MILITARY SPECIFICATION

PRIMER, CATHODIC ELECTRODEPOSITION, CHEMICAL AGENT RESISTANT

This specification is approved for use within the USA Belvoir Research, Development and Engineering Center, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers a waterborne, cathodic epoxy electrodeposition primer formulated lead and hexavalent chrome free. The primer meets solvent emission maximums of 144 grams per liter (1.2 pounds per gallon) of volatile organic compounds (VOC).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

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

SPECIFICATIONS

FEDERAL

TT-C-490	- Cleaning Methods and Pretreatment of Ferrous Surfaces.
PPP-P-1892	- Paint, Varnish, Lacquer, and Related Materials: Packaging, Packing, and Marking of.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: USA Belvoir Research, Development, and Engineering Center, ATTN: STRBE-TSE, Fort Belvoir, VA 22060-5606 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 8010

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MIL-C-5541 - Chemical Conversion Coatings for Aluminum and Aluminum Alloys.
MIL-C-46168 - Coating, Aliphatic Polyurethane, Chemical Agent Resistant.
MIL-C-53039 - Coating, Aliphatic Polyurethane, Single Component, Chemical Agent Resistant.

STANDARDS

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FED-STD-141 - Paint, Varnish, Lacquer and Related Materials; Methods of Inspection, Sampling and Testing.
FED-STD-313 - Preparation and Submission of Material Safety Data Sheets.
FED-STD-595 - Colors.

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MIL-STD-129 - Marking for Shipment and Storage.
MIL-STD-147 - Palletized Unit Loads.
MIL-STD-45662 - Calibration Systems Requirements.

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

2.2 Other publications. The following document(s) form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issue of the non-Government documents which are current on the date of the solicitation.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

B 117 - Salt Spray (Fog) Testing.
D 523 - Specular Gloss, Standard Test Method for.
D 610 - Evaluating Degree of Rusting of Painted Steel Surfaces.
D 1014 - Conducting Exterior Exposure Tests of Paints on Steel.
D 1153 - Methyl Isobutyl Ketone, Standard Specification for.
D 1394 - Chemical Analysis of White Titanium Pigments.
D 1475 - Density of Paint, Varnish, Lacquer and Related Products.
D 3335 - Low Concentrations of Lead, Cadmium and Cobalt in Paint by Atomic Absorption Spectroscopy, Standard Method for.
D 3359 - Measuring Adhesion by Tape Test, Standard Method for.

D 3960 - Determining Volatile Organic Content (VOC) of Paints and Related Coatings, Standard Practice for.
D 4399 - Measuring Electrical Conductivity of Electrocoat Baths, Standard Method for.

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

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

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

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 (QPL) at the time set for opening of bids (see 4.2.1 and 6.3). Any change in the formulation of a qualified product will necessitate its requalification. The material supplied under contract shall be identical, in regards to performance tolerances, to the product receiving qualification. The compositional values of the actual production line product will be established on a case by case basis by the approved coating supplier.

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

3.3 Color and 60° gloss. For qualification purposes, the primer shall be a gray visual match to chip number 26493 of FED-STD-595 or at most no darker than chip number 26373. For actual production, the color may darken to chip number 26270. The 60° gloss range shall be 30-50.

3.4 Composition. The primer shall be furnished in two parts: a resin feed component and a pigment feed paste component.

3.4.1 Resin feed component. The resin feed component shall consist of an epoxy or and epoxy-urethane resin combined with the necessary amounts of flow control agents and volatile solvents. The use of acrylic resins as flow control agents is restricted to less than 2.0 percent by weight. When tested as specified in 4.5, the resin feed component must meet the quantitative requirements of table I.

3.4.2 Pigment paste component. The pigment paste shall consist of a resin as specified in 3.4.1, volatile solvents, titanium dioxide and siliceous extenders. The use of small amounts of tinting pigments is permissible to achieve the color as specified in 3.3. Hexavalent chromate, zinc chromate, or lead pigments shall not be used alone or as a component part of any pigment. When tested as in section 4, the pigment paste component must meet the quantitative requirements of table I.

TABLE I. Component breakdown.

