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15 December 1972
SUPERSEDING
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MILITARY SPECIFICATION

PAINT, PRIMING, EXTERIOR AND INTERIOR (FOR AMMUNITION)

This specification has been approved by the Naval Ordnance Systems Command, Department of the Navy.

*1. SCOPE

1.1 Scope. This specification covers a quick drying, rust inhibiting, lacquer resisting primer for coating interior and exterior surfaces of ammunition and rockets. It provides for two compositions, one of which is suitable for use under Air Pollution Regulations (see 6.6).

*1.2 Classification. The primer covered by this specification shall be of the following compositions as specified (see 6.2):

Composition G - For use where Air Pollution Regulations do not apply.
Composition L - For use where Air Pollution Regulations are in force.

*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.

SPECIFICATIONS

Federal

TT-E-489	Enamel Alkyd, Gloss, (for Exterior and Interior Surfaces)
TT-P-143	Paint, Varnish, Lacquer and Related Materials; Packaging, Packing and Marking of

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TT-P-375	Pigment, Indian Red and Bright Red (Iron Oxide) Dry, (for Use in Protective Coatings)
TT-P-465	Pigment, Zinc-Yellow (Zinc Chromate) Dry
TT-S-735	Standard Test Fluids; Hydrocarbon
TT-T-266	Thinner: Dope and Lacquer (Cellulose Nitrate)
TT-T-291	Thinner, Paint, Volatile Mineral Spirits (Petroleum Spirits)
TT-T-306	Thinner, Synthetic Resin Enamel
TT-X-916	Xylene (for Use in Organic Coatings)
PPP-T-60	Tape, Pressure-Sensitive Adhesive, Waterproof, for Packaging

STANDARDS

Federal

FED-STD-141	Paint, Varnish, Lacquer, and Related Materials; Methods of Inspection, Sampling, and Testing
FED-STD-595	Colors

Military

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-286	Propellant, Solid, Sampling, Examination and Testing

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

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3. REQUIREMENTS

3.1 Qualification. The primer furnished under this specification shall be a product which is qualified for listing on the applicable Qualified Products List at the time set for opening of bids (see 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.

3.2 Color. The color of the primer shall not be lighter than color 30109 nor darker than color 30111 of FED-STD-595.

3.3 Composition.

3.3.1 Pigment. The pigment portion of the primer shall conform to the requirements of table I when tested as in 4.4.2. The iron oxide shall conform to TT-P-375 and the zinc chromate to TT-P-465.

Table I

QUANTITATIVE REQUIREMENTS OF PIGMENT

Pigment	Percent by weight	
	Minimum	Maximum
Zinc chromate ($CrO_3 \times 2.4$)	10	12
Iron oxide (Fe_2O_3 by analysis)	50	55
Siliceous extenders	-	40
Sum of percentages of iron oxide (Fe_2O_3) and zinc chromate ($CrO_3 \times 2.4$) and acid insoluble siliceous material	90	-

3.3.2 Vehicle.

3.3.2.1 Composition G. The vehicle shall be a resin modified, drying oil phthalic alkyd resin conforming to the requirements of table II together with the necessary amounts of driers and volatile aromatic solvents to meet the requirements of this specification. Small amounts of antioxidants, wetting agents, and stabilizers may be used. The volatile material shall contain no benzene, methanol, chlorinated solvent or other solvent of highly toxic nature.

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*Table II

CHARACTERISTICS OF ALKYD RESIN

Characteristics	Requirements	
	Minimum	Maximum
Alkyd resin solution:[1]		
Total solids, percent by weight[2]	49	51
Viscosity (Gardner)	U	Y
Color (Gardner Color Standards of 1953)	-	14
Alkyd resin solids:		
Phthalic anhydride, percent by weight	38	-
Unsaponifiable matter, percent by weight	-	5
Oil acids, percent by weight	32	-
Acid number	-	32

[1] For composition G the volatile portion of the resin shall be xylene. For composition L the volatile portion shall conform to 3.3.2.2.

[2] An alkyd resin manufactured at higher solids content may be used provided the resin conforms to the viscosity and color requirements on reduction with xylene for composition G and with volatiles conforming to 3.3.2.2 for composition L.

*3.3.2.2 Composition L. The vehicle shall be the same as in 3.3.2.1 except the volatile solvents used 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 (see 6.7).

(d) Ketones: negative.

(e) Total of a + b: 20 percent maximum.

3.4 Quantitative requirements. The primer shall conform to the quantitative requirements of table III when tested as in 4.4.

3.5 Qualitative requirements.

3.5.1 Condition in container. A freshly opened full container of the primer, when tested as in 4.4.6, shall be free from grit, seeds, skins, lumps, abnormal thickening, or livering and shall show no more pigment settling or caking than can be readily reincorporated to a smooth homogeneous state.

