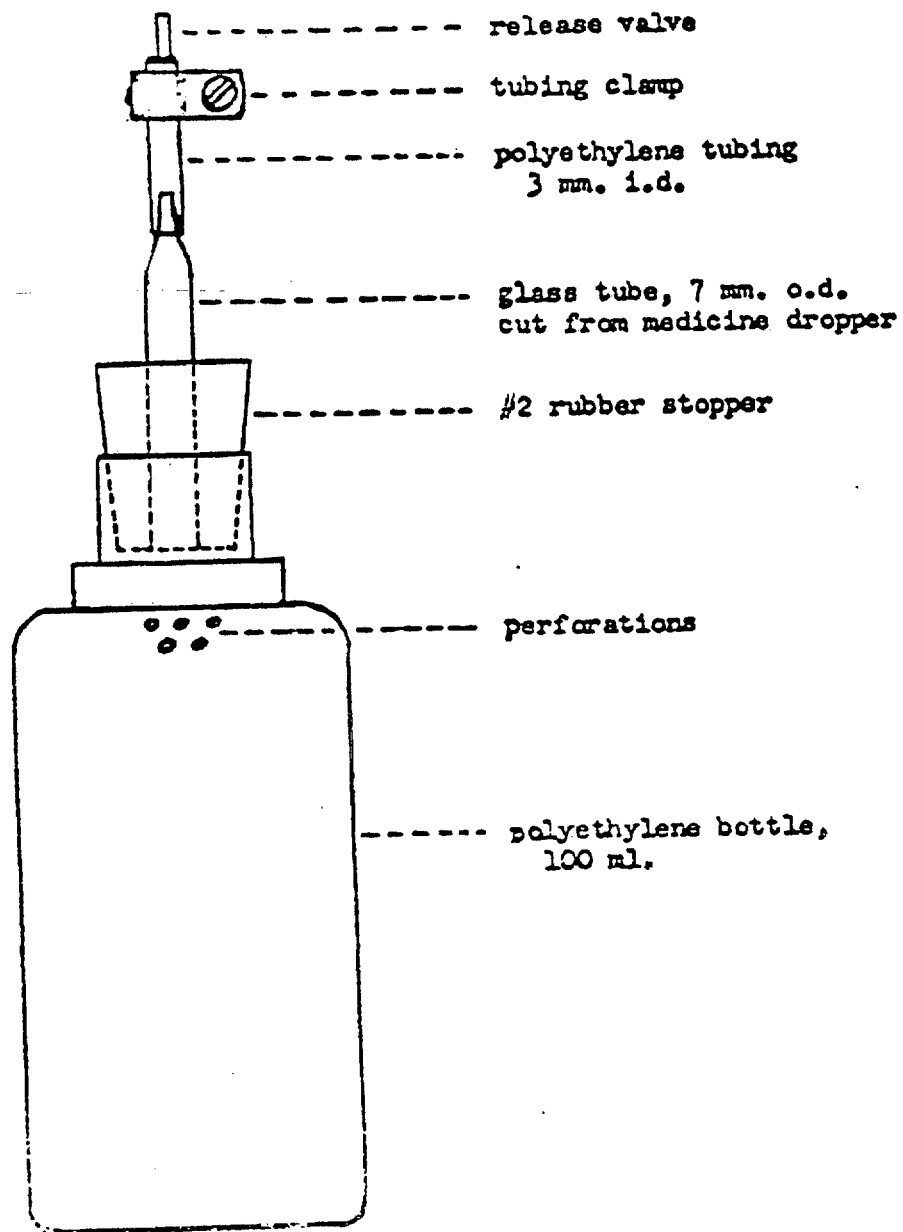


FIGURE 1

MIL-E-46096C (MR)