Characteristic	Resin Feed	Pigment Paste
Total solids, percent by weight	36.0 ±2.0	53.0 +2.0
Weight per gallon	8.8 ±0.2	11.6 - 13.5
pH range	6.0 - 7.0	6.7 - 8.0
Viscosity	100 CPS (max)	5000 CPS (max)
Titanium dioxide, percent by weight of pigment	-	50 min.
Hexavalent chrome	-	Negative
Epoxy resin	Positive	Positive

3.5 Mixed primer requirements. The mixed primer shall conform to the quantitative requirements of table II when tested as in section 4.

TABLE II. Mixed primer quantitative requirements.

Characteristic	Requirement
Total solids, percent by weight	19.0 - 21.0
Pigment/binder	0.25 - 0.35
pH range	5.6 - 6.3
Conductivity, micromhos	1000 - 1500
Volatile organic compounds (VOC), grams per liter/pounds per gallon	144/1.2 (max)
Lead content, percent by weight of total solids	0.06 (max)

3.6 Applied primer qualitative requirements.

3.6.1 Conditioner in container. When tested as specified in 4.8.1, the resin feed component and pigment paste component shall be free from grit, seeds, abnormal thickening or livering in a freshly opened container. The pigment paste component shall show no more pigment settling or caking than can be easily and completely reincorporated to a smooth homogeneous state.

3.6.2 Mixing properties. When mixed as specified in 4.8.2, a smooth homogeneous mixture shall result.

3.6.3 Electrocoating application properties. When applied as specified in 4.8.3, the primer shall electrocoat satisfactorily and shall show a continuous film after baking which conforms to the color, gloss and performance properties as specified in section 4. The baked film shall show no mottling or color separation and shall present a finish free from craters or orange peel.

3.6.4 Cure time. When tested as specified in 4.8.4, the tested area shall show no film softening when compared to an untested portion of the panel.

3.6.5 Adhesion. When tested as specified in 4.8.5, the film of primer shall show no removal from the surface of the cross-cut area, classification 5B per ASTM D 3359. The film of primer and topcoat shall show less than 5 percent of the area affected as described as classification 4B per ASTM D 3359.

3.6.6 Knife test. When tested as specified in 4.8.6, the film of primer shall adhere tightly to the test 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.

3.6.7 Flexibility. When tested as specified in 4.8.7, the film of primer shall show no cracking or flaking. Cracks occurring at either end and extending no more than one-quarter inch shall be disregarded.

3.6.8 Salt spray resistance. When tested as specified in 4.8.8, the panels shall be examined immediately after removal from the test and show no more than a trace of rusting)ASTM D 610, No. 8) and no blister larger than one millimeter in diameter. The cross-scribed area shall not exceed one-eight inch score rust creeping on either side of the scribe line or loss of adhesion. The panels tested for cross hatch adhesion properties shall satisfy classification 3B of ASTM D 3359. Upon removal of the primer, the substrate shall show no more than a trace of rusting. pitting or corrosion.

3.6.9 DS2 resistance. When tested as specified in 4.8.9, the tested portion of the primer shall show no blistering or wrinkling when examined immediately after washing with water. After drying, there shall be no film softening and a maximum color change of 2.5 NBS units (see 6.4) when comparing a portion of the untested panel to that of the tested area.

3.6.10 Throw power. When tested as specified in 4.8.10, the inside face of the test panel shall plate to a dry film thickness of 0.0001 inch minimum at least 10 inches up the panel. A throw power below 10 inches is unacceptable. After removal from the salt spray cabinet, rinse the panels and examine for rusting. There shall be no more than a trace amount of rusting (ASTM D 610, No. 8) and no blisters larger than one millimeter in diameter on the entire 10 inch coated surface.

3.6.11 Weather resistance. When tested as specified in 4.8.11, the panels shall show no rusting, cracking, checking, flaking or loss of adhesion. On removal of the primer and topcoat, the panels shall show no more than a trace of rusting, pitting or corrosion (ASTM D 610, No. 9).

3.6.12 Toxic ingredients. The primer shall contain no benzene, chlorinated solvents or acetates of ethylene based glycol ethers. The primer shall have no adverse effects on the health of personnel when used for its intended purpose.

3.6.13 User instruction markings. In addition to the markings in 5.4, all primary containers shall be legibly marked or labeled with the emergency and first-aid procedures; type of personal protective equipment required; the precautions to be taken when using the product for its intended use and with the following:

INSTRUCTIONS FOR USE: For safety and disposal instructions refer to the Material Data Safety Data Sheet. Instructions for mixing, thinning and maintaining the coating bath parameters should be provided by the approved coatings supplier.