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Table III

QUANTITATIVE REQUIREMENTS OF PRIMER

Characteristics	Requirements	
	Minimum	Maximum
Total solids, percent by weight of primer	60	-
Pigment, percent by weight of primer	38	42
Vehicle solids, percent by weight of primer	19	22
Pigment volume, percent of total solids volume	-	45
Phthalic anhydride, percent by weight of vehicle solids	38	-
Unsaponifiable matter, percent by weight vehicle solids	-	5
Oil acids, percent by weight of vehicle solids	32	-
Flash point, closed cup, °F	75	-
Water, percent by weight of primer	-	1.0
Coarse particles and skins (retained on No. 325 mesh sieve), percent by weight of pigment	-	0.5
60-degree specular gloss	2	15
Viscosity (package), Krebs-Stormer shearing rate 200 rpm:		
Grams	125	175
Equivalent KU	67	77
Viscosity (reduced) No. 4 Ford cup, seconds	15	25
Fineness of grind	5	-
Drying time, air dry, minutes:		
Set to touch	3	6
Dry hard	-	15
Dry after-tack-free	-	20
Dry through	-	25
Drying time, baking:		
Full hardness, minutes at 250° F or equivalent heat treatment	-	30

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3.5.2 Storage stability.

3.5.2.1 Partially full container. A three-quarter filled, closed 8-ounce glass jar of the primer shall show no skinning when tested as in 4.4.7.1. After aging as in 4.4.7.1 the primer shall show no livering, curdling, hard caking, or gummy sediment. It shall mix readily to a smooth homogeneous state and any skin formed shall be continuous and easily removed.

3.5.2.2 Full container. A full quart container of the primer shall show no skinning, livering, curdling, hard, dry caking, nor tough, gummy sediment when tested as in 4.4.7.2. The primer shall remix readily to a smooth homogeneous state, shall have a maximum viscosity of 89 KU, and shall meet all other requirements of the specification.

3.5.3 Dilution stability. When tested as in 4.4.8, the primer shall remain stable and uniform showing no precipitation, curdling, or separation. Slight pigment settling shall be permitted.

3.5.4 Suspension properties. The primer shall show no more than slight settling, no caking, and shall redisperse to a smooth, homogeneous state when tested as in 4.4.9.

3.5.5 Spraying properties. The primer, when tested as in 4.4.10, shall spray satisfactorily in all respects, and shall show no running, sagging, or streaking. The dried film shall show no dusting, mottling, or color separation and shall present a smooth uniform finish free from seeds.

3.5.6 Flexibility. A film of the primer tested as in 4.4.11 shall withstand bending without cracking or flaking.

3.5.7 Adhesion. A film of primer tested as in 4.4.12 shall show no removal of the primer by the adhesive tape beyond one-sixteenth inch on either side of the score line.

3.5.8 Knife test. A film of primer tested as in 4.4.13 shall be hard and tough and shall adhere tightly to the metal panel. It shall be difficult to furrow off with the knife and shall not flake, chip, or powder. The knife cut shall show beveled edges.

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3.5.9 Water resistance. A film of the primer tested as in 4.4.14 shall show no wrinkling or blistering immediately after removal of the panel from water. The primer shall be no more than slightly affected when examined 2 hours after removal; and after 24 hours air-drying, the portion of the panel which was immersed shall be almost indistinguishable from the portion which was not immersed, with regard to hardness, and shall show a color change equivalent to a lightness index difference not exceeding 2.5 units.

3.5.10 Hydrocarbon fluid resistance. A film of the primer tested as in 4.4.15 shall show no wrinkling or blistering immediately upon removal of the panel. After 24 hours air-drying, the portion of the panel which was immersed shall be almost indistinguishable from a panel prepared at the same time but not immersed with regard to hardness, color, and gloss.

3.5.11 Lacquer resistance. A film of primer tested as in 4.4.16 shall show no bleeding, blistering, wrinkling, film irregularities, or other evidence of lifting. The system shall have a gloss of not less than 90 percent of the gloss of the white test lacquer applied over glass and shall show satisfactory adhesion between lacquer and primer and between primer and metal.

3.5.12 Enamel resistance. A film of primer tested as in 4.4.17 shall show no blistering, wrinkling, or other evidence of lifting. The system shall have a gloss of not less than 90 percent of the gloss of the olive drab enamel applied over glass and shall show satisfactory adhesion between enamel and primer and between primer and metal.

3.5.13 Salt spray resistance. A film of primer tested as in 4.4.18 and examined immediately after removal from the salt spray test shall show no more than a trace of rusting (No. 9-1 Method 6451 of FED-STD-141) and no more than five scattered blisters none larger than 1 mm in diameter. On removal of the primer there shall be no more than a trace of rusting, pitting, or corrosion of the steel.