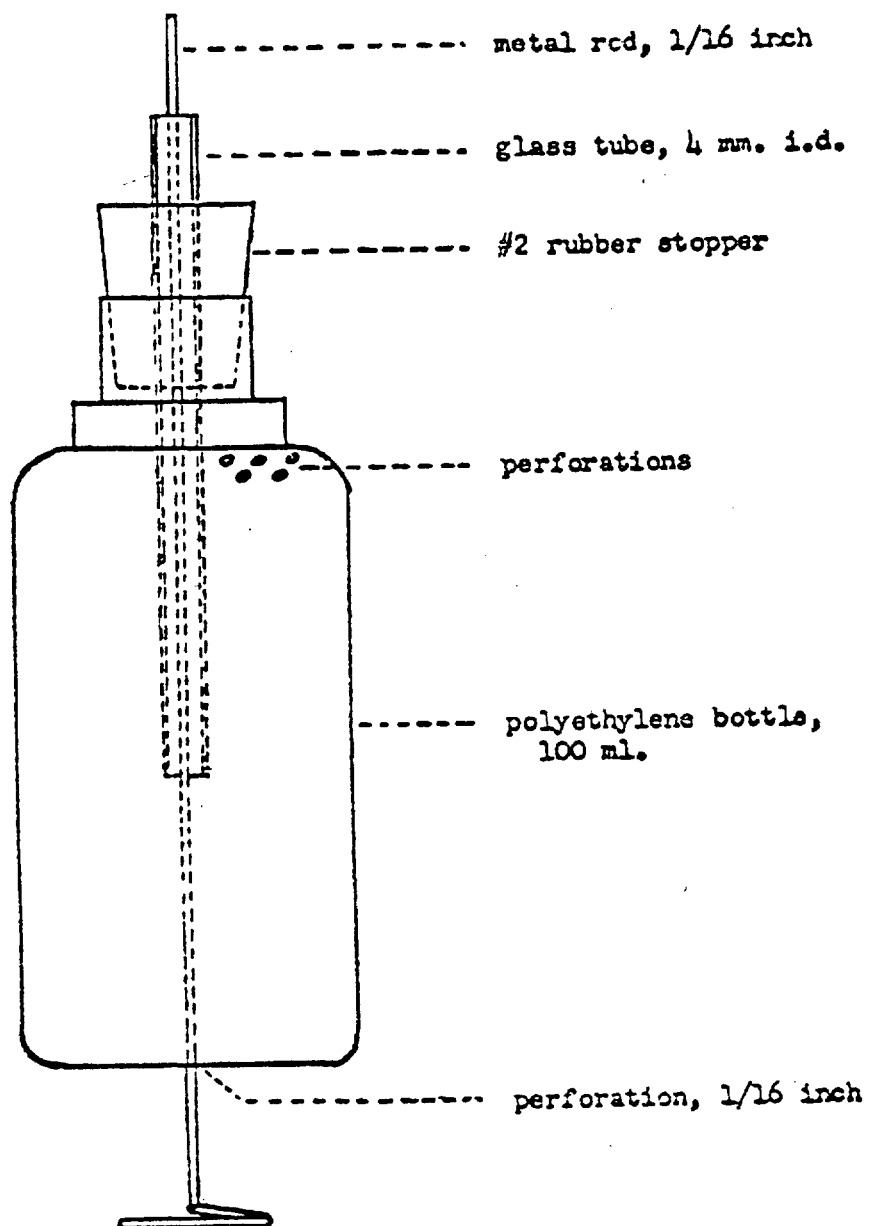


FIGURE 3

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 117-R004
<p align="center">INSTRUCTIONS</p> <p>This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity.</p>		
SPECIFICATION MIL-E-46096C(MR)		Enamel, Lustreless, Quick Drying Styrenated Alkyd Type, Solar Heat Reflecting
ORGANIZATION		CITY AND STATE
CONTRACT NO	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT \$
MATERIAL PROCURED UNDER A		
<input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? A. GIVE PARAGRAPH NUMBER AND WORDING		
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES		
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3. IS THE SPECIFICATION RESTRICTIVE? <input type="checkbox"/> YES <input type="checkbox"/> NO IF "YES" IN WHAT WAY?		
4. REMARKS: Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity.		
SUBMITTED BY: (Printed or typed name and activity)		DATE

DD FORM 1426

REPLACES NAVSHIPS FORM 4863, WHICH IS OBSOLETE

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