3.6.14 Material Data Safety Data Sheet. A Material Data Safety Data Sheet shall be prepared for each part of the primer in accordance with FED-STD-313 and forwarded to the qualifying activity (see 6.5). The Material Data Safety Data Sheet shall be included with each shipment of the material covered by this specification and submitted to pertinent government agencies as stated in appendix B of FED-STD-313.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. The contractor shall verify that his test, measurement and diagnostic equipment (TMDE) is calibrated in accordance with MIL-STD-45662. Except as otherwise specified in the contract or order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to the prescribed requirements.

4.1.1 Sampling and inspection. Unless otherwise specified, sampling, inspection and testing shall be in accordance with section 1000 of FED-STD-141. In addition to section 1000 of FED-STD-141, the following determinations shall be done at the primer application line:

a. Daily tests for percent solids, pigment to binder ratio, pH and conductivity of the primer bath.
b. Daily tests for conductivity of the deionized rinse water, post rinse before the primer bath and the anolyte.
c. One gallon samples of the primer bath shall be evaluated on a monthly basis by the coating supplier (see 4.2.2).

This data shall be available for review by responsible parties in the Department of Defense.

4.1.2 Material Safety Data Sheet. Material Data Safety Data Sheet must address all components of the primer and be in compliance with the requirements of FED-STD-313. Nonconformance to 3.6.14 shall constitute failure of this requirement.

4.2 Classification of inspection. Testing under this specification shall be for the following:

a. Qualification (see 4.2.1).
b. Contractor's on-site production (see 4.1.1 and 4.2.2).

4.2.1 Qualification tests. Qualification testing shall consist of tests for all requirements specified in section 3 in accordance with table III.

4.2.2 On-Site production tests. On a monthly basis, under production conditions, the contractor will electrocoat and cure a standard pretreated panel. The tank operating conditions at the time of application will be noted on the panel (date, voltage, tank temperature, line speed, dry film thickness, bake temperature, bake time). The panel, along with a gallon tank sample, will be sent to the coating manufacturer for evaluation. Panel, test results and analyses of tank sample shall be retained by the coating supplier for one year. This data will be presented to responsible parties in the Department of Defense upon request.

4.3 Test methods.

4.3.1 Test conditions. The routine testing conditions shall be in accordance with section 9 of FED-STD-141 or in accordance with the appropriate ASTM method except as otherwise specified herein. Failure of any test result to fall within the ranges specified in 3.3, 3.4, 3.5 and 3.6, as applicable, shall constitute failure of the applicable test. For all tests requiring the use of the mixed primer, the resin feed component and pigment paste feed component shall be mixed in the proportions specified in 4.3.3.

4.3.2 Test panels. Except as otherwise specified, steel test panels shall be pretreated with a zinc phosphate coating conforming to TT-C-490, type I 1/. Aluminum test panels shall be aluminum alloy 3003H14 treated with alodine 1200S to produce a coating meeting the requirements of MIL-C-5541 2/.

4.3.3 Mixing and application. Instructions for mixing and thinning should be provided by the contractor. In preparation of the primer bath, the deionized water used for thinning and rinsing must have a conductivity of less than 10 micromhos per centimeter and be free of bacteria. After mixing the resin, pigment and deionized water, allow the bath to stir for a 24 hour period before testing. Throughout the testing period, the bath should be constantly agitated. The bath operations should be held between 78-82 °F. Since the electrodeposition primer is cathodic, the panel being coated is the negative electrode while the beaker or side electrodes are positively charged. Panels to be electrocoated are immersed in the bath liquid and the rectifier turned on. Voltage is increased over approximately 20 seconds to a reading necessary to provide 0.001 ±0.0001 inch of dry film thickness. Several trial panels are necessary to define this voltage for each substrate. Generally, 150, to 300 volts are required. Normal deposition time is 90 seconds. Once coated, panels are removed from the bath and rinsed with deionized water. Curing of the deposited primer will be in convection type oven capable of reaching a 350 °F metal temperature for 20 minutes. Allow the cured primer to cool to room temperature (65-80 F°) before testing.