3.5.14 Weather resistance. Panels exposed as in 4.4.19 shall show no rusting, cracking, checking, flaking, or loss of adhesion after 18 months exposure. On removal of the coating system, the surface of the metal shall show no more than a trace of rusting, pitting, or corrotion (No. 9-1 Method 6451 of FED-STD-141).

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3.5.15 Reactivity. When subjected to the vacuum stability test as in 4.4.20, the reactivity of the primer with the explosives listed in table IV shall not exceed 3.0 milliliters of gas over and above that generated by the controls.

*Table IV

HIGH EXPLOSIVES

(a) HBX-type explosive (1) Either HBX-1, HBX-3, or H-6	(f) TNT or tritonal (1)
(b) Composition A-3	(g) Tetryl
(c) Composition B-type explosive (1)	(h) Black powder
(d) Either Composition B-4, Composition B, or cyclotol	(i) Octol
(e) Composition C-4	(j) MOX-2B
	(k) Composition A-5, HMX blend

3.5.16 Corrosion. Panels tested as in 4.4.21 shall show no evidence of corrosion within one-eighth inch of the edge and shall show no breaks or cracks in the film.

3.5.17 Ignition. When tested as in 4.4.22, mixtures of the dried paint film and the explosives listed in table V shall give ignition temperatures at or above those shown below for two consecutive tests.

Table V

IGNITION TEMPERATURES

Explosives	Minimum ignition temperature
HBX	175° C
Composition B	175° C
TNT	200° C
Tetryl	150° C
Composition A	190° C

4. QUALITY ASSURANCE PROVISIONS

*4.1 Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements specified herein. Except as otherwise specified in the

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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 this specification where such inspections are deemed necessary to assure 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-STD-141.

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

(a) Qualification: Qualification tests are those tests performed on samples submitted for approval as qualified products.

(b) Acceptance tests: Acceptance tests are tests performed on individual lots which have been submitted for acceptance.

4.3.1 Qualification.

4.3.1.1 Sampling instructions. Qualification test samples of the composition for which qualification is desired shall consist of four 1-quart samples of the primer, 1 pint of the resin vehicle, selected as required by FED-STD-141, instructions for reducing the primer for application, and baking instructions. The manufacturer shall also supply a certified statement of composition and prior tests, except for:

(a) Reactivity
(b) Corrosion
(c) Ignition.

The statement shall show that the primer complies with the requirements of this specification. Samples shall be identified as required and forwarded to the activity responsible for qualification, designated in the letter of authorization from the activity responsible for the Qualified Products List (see 6.4).

4.3.2 Qualification tests. Qualification tests shall consist of all tests of table VI (see 6.4).

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*Table VI

INDEX

Tests	Test method		Paragraph of this specification giving requirements
	Applicable method in FED-STD-141	Paragraph of this specification giving further references	
Analysis of pigment	7331	-	Table I
Isolation of vehicle (supercentrifuge)	4032	-	-
Benzene	5091	-	3.3.2
Methanol	5133	-	3.3.2
Chlorinated solvents	5132	-	3.3.2
Aromatic hydrocarbon	-	4.4.3.2	3.3.2.2
Olefinic and cyclo-olefinic compounds	-	4.4.3.3	3.3.2.2
Ketones	-	4.4.3.4	3.3.2.2
Color of transparent liquids	4248	-	Table II
Acid number	5072	-	Table II
Total solids	4041	-	Table III
Pigment solids	4022	-	Table III
Vehicle solids	4052	-	Table III
Pigment volume	4312	-	Table III
Phthalic anhydride	7014	-	Table III
Unsaponifiable	7014	-	Table III
Oil acids	7014	-	Table III
Flash point	4293	-	Table III
Water	4082	-	Table III
Coarse particles and skins	4092	-	Table III
Specular gloss	6101	-	Table III
Viscosity:			
Package	4281	-	Table III
Reduced	4882	4.4.4	Table III
Fineness of grind	4411	-	Table III
Drying time:			
Set to touch	4061	4.4.5	Table III
Dry hard	4061	4.4.5	Table III
Dry after-tack-free	4061	4.4.5	Table III
Dry through	4061	4.4.5	Table III
Condition in container	3011	4.4.6	3.5.1
Storage stability:			
Partially full container	3021	4.4.7.1	3.5.2.1
Full container	3022	4.4.7.2	3.5.2.2
Dilution stability	4203	4.4.8	3.5.3

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*Table VI (contd)

INDEX

Tests	Test method		Paragraph of this specification giving requirements
	Applicable method in FED-STD-141	Paragraph of this specification giving further references	
Suspension properties	-	4.4.9	3.5.4
Spraying properties	4331	4.4.10	3.5.5
Flexibility	6221	4.4.11	3.5.6
Adhesion	-	4.4.12	3.5.7
Knife test	6304	4.4.13	3.5.8
Water resistance	6011	4.4.14	3.5.9
Hydrocarbon resistance	6011	4.4.15	3.5.10
Lacquer resistance	-	4.4.16	3.5.11
Enamel resistance	-	4.4.17	3.5.12
Salt spray resistance	6061	4.4.18	3.5.13
Weather resistance	6160	4.4.19	3.5.14
Reactivity	-	4.4.20	3.5.15
Corrosion	-	4.4.21	3.5.16
Ignition	-	4.4.22	3.5.17

4.3.3 Acceptance tests. Acceptance tests shall consist of all tests of table VI with the following exceptions unless otherwise deemed necessary by the procuring activity.

