

MIL-C-82594

15 September 1971

See Section 6

## MILITARY SPECIFICATION

CORROSION PREVENTIVE COMPOUND AND  
SURFACE SEALER FOR NONFERROUS METALS

*This specification is mandatory for use by all Departments and Agencies of the Department of Defense.*

## 1. SCOPE

1.1 Scope. This specification covers a solvent-dispersed compound which penetrates metal pores and forms a microthin, clear, protective coating, and seal to prevent corrosion when applied by aerosol, brush, dip, or spray to nonferrous metals.

1.2 Classification. The corrosion preventive compound and surface sealer shall be of the following types, as specified (see 6.2).

Type I	Aerosol application
Type II	Brush, dip, or spray application

## 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

QQ-Z-325	Zinc Coating, Electrodeposited, Requirements for
QQ-A-327	Aluminum Alloy, Plate and Sheet 6061
QQ-A-355	Aluminum Alloy, Plate and Sheet 2024
QQ-P-416	Cadmium Plating (Electrodeposited)

FSC 8030

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TT-E-485	Enamel, Semi-Gloss, Rust-Inhibiting
PPP-C-96	Cans, Metal, 28 Gage and Lighter
PPP-D-729	Drum, Metal, 55-Gallon (for Shipment of Non-Corrosive Material)
PPP-P-704	Pail, Shipping, Steel (1 through 12 gallons)

Military

JAN-H-792	Humidity-Cabinet, Operation of
MIL-E-5272	Environmental Testing, Aeronautical and Associated Equipment, General Specification for
MIL-C-5541	Chemicals Films and Chemical Film Materials for Aluminum and Aluminum Materials
MIL-A-8625	Anodic Coatings for Aluminum and Aluminum Alloys

## STANDARDS

Federal

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

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-1341	Symbols for Packages and Containers for Hazardous Industrial Chemicals and Materials

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

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

American Society for Testing and Materials (ASTM) StandardsD1310<sup>1</sup>

Flash Point of Liquids by Tag Open-Cup Apparatus

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

## 3. REQUIREMENTS

3.1 First article inspection. The corrosion preventive compound and surface sealer furnished under this specification shall be a product which has been inspected and passed the first article inspection specified herein (see 4.3 and 6.2.1).

3.2 Material. The corrosion preventive compound and surface sealer, hereinafter referred to as "compound," shall be composed of a base material dispersed in solvent so as to form a fluid formulation conforming to this specification. The compound shall not be injurious in any way to personnel using it, if reasonable procedures and safety precautions are used.

3.3 Appearance and film thickness. The compound when applied in accordance with 4.4.1 shall form a microthin, uniform, clear film. Film thickness when measured in accordance with 4.5.2 shall not exceed 0.0003 inch.

3.4 Sprayability. The flow rate at 40° Fahrenheit from a fully pressurized container for type I or from a commercially available pressure-type container for type II shall be not less than 1.0 gram per second when tested in accordance with 4.5.3. The compound shall be readily sprayable so as to provide a uniform and continuous film after subjecting a fully pressurized container (type I) or a full container (type II) to 40° Fahrenheit for a period of 24 hours.

3.5 Curing. Upon application, the compound shall dry to touch in 3 minutes maximum at 70° Fahrenheit. The compound shall obtain full cure with complete physical properties in 8 days at 70° ± 5° Fahrenheit or in 5 to 10 minutes at 350° to 500° Fahrenheit.

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### 3.6 Coverage.

3.6.1 Type I. The contents of a 10-ounce spray container shall be sufficient to coat 75 square feet when applied, using the spraying method specified in 4.5.1.4.

3.6.2 Type II. The contents of a 1-gallon container shall be sufficient to coat 3000 square feet minimum, when applied, using the dip method specified in 4.5.1.4.

3.7 Flash point. The compound shall not flash at temperatures under 85° Fahrenheit when tested in accordance with 4.5.5.

3.8 Corrosion resistance. The compound shall afford protection against the environmental conditions of humidity and salt spray. There shall be no evidence of pitting, etching, or corrosion when tested in accordance with 4.5.6 and 4.5.7.