1/ Bonderite 40, The Q-Panel Company or equivalent.
2/ AL 412, The Q-Panel Company or equivalent.

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

TABLE III. Index.

Item	FED-STD-141 Method	ASTM Method	Test Paragraph	Requirement Paragraph
Color and 60° gloss	4250.1	D 523	4.4	3.3
Resin feed component	-	-	4.5	3.4.1
Pigment paste component	-	-	4.6	3.4.2
Viscosity	4287	-	4.5.4, 4.6.4	Table I
Weight per gallon	-	D 1475	4.5.2, 4.6.2	Table I
Titanium dioxide	-	D 1394	4.6.5	Table I
Hexavalent chrome	-	-	4.6.6	3.4.2
Epoxy resin test	-	-	4.5.5, 4.6.7	3.4.1, 3.4.2
pH range	-	-	4.5.3, 4.6.3 4.7.3	Table I, II
Conductivity	-	D 4399	4.7.4	Table I, II
Total solids	-	-	4.5.1, 4.6.1 4.7.1	Table I, II
Volatile organic compounds (VOC)	-	D 3960	4.7.5	Table II
Lead content	-	D 3335	4.7.6	Table II
Pigment to binder ratio			4.7.2	Table II
Condition in container	3011.2	-	4.8.1	3.6.1
Mixing properties	-	-	4.8.2	3.6.2
Application properties	-	-	4.8.3	3.6.3
Cure time	-	-	4.8.4	3.6.4
Adhesion	-	D 3359, Method B	4.8.5	3.6.5
Knife test	6304	-	4.8.6	3.6.6
Flexibility	6221	-	4.8.7	3.6.7
Salt spray resistance	-	B 117	4.8.8	3.6.8
DS2 resistance	-	-	4.8.9	3.6.9
Throw power	-	-	4.8.10	3.6.10
Weather resistance	-	D 1014	4.8.11	3.6.11
Toxic ingredients	-	-	4.8.12	3.6.12

4.4 Color and 60° gloss. Prepare a panel of each substrate as specified in 4.3.2 and 4.3.3. Compare the color as specified in 3.3. Determine the 60° gloss in accordance with ASTM D 523 and check for compliance to 3.3. Nonconformance to 3.3 shall constitute failure of this test.

4.5 Resin component. The following tests shall be made on the resin feed component. Check for compliance with 3.4.1 and table I. Nonconformance to 3.4.1 and table I shall constitute failure of this test.

4.5.1 Total solids. Weigh a 60 mm aluminum dish with four digit accuracy. Record the weight of the dish, A. Transfer a small amount of the well mixed sample, 1.0 - 1.5 grams, to the dish and record the weight, B. Place the sample dish in a gravity convection oven at 110 ±5 °C for one hour. Remove the sample dish from the oven and allow it to return to room temperature. Reweigh the dish to the nearest one-tenth mg, C. Calculate the total solids as follows:

$$\frac{C-A}{B-A} \times 100$$

Duplicate the results by making another solids determination and report the average of the two.

4.5.2 Weight per gallon. Determine the weight per gallon in accordance with ASTM D 1475.

4.5.3 pH determination. Standardize pH meter using fresh buffer solutions with pH of 4, 6 and 7 at 77 °F. Rinse the pH probe with distilled or deionized water between each reading. Immerse the probe into sample and take the reading after one minute with mild agitation.

4.5.4 Viscosity. Determine the viscosity in accordance with method 4287 of FED-STD-141.

4.5.5 Epoxy resin test. Determine the presence of an epoxy-based resin by placing approximately 5 mL of the well mixed resin component into a test tube. Extract the sample with 10 mL of toluene. Decant most of the top organic layer into a 25 mL beaker and evaporate to dryness on a steam bath. After cooling, add dropwise 2 mL of concentrated H_2SO_4. Stir, cool and add 2-3 drops of 40 percent formaldehyde solution. Allow sample to stand a few minutes. Dilute with 15 mL of distilled water added all at one time. A green to blue-green color will form immediately indicating the presence of a bisphenol type of epoxy resin. Confirmation of the resin type shall be determined by placing two drops of the organic layer extract onto a KBr plate. Remove the solvent by drying the plate in a 60 °C oven for 30 minutes. Identify the remaining film by infrared spectroscopy.