(a) Storage stability
(b) Weather resistance
(c) Reactivity
(d) Corrosion
(e) Ignition.

Failure of a sample to comply with any of the requirements of this specification shall result in the rejection of the lot of material represented.

4.3.3.1 Examination of filled containers. A sample of filled containers shall be taken at random in accordance with MIL-STD-105 at inspection level I, acceptable quality level of 1.5 percent defective, to verify compliance with the product specification in regards to fill, closure, markings, and other requirements not involving tests.

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4.4 Test methods.

4.4.1 Test conditions. The routine and referee testing conditions shall be in accordance with Section 7 of FED-STD-141 except as otherwise specified herein.

4.4.2 The following tests shall be conducted in accordance with FED-STD-141 and as hereinafter specified.

*4.4.3 Solvent analysis for composition L.

*4.4.3.1 Separation of volatile portion. Pour about 15 grams of the vehicle into a 50-ml distilling flask. Add 10 ml of tricresyl phosphate and several antibumping stones or Berl saddles. Fit a release valve into the mouth of the flask and attach a delivery tube to the side arm, extending into a receiver consisting of a test tube (20 × 150 mm) with side arm for attaching to a vacuum pump. The glass delivery tube should reach 1-1/2 inches from the bottom of the tube. Immerse the receiver in a Dry Ice-acetone bath. Preheat a silicone oil bath to 180° Celsius (C). Raise the oil bath until the oil reaches the sample level. Reduce the pressure slowly to 10 mm of mercury. After all solvent has distilled, carefully release the vacuum using the valve that is connected to the distilling flask. Reserve the collected distillate for the aromatic solvent determination and the test for ketone, olefinic, and cyclo-olefinic compounds.

*4.4.3.2 Determination of aromatic hydrocarbons.

Apparatus: A gas chromatograph equipped with a thermal conductivity detector.

Column preparation: Two lengths of 1/4-inch copper tubing, 6 ft and 18 ft long, are packed with 35 percent N,N-bis (2-cyanoethyl) formamide on 60- to 80-mesh Chromosorb P.

Operating conditions:

	6 ft	18 ft
Detector cell temperature, °C	300	300
Detector cell current, ma	150	150
Injection port temperature, °C	300	300
Helium flow at exit, cc/minute	175	110
Column temperature, °C	125	100

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*4.4.3.2.1 Total aromatic content - procedure A. Transfer precisely 3 ml of distillate or thinner to a 25-ml glass-stoppered volumetric flask and add exactly 0.3 ml of high purity phenylcyclohexane. While cooling the graduate under tap water, add 15 ml of 85 percent sulfuric acid slowly. After all the acid has been added, shake vigorously for 2 minutes and allow the layers to separate. Add sufficient 85 percent acid to force the top layer into the neck of the flask and then transfer most of the top layer to a micro-separatory funnel. Wash the distillate with 5-ml portions of distilled water until all acid has been removed and reserve the washed solvent for chromatographic analysis. Install the 6-ft column and follow the operating conditions described above. Inject about 5 microliters of the acid-treated sample and allow the chromatogram to develop until the internal standard, phenylcyclohexane, emerges.

$$\% \text{ total aromatic solvents, v/v} = \frac{A \times 10^{*} \times 1.07^{**}}{B}$$

where

A = area of aromatic solvent peaks
B = area of internal standard peaks
* = percent of internal standard
** = detector response correction factor.

NOTE: If the above determination exceeds 8 percent, continue with the following procedure:

*4.4.3.2.2 Toluene and ethylbenzene - procedure B. Treat 3 ml of solvent in the same manner as described in procedure A except substitute benzene for phenylcyclohexane. Install the 18-ft column and follow the operating conditions described for that column. Inject about 3 microliters of sample and allow the chromatograph to develop until all of the xylene isomers appear. Purge the column by raising the column temperature to 120° C. After the high boiling materials emerge, reset the column temperature to 100° C. Calculate the percent of toluene and ethylbenzene as follows:

$$\% \text{ toluene, v/v} = \frac{(\text{area of toluene peak})(1.017)^{*}\ (10)^{**}}{(\text{area of benzene peak})}$$

$$\% \text{ ethylbenzene, v/v} = \frac{(\text{area of ethylbenzene peak})(1.054)^{*}\ (10)^{**}}{(\text{area of benzene peak})}$$

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where

* = the correction factor for the detector response
** = the percentage of internal standard added.

