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SUPERSEDING
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MILITARY SPECIFICATION

PRIMER COATING, SHIPBOARD, VINYL-ZINC CHROMATE

(FORMULA NO. 120 - FOR HOT SPRAY)

This specification has been approved by the Department of Defense and is mandatory for use by the Departments of the Army, the Navy, and the Air Force.

1. SCOPE

1.1 This specification covers primer coating, vinyl-zinc chromate for use with hot spray equipment over pretreatment coating (Formula No. 117, Specification MIL-C-15328). The primer coating is used under vinyl-alkyd topcoats of the Formula No. 122 series or vinyl antifouling paint, Formula No. 121, Specification MIL-P-15931 or Formula No. 129, Specification MIL-P-16189A.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

FEDERAL

RR-S-366 - Sieves, Standard for Testing Purposes.
TT-L-70 - Lampblack, Dry (Paint Pigment).
TT-M-268 - Methyl Isobutyl Ketone (for use in Organic Coatings).
TT-P-143 - Paint, Varnish, Lacquer and Related Materials; Packaging of.
TT-T-548 - Toluol (for Use in Organic Coatings).
TT-T-656 - Tricresyl Phosphate.

MILITARY

MIL-M-15173 - Magnesium - Silicate (Flatting Extender Pigment).
MIL-A-15206 - Aluminum-Stearate.
MIL-C-15328 - Coating, Pretreatment, (Formula No. 117 for Metals).
MIL-L-19868 - Labels for Hazardous Industrial Chemicals and Materials.

STANDARDS

FEDERAL

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

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

2.2 Other publications. - The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply.

AMERICAN SOCIETY FOR TESTING MATERIALS

D1482-57T - Color Difference Using the General Electric Spectrophotometer.
D1495-57T - Color Difference Using the Color Eye.

(Application for copies should be addressed to the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pennsylvania.)

3. REQUIREMENTS

3.1 The primer coating shall consist of ingredients conforming to the applicable specifications in the proportions shown in table I.

3.1.1 The formula shown in table I is designated Formula No. 120 - for Hot Spray. Wherever Formula No. 120 - for Hot Spray is specified, the primer coating shall conform to this specification. Reasonable variation in the amount of toluene will be permitted to adjust to the required viscosity, the amount of lampblack may be varied as necessary to meet the color requirement, and small amounts of antiskinning and antisettling agents may be added to meet the 3.2 and 3.4 requirements provided all other requirements are met and the exact formula used is furnished in the record required by method 1031 of Standard FED-STD-141.

3.2 Manufacture. - The component raw materials shall be mixed and ground as required to produce a product which is uniform, homogeneous, free from grit, entirely suitable for the purposes intended, and in full conformity to the requirements of this specification.

FSC 8010

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Table I - Formula No. 120 - For Hot Spray.

Ingredients	Pounds[1]
Zinc chromate insoluble type[2]	80
Magnesium-silicate (Type A or B of Spec. MIL-M-15173)	50
Lampblack (Spec. TT-L-70)	2
Aluminum-stearate (Spec. MIL-A-15206)	1
Vinyl resin[3]	145
Tricresyl phosphate (Spec. TT-T-656)	12.5
Methyl isobutyl ketone (Spec. TT-M-268)	345
Toluol (Spec. TT-T-548)	230

[1] The formula is given slightly in excess of 100 gallons to allow for normal manufacturing loss.

[2] The zinc chromate shall be an "insoluble type," showing on analysis 16 to 19 percent CrO_3, and 67 to 72 percent ZnO, and not more than 1 percent water soluble salts.

[3] The resin shall be a hydroxyl containing vinyl chloride-acetate copolymer. It shall contain 89.5 to 91.5 percent vinyl chloride, 5.3 to 7.0 vinyl alcohol and 2.0 to 5.5 percent vinyl acetate. The resin shall have a specific gravity of 1.35 minimum. The material shall be furnished as a powdered white solid not less than 98 percent of which shall pass through a No. 20 sieve, conforming to Specification RR-S-366. An 18 percent solution of the resin in methyl isobutyl ketone shall be no darker than 1.0 gram of potassium dichromate dissolved in 100 milliliters (ml) of water.

3.3 Quantitative requirements. - The quantitative requirements which are in table II shall be the criteria for laboratory tests as specified in paragraph 4.3 that the primer coating has been manufactured in accordance with the formula and good practice.

3.4 Qualitative requirements. - The primer coating shall meet the following qualitative requirements:

3.4.1 Odor. - The odor shall be normal for the volatiles permitted when tested as specified in 4.3.2.1.

3.4.2 Color. - The color shall match or be slightly darker than the standard color chip (see 6.3) when tested as specified in 4.3.2.3.