4.6 Pigment component. The following tests shall be made on the pigment feed component. Check for conformance with table I. Nonconformance to table I shall constitute failure of this test.

4.6.1 Total solids. Determine the total solids of the pigment component as specified in 4.5.1.

4.6.2 Weight per gallon. Determine the weight per gallon of the pigment component as specified in 4.5.2.

4.6.3 pH determination. Determine the pH of the pigment component as specified in 4.5.3.

4.6.4 Viscosity. Determine the viscosity of the pigment component as specified in 4.5.4.

4.6.5 Titanium dioxide. Determine the titanium dioxide (TiO_2) content on the extracted pigment in accordance with ASTM D 1394.

4.6.6 Hexavalent chrome. Determine the absence of hexavalent chrome by using pigment extracted as in 4.6.5. Add 5 mL of 25 percent aqueous KOH to 0.5 g of the extracted pigment in a 15 mL centrifuge tube. Agitate by shaking the tube for a few minutes then centrifuge. The supernatant liquid should be colorless. A yellow color indicates the presence of hexavalent chrome and shall constitute failure of this test.

4.6.7 Epoxy resin test. Determine the presence of an epoxy-based resin by placing approximately 5 mL of the well mixed pigment component into a test tube. Extract the sample with 10 mL of toluene. Decant most of the top organic layer into a 25 mL beaker and evaporate to dryness on a steam bath. After cooling, add dropwise 2 mL of concentrated H_2SO_4. Stir, cool and add 2-3 drops of 40 percent formaldehyde solution. Allow sample to stand a few minutes. Dilute with 15 mL of distilled water added all at one time. A green to blue-green color will form immediately indication the presence of a bisphenol type of epoxy resin. Confirmation of the resin type shall be determined by placing two drops of the organic layer extract onto a KBr plate. Remove the solvent by drying the plate in a 60 °C oven for 30 minutes. Identify the remaining film by infrared spectroscopy. Nonconformance to table I shall constitute failure of the test.

4.7 Mixed primer requirements. When mixed as specified in 4.3.3, the primer bath shall have the following quantitative characteristics. Check the compliance with table II. Nonconformance to table II shall constitute failure of the test.

4.7.1 Total solids. Determine the primer bath total solids as specified in 4.5.1.

4.7.2 Pigment/binder. Determine the pigment/binder value as an average of two sample test results. Precondition porcelain crucibles in a oven at 110 ±5 °C for 30 minutes and store in a desiccator prior to use. Weigh the crucibles and record the weight, C. Transfer 1.0 to 1.5 g of the mixed primer bath into the crucible and bake for one hour at 110 ±5 °C. After cooling the sample to room temperature in a desiccator, reweigh the crucible, D. Transfer the crucible to a muffle furnace preset to 100 °C or less and adjust the setting in order to reach a final temperature of 660 °C. The sample shall remain at 660 °C for 90 minutes. Remove sample from muffle furnace and allow it to return to room temperature in a desiccator. Reweigh crucible and record the weight, E. Calculate the pigment/binder as follows:

$$P/B = \frac{E-C}{D-E}$$

4.7.3 pH determination. Determine the pH of the mixed primer bath as specified in 4.5.3.

4.7.4 Conductivity. Determine the conductivity of the mixed primer bath with a conductivity meter with a range of 0.1 to 10,00 micromhos per centimeter and by using a cell with a constant of 1.0. Before determining the conductivity of the sample, the conductivity cell must be standardized by using a 0.010 normal KCL solution. A 0.010 normal KCL solution should have a conductivity reading of 1413 micromhos per centimeter at 77 °F therefore a conductivity cell K factor is obtained as follows:

$$\text{K factor} = \frac{1413}{\text{Conductivity reading of KCL solution}}$$

Disconnect the conductivity cup and discard the standard solution. Rinse the cup several times with deionized water and wipe dry. The test sample shall be homogeneous and at a temperature of 77 ±1 °F. Fill the conductivity cup with the sample, reconnect the cup to the conductivity meter and record the apparent conductivity reading, A. Calculate the bath conductivity of the sample as follows:

$$\text{Conductivity of mixed primer bath} = \text{K factor} \times A$$

4.7.5 VOC. Determine the VOC of the mixed primer bath in accordance with ASTM D 3960.

4.7.6 Lead content. Determine the lead content of the mixed primer bath by atomic absorption spectroscopy in accordance with ASTM D 3335.