NOTE: Sensitivity of the instrument should be adjusted to keep peaks from running off the scale. Appropriate corrections must be made for changes in sensitivity when computing the peak areas.

*4.4.3.3 Test for olefinic or cyclo-olefinic compounds. Take two test tubes and place 2 drops of the distillate in each. Dissolve the first sample in 1 ml of carbon tetrachloride and add 1 drop of 1 percent bromine in carbon tetrachloride. Shake and allow to set for 5 minutes. A positive test is indicated by the complete absence of yellow color when observed against a white background. Dissolve the second sample in 1 ml of acetone and add 1 drop of 1 percent permanganate solution (1 gram of potassium permanganate crystals in 95 ml of acetone and 5 ml of water). Shake and allow to set for 2 minutes. A positive test is indicated by the decolorization of the purple solution. The solvent is considered to fail the test for olefinic and cyclo-olefinic compounds if either of the above tests is positive (see 3.3.2.2 and 6.7).

*4.4.3.4 Test for ketones.

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

*4.4.3.4.2 Procedure. Pipette 1 ml of reagent into a 20- × 170-mm test tube. Add 10 drops of distillate (see 4.4.3.1) and shake for 30 seconds. A yellow precipitate or cloud in the reagent layer indicates the presence of ketones. Run a blank using 1 ml of reagent and 10 drops of mineral spirits.

*4.4.4 Viscosity (reduced). Reduce three parts by volume of primer with one part by volume of thinner conforming to TT-T-306, except thinner used with composition L shall conform to table VII, and tested as in method 4282 of FED-STD-141. Check for compliance with table III.

4.4.5 Drying time. Using a 0.002-inch film applicator (0.004-inch gap clearance) draw down a 2-inch-wide film of the primer on a clean plate glass panel. Determine drying time under referee conditions as in method 4061 of FED-STD-141 for compliance with table III.

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*Table VII

THINNER FOR COMPOSITION L

Ingredient	Percent by weight
VMP Naphtha (8 percent maximum aromatic)	65
n-Butyl alcohol	20
Toluene	15

4.4.6 Condition in container. Determine package condition on acceptance testing as in method 3011 of FED-STD-141 and observe for compliance with 3.5.1. On qualification testing, evaluate pigment settling or caking by proceeding as in method 3011 of FED-STD-141, but do not stir. Reseal and then agitate the can for 3 minutes on a paint shaker.[1] On re-examination of the contents, the disclosure of any gel bodies or undispersed pigment indicates unsatisfactory settling properties.

4.4.7 Storage stability.

4.4.7.1 Partially full container. Determine skinning after 48 hours as in method 3021 of FED-STD-141 and observe for compliance with 3.5.2.1. Reseal and age for 7 days at 60° C and observe for compliance with 3.5.2.1.

4.4.7.2 Full container. In accordance with method 3022 of FED-STD-141, allow a full standard quart of the primer to stand undisturbed for 6 months and then examine the contents. Evaluate pigment settling or caking as in 4.4.6 except agitate the can for 5 minutes on the paint shaker prior to re-examination. Determine viscosity and make other applicable tests for compliance with 3.5.2.2.

4.4.8 Dilution stability. Reduce one part by volume of primer as packaged with one volume of thinner. For composition L the thinner shall conform to table VII and for composition G to the following composition:

	Parts by volume
Xylene, TT-X-916, grade B	25
Mineral spirits, TT-T-291, grade 1	75

[1] An apparatus of this type, powered by a 1/4-hp motor, operates at a rate of 1350 shakes per minute and is manufactured by Red Devil Tools, Irvington, N. J.

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Allow to stand 24 hours and observe for incompatibility as in method 4203 of FED-STD-141. Then flow the primer over a clear plate glass, and examine in both the wet and dry condition for compliance with 3.5.3.

4.4.9 Suspension properties. Reduce the primer as in 4.4.4. Place 6 ounces of the reduced material in an 8-ounce glass jar and do not agitate or disturb for 24 hours. At the end of this period, examine the material for hard or excessive settling by means of a spatula. Do not stir. Restopper the jar and shake vigorously for 20 seconds. Re-examine the material for any evidence of non-homogeneity or undispersed pigment and observe for compliance with 3.5.4.

4.4.10 Spraying properties. Reduce the primer as in 4.4.4. Spray on a steel panel to a dry film thickness between 0.0009 and 0.0011 inch and observe for spraying properties as in method 4331 of FED-STD-141 for compliance with 3.5.5. For referee test use automatic application per method 2131 of FED-STD-141.