3.4.3 Compatibility. - There shall be no evidence of incompatibility of any of the ingredients of the primer coating when tested as specified in 4.3.2.4.

Table II - Quantitative requirements.

Characteristics	Requirements	
	Minimum	Maximum
Pigment, percent by weight of paint	14.5	17.0
Volatiles, percent by weight of paint	64.5	67.0
Nonvolatile vehicle; percent by weight of paint (calculated by difference)	17.0	19.5
Water, percent by weight of paint	----	0.5
Coarse particles and skins (as residue retained on standard No. 325 sieve) (Spec. RR-S-366) percent by weight of paint	----	0.5
Viscosity, Krebs units	78	85
Weight per gallon, pounds	8.4	8.7
Fineness of grind	5	----
Time of setting to touch, minutes	----	15
Time of drying hard, minutes	----	30
Zinc oxide, percent by weight of pigment	40.0	45.0
Chromium oxide (CrO_3) percent by weight of pigment	9.0	12.0

3.4.4 Adhesion. - The primer coating shall show good adhesion when tested as specified in 4.3.2.5.

3.4.5 Condition in container. - The product shall be capable of being readily broken up with a paddle to a smooth, uniform consistency and shall not liver, shall not exceed 100 Krebs units in viscosity nor exceed one hour dry hard time, shall not curdle, gel nor show any other objectionable properties for at least one year after date of manufacture.

3.4.6 Additional chemical and physical tests shall be run as may be necessary to determine that the ingredients and proportions specified in 3.1 have been used (see 4.3.1).

4. QUALITY ASSURANCE PROVISIONS

4.1 The supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilizer his own or any other inspection facilities and services acceptable to the Government. Inspection records of the examination and tests shall be kept complete and available to the Government as specified in the contract or order. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections

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are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Quality assurance shall be provided in accordance with method 1031 of Standard FED-STD-141.

4.2.1 Ingredient materials. - A one pint sample from each lot of the vinyl resin and the zinc chromate pigment and when requested by proper authority, a one pint sample from each lot of the other ingredient materials shall be taken by the Government representative for test purposes.

4.3 Test procedures. -

4.3.1 Ingredient materials. - The vinyl resin shall be tested to determine compliance with note 3 of table I. Other ingredient materials submitted shall be tested to determine compliance with the applicable specifications.

4.3.2 Finished primer. -

4.3.2.1 The following tests shall be conducted in accordance with methods specified in Standard FED-STD-141:

Test	Methods
Pigment (using extraction mixture "C")	4021
Volatiles	4041
Nonvolatile vehicle (calculated by difference)	4053
Water	4081
Coarse particles and skins (using 1:1 xylene-methyl isobutyl ketone)	4091
Viscosity	4281
Weight per gallon	4184
Fineness of grind	4411
Odor	4401

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

4.3.2.3 Color. - Prepare panel for tests by applying a single drawdown coat of the primer coating to a plane piece of opaque white glass using a doctor blade with a clearance of 0.006 inch (designed to give a wet film thickness of approximately 0.003 inch). After a 48-hour drying period compare the panel with the standard color chip (see 6.3) as specified in method 4250 of Standard FED-STD-141. If doubt exists as to the satisfactoriness of the match the color shall show no more than five units color difference in the direction of minus ΔL, Δa, and Δb values from the standard when tested in accordance with ASTM Tentative Test Method D1482-57T, D1495-57T or similar procedures using an instrument of equal sensitivity.

4.3.2.4 Compatibility. - Compatibility with thinner shall be determined in accordance with method 4203 of Standard FED-STD-141. Fifty ml. of primer coating and 50 ml. of thinner (1:1 toluol-methyl isobutyl ketone) shall be used. Observations shall be made immediately after mixing and also 30 minutes after mixing.

4.3.2.5 Adhesion. - Apply a coat (0.5 mil dry) of pretreatment coating (Spec. MIL-C-15328) to a steel panel. After a one-hour dry, coat with the sample primer coating of this specification to a dry film thickness of topcoat of approximately 1 mil. After a 24-hour dry, the film shall be subjected to the knife test specified in method 6304 of Standard FED-STD-141 to determine whether the primer coating exhibits good adhesion to the pretreatment coating.

4.3.2.6 Pigment analysis. -

4.3.2.6.1 Preliminary separation. - Weight out a 2.000 gram (gm.) sample of the pigment and transfer to a 250 ml. beaker. Moisten the pigment with acetone and add 25 ml. of 1:4 sulfuric acid. Let stand on steam bath for 1 hour with occasional stirring. Filter, wash with 1:4 sulfuric acid until free of chromium, and transfer filtrate to a 250 ml. volumetric flask. Dilute filtrate to exactly 250 ml. and reserve for zinc and chromium determination.