4.8 Applied primer qualitative requirements.

4.8.1 Condition in container. Determine the package condition of both components as specified in method 3011.2 of FED-STD-141 but do not stir. Note pigment settling or caking. Reseal and mix the sample for up to 2 hours by an appropriate method such as an electric air stirrer taking care not to introduce air into the system. Recheck the contents and check for compliance with 3.6.1. Nonconformance to 3.6.1 shall constitute failure of this test.

4.8.2 Mixing properties. Follow the manufacturer's instructions in preparing the primer bath. Charge the coating cell with deionized water as specified in 4.3.3 and under agitation slowly add the resin feed component. Gradually add the pigment feed under sufficient agitation to produce a homogeneous system. Check for compliance with 3.6.2. Nonconformance to 3.6.2 shall constitute failure of this test.

4.8.3 Electrocoating application properties. Deposit a film of the primer and cure as specified in 4.3.3. Check for compliance with 3.6.3. Nonconformance to 3.6.3 shall constitute failure of this test.

4.8.4 Cure time. Prepare a film of primer as specified in 4.8.3 ensuring that the primer is cured for 20 minutes at a metal temperature of 350 °F. Allow the panel to cool to a room temperature of 65-80 °F. A soft cloth or laboratory tissue should be saturated with methyl isobutyl ketone conforming to ASTM D 1153. Applying medium pressure with the index finger, rub the same area of the primer for a minimum of 30 strokes (movement in one direction). Examine the film of primer for loss of film and check for compliance with 3.6.4. Nonconformance to 3.6.4 shall constitute failure of this test.

4.8.5 Adhesion. Prepare two panels of each substrate as specified in 4.3.3. Perform the cross hatch adhesion test on one panel of each substrate in accordance with ASTM D 3359, method B. Check for compliance with 3.6.5. The remaining steel and aluminum panels shall be topcoated with MIL-C-46168 or MIL-C-53039 to a minimum dry film thickness of 0.0018 inches and allowed to air dry seven days. Perform the cross hatch adhesion test on each topcoated panel in accordance with ASTM D 3359, method B. Check for compliance with 3.6.5. Nonconformance with 3.6.5 for either tests shall constitute failure of this test.

4.8.6 Knife tests. Prepare one panel of each substrate as in 4.8.5. Perform the knife test to each panel in accordance to method 6304 of FED-STD-141. Check for compliance with 3.6.6. Nonconformance to 3.6.6 shall constitute failure of this test.

4.8.7 Flexibility. Prepare a film of primer on an aluminum panel as specified in 4.3.2 and 4.3.3. Perform the flexibility test in accordance to method 6221 of FED-STD-141 using a 1/4 inch mandrel. Check for compliance with 3.6.7. Nonconformance to 3.6.7 shall constitute failure of this test.

4.8.8 Salt spray resistance. prepare three panels of each substrate as specified in 4.3.2 and 4.3.3. Two intersecting lines shall be scribed across the surface of each panel so that the bare substrate is exposed. The edges of all panels shall be sealed. The panels shall then be placed in a 5 percent salt spray cabinet for 1000 hours as described in ASTM B 117. Upon removal, wash the panels gently in warm running water until free from any visible salt deposits and examine immediately with 3.6.8. One panel of each substrate shall have the cross hatch adhesion test performed in accordance with ASTM D 3359, method B. Check for compliance with 3.6.8. One panel of each substrate shall be stripped down to the substrate and checked for compliance with 3.6.8. Nonconformance to 3.6.8 shall constitute failure of this test.

4.8.9 DS2 resistance. Prepare a film of primer on steel as specified in 4.3.2 and 4.3.3. Place two spots approximately 0.5 mL each of DS2 agent on the panel surface. Do not cover, and allow to stand 30 minutes. Thoroughly wash with cool water and check for compliance with 3.6.9. Nonconformance to 3.6.9 shall constitute failure of this test.