4.4.11 Flexibility. Determine flexibility as in method 6221 of FED-STD-141. Draw down a 2-inch-wide film of primer with a film applicator that will give a dry film thickness of 0.0009 to 0.001 inch on a smooth finish steel panel solvent cleaned as in method 2011 of FED-STD-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 1/2 hour; then bake the panel for 24 hours at 150° ± 2° C (221° ± 4° Fahrenheit (F)). Condition the panel for 1/2 hour under referee conditions. Bend over a 1/4-inch mandrel, and examine the panel for compliance with 3.5.6.

4.4.12 Adhesion. Using a 0.002-inch (0.004-inch film applicator) draw down a 2-inch-wide film of the primer on a steel panel that has been sanded with 6/0-220 silicon carbide paper and solvent cleaned as in method 2011 of FED-STD-141, using the aliphatic naphtha-ethylene glycol monoethyl ether mixture. 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 water resistant, pressure sensitive adhesive tape (3/4-inch width) conforming to the requirements of 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 and at a rapid speed strip it from the specimen by pulling the tape back upon itself at 180°. Observe the specimen for compliance with 3.5.7.

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4.4.13 Knife test. Prepare a film of primer as in 4.4.12, and air dry for 72 hours. Perform the knife test as in method 6304 of FED-STD-141 and observe for compliance with 3.5.8.

4.4.14 Water resistance. Prepare a film of primer as in 4.4.12, and air dry for 72 hours. All exposed, uncoated metal surfaces shall be coated with wax, and the panel shall be immersed for 18 hours in distilled water at 23° ± 1° C as in method 6011 of FED-STD-141. On removal, observe the panel for compliance with 3.5.9. Examine the panel for color change by measuring the directional reflectance (method 6121) before and after exposure. Calculate the amount of color change, expressed as lightness index difference (ΔL), in NBS units using method 6122 of FED STD-141. Check test results for compliance with 3.5.9.

4.4.15 Hydrocarbon fluid resistance. Prepare a film of primer as in 4.4.12, and air dry 72 hours. Do not wax or coat the exposed metal surfaces. Immerse the panel for 4 hours in a hydrocarbon fluid conforming to TT-S-735, Type III. Upon removal examine for compliance with 3.5.10.

4.4.16 Lacquer resistance. Prepare four panels of the primer as in 4.4.12. Allow to air dry 15 minutes, 1 hour, 24 hours, and 96 hours, respectively, and then spray a wet coat of white test lacquer (table VIII) over the specimens and over a glass panel. The dry film thickness of the test lacquer shall be 0.0009 to 0.0011 inch. The dry film thickness of the primer-lacquer system shall be 0.0017 to 0.0019 inch. The test lacquer shall be prepared for spraying at room temperature by reducing two parts by volume of lacquer with one part by volume of lacquer thinner conforming to TT-T-266. After the lacquer topcoat has air dried 24 hours, examine for lifting; compare 60° specular gloss with that of the lacquer on glass, and check for compliance with 3.5.11. Allow the specimens to air dry 1 week after recoating, and determine adhesion between lacquer and primer and between primer and steel using the knife test of method 6304 of FED-STD-141. Check for compliance with 3.5.11.

4.4.17 Enamel resistance. Prepare two panels of the primer as in 4.4.12. Allow one to dry 1 hour and the other 24 hours, and then spray a wet coat of olive drab gloss enamel conforming to TT-E-489, class A, over the test specimens and over a glass panel. The dry film thickness of the enamel shall be 0.0009 to 0.0011 inch. The dry film thickness of the primer-enamel system shall be 0.0017 to 0.0019 inch. The enamel shall be prepared for spraying by reducing eight parts by volume of enamel to one part by volume of thinner conforming to TT-T-306. After the topcoat has air dried 24 hours, examine for evidence of lifting; and after 48 hours, compare the 60° specular gloss with that of the enamel on glass, and check for compliance with 3.5.12. Allow the specimens to air dry 1 week after recoating, and determine the adhesion between

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enamel and primer and between primer and steel using the knife test as in method 6304 of FED-STD-141. Observe for compliance with 3.5.12.

Table VIII

TEST LACQUER (HOT SPRAY TYPE)

Ingredient	Percent by weight
White dispersion[1]	18
Cellulose nitrate RS 1/2 second (70 percent in ethanol)	10
Alkyd resin (65 percent xylene)[2]	14
Dioctyl phthalate	3
Butyl acetate	25
Butyl Cellosolve	8
Butyl alcohol	9
Xylene	13

[1]Shall consist of the following:

Rutile titanium dioxide	60.0
RS 1/2 second nitrocellulose	8.0
Ethyl alcohol	3.5
Ethyl acetate	16.0
Toluol	12.5

[2]Shall contain the following:

Non-drying phthalic alkyd resin:

Phthalic anhydride	35
Castor oil	45

4.4.18 Salt spray resistance. Prepare three 4- × 12-inch steel panels which have been solvent cleaned and sanded as in 4.4.12. Reduce the primer as in 4.4.4, and spray the panels to a dry film thickness of 0.0009 to 0.0011 inch. Air dry for 96 hours, and coat edges and uncoated metal surfaces with wax or other suitable coating. Do not score. Expose the unscored panels to 5 percent salt spray for 48 hours as in method 6061 of FED-STD-141. Upon removal, wash the panels gently in running water not warmer than 100° F until free from any visible salt deposits, and examine immediately for compliance with 3.5.13. Strip the primer film from the panels by means of lacquer thinner, and inspect steel for rust, pitting, or corrosion, and check for compliance with 3.5.13.