3.9 Fungus resistance. The compound shall resist fungus when tested in accordance with 4.5.8.

3.10 Heat resistance. The compound shall resist temperature extremes ranging from -100° to 500° Fahrenheit when tested in accordance with 4.5.9.

3.11 Flexibility. The compound shall be flexible and show no evidence of cracking, peeling, flaking, or lifting when tested in accordance with 4.5.10.

3.12 Paint adhesion. The compound shall provide adhesion for paints. There shall be no evidence of paint peeling, flaking, or lifting when tested in accordance with 4.5.11.

3.13 Storage life. The compound shall be certified by the supplier as having a storage life of at least 36 months from the time of delivery when stored unopened at a temperature of 40° to 90° Fahrenheit.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Classification of inspection. The inspection of the compound shall be classified as follows:

- (a) First article inspection (see 4.3)
- (b) Quality conformance inspection (see 4.4).

4.3 First article inspection. Unless otherwise specified (6.2.1), the contractor shall produce a first article or preproduction lot of the compound at the same plant, using the same materials and processes that he proposes to use in fulfilling the contract. First article samples selected in accordance with 4.3.1, shall be subjected to all quality conformance examinations and tests specified herein. Failure of the samples to meet all the requirements shall be cause for rejection of the first article sample.

4.3.1 Sampling for first article inspection. The samples for each type of compound shall be forwarded for analysis to the laboratory designated by the procurement activity.

4.3.1.1 Type I. Six containers of type I compound, prepared as specified in 5.1.1, shall be selected from the first quantity produced for first article lot. These containers shall be in addition to the quantity on order.

4.3.1.2 Type II. A 1-gallon sample of the compound shall be selected from the first quantity produced for first article lot and placed in a clean, dry, metal container with the top sealed. The container shall be in addition to the quantity on order.

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4.4 Quality conformance inspection. Quality conformance inspection shall consist of all the examinations and tests specified in table I.

Table I

## QUALITY CONFORMANCE INSPECTION

Examination or tests	Requirement	Test method
Film thickness	3.3	4.5.2
Sprayability	3.4	4.5.3
Curing	3.5	-
Coverage		
Type I application	3.6.1	4.5.4
Type II application	3.6.2	-
Flash point	3.7	4.5.5
Corrosion resistance		
Humidity	3.8	4.5.6
Salt spray	3.8	4.5.7
Fungus	3.9	4.5.8
Heat resistance	3.10	4.5.9
Flexibility	3.11	4.5.10
Paint adhesion	3.12	4.5.11
Visual	5.	4.4.4

4.4.1 Sampling.

4.4.1.1 Inspection lot. For the purpose of sampling, an inspection lot of type I compound shall consist of not more than 1200 filled containers. An inspection lot of type II compound shall consist of one production batch but shall not exceed 5000 gallons.

4.4.1.2 Samples.

4.4.1.2.1 Type I. Unless otherwise specified by the procuring activity, at least six containers of the compound from each inspection lot shall be selected at random, certified by the manufacturer as complying with the requirements set forth herein, and forwarded for check analysis to the test laboratory designated by the procurement activity concerned.

4.4.1.2.2 Type II. Unless otherwise specified by the procuring activity, a 1-gallon sample of the compound from each inspection lot shall be selected at random and placed in a clean, dry, metal container with the top sealed and forwarded to the test laboratory designated by the procurement activity concerned.

4.4.2 Rejection. If any sample fails to pass any of the tests specified in 4.5, it shall be cause for rejection of the lot represented by the sample.

4.4.3 Examination of containers. A random sample of filled containers shall be selected in accordance with MIL-STD-105 to verify compliance with the requirements of this specification not requiring tests. Each sample-filled container shall be examined for defects of construction of the container and the closure, for evidence of leakage, and unsatisfactory marking. Each filled container shall also be weighed and the amount of its contents determined. Any container in the sample having one or more defects or under required fill, shall be cause for rejection.