4.8.10 Throw power. In determining the throw power of the primer bath use 4 x 18 inch steel panels as specified in 4.3.2 and apply as specified in 4.3.3. Assemble a throw power box by securing the two metal panels face to face in such away that will result in a 3/8-inch gap between the panels. The panels shall be assembled along the sides using a nonconductive material with the top and bottom edges open. Submerge the throw power box into the primer bath and deposit a film of primer in accordance to 4.3.3. Application of the primer shall follow the parameters established in order to obtain a 0.001 ±0.0001 inch dry film deposited on the outside face of the panel to be coated. Cure the panels per 4.3.3. Measure the film thickness at one inch intervals on the side of the panel which was located on the interior surface of the throw box. Seal the uncoated section and all edges of the test panel and expose the inside face to a 5 percent salt spray solution for 96 hours per ASTM B 117. Upon completion of the exposure, remove the panels and wash in warm running eater until they are free from any visible salt deposits. Examine immediately for compliance with 3.6.10. Nonconformance to 3.6.10 shall constitute failure of this test.

4.8.11 Weather resistance. Prepare two panels of each substrate as specified in 4.3.2 and 4.3.3. Topcoat all primed panels with Green 383, 34094 as specified in MIL-C-46168 or MIL-C-53039 to a dry film thickness of 0.0020 ±0.0002 inch. Allow to air dry for 7 days and record color and 60° gloss readings for each panel. Place panels for a 2 year outdoor exposure at an angle of 45° facing south in the vicinity of the Washington, DC area. Check for compliance with 3.6.11. Nonconformance to 3.6.11 shall constitute failure of this test.

4.8.12 Toxic ingredients. The manufacturer shall certify that the primer contains no benzene, chlorinated solvents or acetates of ethylene based glycol ethers. Check for compliance with 3.6.12. Nonconformance to 3.6.12 shall constitute failure of this test.

4.9 Inspection of packaging. Inspection of packaging shall be in accordance with the applicable quality assurance provisions of PPP-P-1892.

5. PACKAGING

5.1 Preservation. Preservation shall be level A or C as specified (see 6.2).

5.1.1 Level A. The primer, in unit containers of the types and sizes specified (see 6.2), shall be in accordance with the applicable level A packaging requirements of PPP-P-1892.

5.1.2 Level C. The primer, in unit containers of the types and sizes specified (se 6.2), shall be in accordance with the applicable level C packaging requirements of PPP-P-1892.

5.2 Packing. Packing shall be level A or C as specified (see 6.2).

5.2.1 Levels A and C. The primer, preserved as specified in 5.1, shall be packed for level A or C in accordance with the applicable packing requirements of PPP-P-1892.

5.3 Palletization. When specified (see 6.2), the primer, preserved and packed as specified in 5.1 and 5.2 respectively, shall be palletized in accordance with MIL-STD-147.

5.4 Marking. In addition to any special or identification markings required by the contract or purchase order (see 6.2) and 3.6.13, each unit container, each intermediate container when required, each shipping container and, as applicable, each palletized unit load shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. This specification covers a cathodic electrodeposition epoxy primer intended for use on properly cleaned and pretreated steel and aluminum. It is formulated lead and chrome free and will meet a volatile organic compound (VOC) level of 144 grams per liter (1.2 pounds per gallon).

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents shall specify the following:

a. Title, number and date of this specification.
b. Level of preservation and packing (see 5.1 and 5.2).
c. Type and size of unit container (see 5.1.1 and 5.1.2).
d. When palletization is required (see 5.3).
e. Any special marking (see 5.4).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable qualified products list (QPL) whether or not such products have actually been so listed by that date. The attention of contractors is called to this requirement and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the qualified products list (QPL) is the USA Belvoir Research, Development and Engineering Center, ATTN: STRBE-VO, Fort Belvoir VA 22060-5606, and information pertaining to qualification of products may be obtained from this activity.

6.4 Color difference equation. The correct difference equation is entitled "Hunter's Revised National Bureau of Standards (NBS) Color Difference Equation". One reference source is "Color in Business, Science and Industry", (Wiley, NY).

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

6.6 Subject term (key word) listing.

Chemical agent resistant coating
Electrodeposition primer
Epoxy primer

Custodian:

Army - ME

User activity:

Army - AT

Preparing activity:

Army - ME

Project 8010-A356

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-P-53084(ME)	Primer, Cathodic Electrodeposition, Cemical Agent Resistant

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark on*
	☐ VENDOR
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ USER
	☐ MANUFACTURER
	☐ OTHER *(Specify)*: _____

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Ar Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

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