4.4.19 Weather resistance. Prepare two unscored 4- × 12-inch test specimens of the primer as in 4.4.18. Allow to air dry 24 hours, and spray a coat of olive drab enamel conforming to TT-E-489, class A, to a dry film thickness of 0.0009 to 0.0011 inch. Allow to air dry 72 hours, and place on outdoor exposure for 18 months at an angle of 45° facing south in the latitude of Washington, D. C. Then strip the primer film from the metal, and inspect for compliance with 3.5.14.

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4.4.20 Reactivity. Determine the reactivity of the paint in contact with the explosives listed in table IV using the vacuum stability test. The reactivity shall be determined before and after storage for 60 days at 71° C and ambient relative humidity and at 71° C and 100 percent relative humidity. The 100 percent relative humidity test shall not be made on the black powder and MOX-2B which are deteriorated by moisture. Prepare the samples as specified in 4.4.20.1.

4.4.20.1 Preparation of samples. A sufficient amount of the paint to provide approximately 140 grams of dried film shall be poured on glass or stainless steel plates. The films shall be air dried under ambient conditions for 48 hours, or until no longer tacky, and then peeled off with a sharp edged tool in strips. These strips are then suspended on glass rods in an oven or cabinet with circulating air at a temperature not to exceed 30° C for 48 hours. If an air circulating oven is not available, it will be satisfactory to place the suspended strips before a fan in a warm room for 48 hours. The paint strips are then removed, cut into smaller pieces, and then ground in a mortar fine enough to pass through a 16-mesh sieve. The explosives shall be reduced by grinding or rasping to a fineness of 20 mesh or less. The black powder shall not be ground, but is to be used in the granulation furnished for the test. Ten samples shall then be prepared consisting of 10 grams of each of the explosives listed in table IV (with the exception of black powder and MOX-2B) with 10 grams of the paint. With the black powder and the MOX-2B, 7.0 grams of each shall be mixed with 7.0 grams of paint. The mixing shall be thorough using a wood spatula with the mixture on a piece of glazed paper. After mixing, the mixtures shall be spread out on large watch glasses, and dried in a desiccator at room temperature for 24 hours. They are then placed in dry glass bottles with rubber or cork stoppers and reserved for tests. At the same time, 10-gram samples of each of the explosives and a 20-gram sample of the paint are prepared and bottled in the same way. Samples are taken directly from these bottles to make the initial vacuum stability and ignition tests as required in sections 4.4.20.3 and 4.4.22. For the storage tests, the remainder of the mixed samples and controls, after the initial tests, are divided into equal portions and placed in separate bottles. One series of the samples is arranged, unstoppered, in individual mason jars, sealed under ambient conditions, and placed in a surveillance oven at 71° C. The other series of mixtures and controls, except the black powder and MOX-2B, is placed, also unstoppered, in individual mason jars, each containing a test tube with 10 cc of water. The bottles containing the samples are protected in such a way that condensation from the top of the mason jar will not fall into the sample bottle. The jars are fitted with rubber gaskets, closed, and placed in a surveillance oven at 71° C. After 60 days the samples of both series are removed, dried in a circulating oven or cabinet at approximately 35° to 40° C for 48 hours, and tested according to sections 4.4.20.3 and 4.4.22.

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4.4.20.2 Calibration. Calibration of the glass tube shall be as specified in method 403.1.1 of MIL-STD-286.

4.4.20.3 Testing procedure. The procedure shall be as specified in method 403.1.1 of MIL-STD-286 except that 2N + 2 heating tubes (where N equals the number of explosives involved) shall be selected. These tubes shall be similar to the heating tube portion of the apparatus shown in figure 1 of MIL-STD-286. Two and one-half gram portions of the dried paint, as controls, shall be added to each of two tubes, and 2-1/2 grams of each of the explosives, also as controls, shall be added to individual tubes. Five-gram samples of each of the mixtures of any one of the series prepared under 4.4.20.1, after drying for 24 hours in a desiccator at room temperature, are placed in individual tubes. After assembly the test is run as prescribed in MIL-STD-286 for 40 hours at 100° C. All readings shall be made with the sample removed from the bath and at room temperatures. The readings of both the controls and the test samples shall then be corrected to standard conditions of temperature and pressure and checked for compliance with 3.5.15.