4.3.2.6.2 Zinc oxide. - Remove a 50.0 ml. portion from the volumetric flask and transfer to a 400 ml. beaker. Dilute to 150 ml. with distilled water and add 25 ml. of a 25 percent solution of tartaric acid. Make just neutral to litmus paper with ammonium hydroxide and add 25 ml. of formic acid mixture. (To 400 ml. formic acid add 60 ml. ammonium hydroxide. Dissolve 500 gm. of ammonium sulfate in approximately one liter of distilled water. Mix the two solutions and add sufficient water to make two liters.) Care shall be taken to adjust the acidity to the proper pH for the quantitative precipitation of the zinc as sulfide. Pass a rapid stream of hydrogen sulfide through the solution for thirty minutes. Filter off the precipitated zinc sulfide and wash with distilled water saturated with hydrogen sulfide. Put the precipitate and paper into a tared porcelain crucible, dry the paper, and then char at low heat until the paper is consumed. Increase the heat to 1,000° C., and ignite for ten minutes. Let cool in desiccator and weigh as zinc oxide.

4.3.2.6.3 Chromium trioxide. - Remove a 50.0 ml. portion from the volumetric flask. Transfer

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to a 600 ml. beaker. Dilute to 300 ml. with distilled water and add 15 ml. of concentrated sulfuric acid and 3 ml. of concentrated nitric acid. Bring to a boil, then add 1 ml. of 2.5 percent silver nitrate solution and 1 ml. of 0.1 N potassium permanganate. Slowly add 10 ml. of 20 percent ammonium persulfate, freshly prepared. The pink color of permanganate should persist after 10 minutes of boiling, adding more ammonium persulfate if necessary and boiling 10 minutes after last addition of ammonium persulfate. Five ml. of 1:3 hydrocholoric acid shall then be added and the solution boiled for 10 minutes after the permanganate color is destroyed. Cool to 20°C. and add standardized ferrous ammonium sulfate solution (approximately 0.1 N) until approximately 5 ml. in excess has been added. Now titrate with approximately 0.1 N potassium permanganate solution (which has been standardized against sodium oxalate) until an excess of approximately 5 ml. has been added. Adjust to the correct end point by careful addition of the standardized ferrous ammonium sulfate solution. Multiply the volume of permanganate solution used by the ferrous ammonium sulfate equivalent of 1 ml. standardized permanganate solution, subtract the product from the amount of ferrous sulfate used and calculate the amount of chromium as CrO_3. To determine the ferrous ammonium sulfate equivalent, take as much of the ferrous ammonium sulfate as was used in the test, dilute in a solution having the same volume and acidity, titrate as above with the permanganate solution and calculate from the data obtained.

5. PREPARATION FOR DELIVERY

5.1 Unless otherwise specified in the contract or order, primer coating shall be furnished in 1-gallon cans or 5-gallon pails. Primer coating shall be packaged level A or C; packed level A, B or C as specified (see 6.2) and marked in accordance with Specification TT-P-143.

5.2 Marking. - In addition to any special marking specified in the contract or order, each unit container shall be marked with the following special instruction:

Special instructions. - Contents formulated for hot spray application. The material may be used for cold spray application by the addition of up to one pint of toluol per gallon of paint. If additional thinning is found necessary, methyl isobutyl ketone should be used.

5.2.1 Additionally, each unit container shall have affixed a warning label of appropiate size similar to class 2 of Specification MIL-L-19868 or shall be lithographed or stenciled with a reasonable likeness thereof. Under "contains" shall be inserted "Methyl Isobutyl Ketone and Toluol". For unit containers that also serve as shipping containers, any conflict with ICC Regulations shall be resolved by reasonable modification of size of label or use of warning statement without label design.

6. NOTES

6.1 Intended use. - This primer coating is intended for use with hot spray equipment over metal surfaces pretreated with coating (Spec. MIL-C-15328) and usually is topcoated with vinyl-alkyd finishes or vinyl antifouling paint.

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

(a) Title, number and date of this specification.
(b) Size of containers (see 5.1).
(c) Level of packaging and level of packing required (see 5.1).
(d) Special marking required (see 5.2).

6.3 Color chips. - Color chips may be obtained upon application to the Commander, Norfolk Naval Shipyard, Portsmouth, Virginia. When requesting, specify for what purpose chips are required.

6.4 Vinyl zinc chromate primer coating should be purchased by volume, the unit being a U.S. gallon at 15.5°C. (60°F.).

Notice. - When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incures no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

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SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004

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 *(as indicated on reverse hereof)*.

SPECIFICATION

ORGANIZATION *(Of submitter)*

CITY AND STATE

CONTRACT NO.

QUANTITY OF ITEMS PROCURED

DOLLAR AMOUNT
$

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)*

DATE

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