4.4.20.4 Calculation of reactivity. The reactivity of each of the explosive materials with the coating compound shall be calculated as follows:

$$\text{Reactivity in ml gas} = C - (A + B)$$

where

C = ml of gas produced by the mixture of explosive material and coating compound

A = ml of gas produced by the explosive material alone

B = ml of gas produced by the coating compound alone.

4.4.21 Corrosion. Coat on both sides 26 smooth SAE 1020 steel panels, approximately 4 × 2 × 1/20 inches, with 0.001 ± 0.0002 inch of the primer and thoroughly dry. Using two panels for each test, make into 12 sandwiches with slabs or compressed pellets of each explosive shown in table IV. The slabs or pellets shall be at least one-eighth inch in thickness, and shall be held in close contact with the coated surfaces of the panel by means of tying the sandwich together with a cotton string or cord. Each sandwich is then placed in a separate glass jar in an inclined position under ambient conditions, then closed and placed in a controlled temperature oven at 71° C for 60 days. Two of the coated

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panels shall be stored under the same conditions, to serve as controls for all of the explosives under tests. After 60 days the samples are removed, the panels separated from the sandwiches, and the surfaces which had been in contact with the explosives examined visually for cracks, pits, or other signs of corrosion as specified under 3.5.16. The control panels will serve as a comparison in this examination.

4.4.22 Ignition. Determine the minimum ignition temperature in duplicate on mixtures of the dried paint film and the explosives listed in table V both prior to and after storage in closed glass containers for 60 days under ambient relative humidity at 71° C and under 100 percent relative humidity at 71° C. Make the initial test on a ground dry mixture of 0.25 gram of each explosive with 0.25 gram of the paint and the final test on 0.50 gram of the ground mixtures after completion of the storage period. Determine the ignition point by raising the temperature at a rate of 5° to 10° C per minute. Check the ignition temperatures obtained for compliance with 3.5.17.

5. PREPARATION FOR DELIVERY

5.1 Packaging and packing. The primer shall be delivered in 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). The primer shall be packaged level A or C; packed level A, B, or C as specified (see 6.2) in accordance with TT-P-143.

5.2 Marking. The containers shall be marked in accordance with MIL-STD-129. In addition each container shall be marked with the qualification report number and composition G or L, as applicable.

6. NOTES

6.1 Intended use. This primer is intended for painting the interior of ammunition items such as bombs, shells, rockets, and mines prior to being filled with explosives. It may also be used for the exterior surfaces of these items as a primer. It is suitable for use over bare or chemically treated metal surfaces and may be used under synthetic enamel or lacquer topcoats.

*6.2 Ordering data. Procurement documents should specify the following:

(a) Title, number, and date of this specification
(b) Composition required (see 1.2)

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(c) Size of containers required (see Section 5)
(d) Level of packaging and level of packing (see Section 5).

6.3 The primer should be purchased by volume, the unit being 1 U. S. liquid gallon of 231 cubic inches at 68° F (20° C).

*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 Naval Ordnance Systems Command, Department of the Navy, Washington, D. C. 20360. Information pertaining to qualification of products may be obtained from the Commanding Officer, Naval Ordnance Station, Indian Head, Md. 20640, Attn: Chemical Analysis Branch.

6.5 The primer is considered to be comparable in performance to the following approximate composition by weight:

Pounds	
205	Red iron oxide (98 percent Fe_2O_3)
40	Zinc chromate ($CrO_3 \times 2.4$)
155	Fibrous acicular talc
80	39 percent phthalic anhydride, resin modified, drying oil alkyd resin; Gardner Viscosity U-Y at 50 percent solids in xylene
140	Xylene
	Grind 18-24 hours in a porcelain ball mill using 2-1 ratio of porcelain balls by weight and reduce as follows:
340	39 percent phthalic anhydride, resin modified, drying oil alkyd resin; Gardner Viscosity U-Y at 50 percent solids in xylene
40	Xylene
5.2	Lead naphthenate (24 percent)
1.0	Cobalt naphthenate (6 percent)
1.0	Antiskinning agent.

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*6.6 Composition L primers should be specified for use in areas with regulations controlling the emission of solvents into the atmosphere.

6.7 The test for olefinic and cyclo-olefinic compounds will not be positive for solvents containing less than 1 percent of these compounds.

*6.8 The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationships to the last previous issue.

Custodians:
Army - MR
Navy - OS
AF - 84

Preparing activity:
Navy - OS
(Project No. 8010-0656)

Reviewer:
Army - MU

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SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 22-R255

INSTRUCTIONS: 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. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements.

SPECIFICATION MIL-P-22332B, Paint, Priming, Exterior and Interior (For Ammunition)

ORGANIZATION

CITY AND STATE

CONTRACT NUMBER

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ 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?

☐ YES ☐ 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 - Optional)*

DATE

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