#### 4.5 Test procedures.

##### 4.5.1 Preparation of test panels.

4.5.1.1 Precautions. The following precautions shall be observed in carrying out the cleaning and finishing procedures.

(a) The utensils and cloths used in the preparation of the test panels shall be clean and free of contamination. Solvents shall be clean and renewed frequently.

(b) In all stages of treatment beginning with step (a), handling of equipment with bare hands shall be avoided. The panels shall be handled with hooks or similar devices, care being taken to prevent contact of the panels with contaminated surfaces during the cleaning or marring the film during coating and subsequent handling. Specimens on which the film has been damaged by handling shall not be used for test purposes.

4.5.1.2 Panel composition and size. Panels shall be fabricated from bare no. 6061 aluminum (QQ-A-327), bare no. 2024 aluminum (QQ-A-355), cadmium-plated steel (QQ-P-416), and zinc-coated steel (QQ-Z-325). The panels shall be  $1/8 \times 2 \times 4$  inches.

4.5.1.3 Panel cleaning. The panel test surfaces shall be cleaned and finished as follows:

- (a) Round off all edges of the panels to a smooth surface.
- (b) Ream out holes used for suspension of the panels.
- (c) The test surface shall be smooth and free of scratches.
- (d) Hot vapor degrease.
- (e) Chemically treat as required by table II.

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Table II

## FIVE PERCENT SALT SPRAY TEST

Metal	Surface condition	Length of test (hours)
No. 2024 aluminum	Compound only	168
No. 2024 aluminum	Per MIL-C-5541, class 1, with compound	500
No. 6061 aluminum	Compound only	500
No. 6061 aluminum	Per MIL-A-8625, type II, with compound	1000
Cadmium-plated steel class 1, type I	Compound only	336
Cadmium-plated steel class 1, type II	Dichromate treatment with compound	800
Zinc-coated steel class 2, type II	Dichromate treatment with compound	500

4.5.1.4 Application of compound. Type I compound shall be applied by spraying to the point of runoff to both sides of the panels held vertically. Care shall be taken to insure that all panel edges are coated. Film on center portion of panel shall not be touched or disturbed in any way. Type II compound shall be applied by dipping panels held vertically into the compound and withdrawing slowly. Procedures shall be performed at an ambient temperature of  $77^{\circ} \pm 2^{\circ}$  Fahrenheit and a relative humidity of  $45 \pm 5$  percent. Coated panels shall be dried in a draft-, dust-, and fume-free atmosphere and cured for 8 days at  $73^{\circ} \pm 5^{\circ}$  Fahrenheit and  $45 \pm 5$  percent relative humidity or for 5 to 10 minutes at  $350^{\circ}$  to  $500^{\circ}$  Fahrenheit.

4.5.2 Film thickness. The film thickness produced by the compound shall be determined in accordance with method 6181 of FED-STD-141.

#### 4.5.3 Sprayability.

4.5.3.1 Type I. A fully filled pressurized container shall be placed in a suitable cold chamber and held at a temperature of  $40^{\circ} \pm 2^{\circ}$  Fahrenheit for a period of 24 hours. At the end of this period and while still

at 40° Fahrenheit a determination shall be made of the discharge rate from the container by the following formula:

$$\text{Discharge rate (grams/second)} = \frac{\text{Weight of filled container (in grams)} - \text{Weight of container after partial discharge (in grams)}}{\text{Time of discharge (in seconds)}}$$

The time of discharge shall be that required to discharge approximately 30 grams of compound. Spray some of the compound on a vertically-positioned glass plate at a distance of about 12 inches moving the nozzle at a rate of about 1 inch per second, allow to dry 24 hours, and examine film for evenness and continuity.

4.5.3.2 Type II. A commercially available pressure-type spray gun shall be filled one-half to two-thirds full with the compound under test, placed in a suitable cold chamber, and held at a temperature of 40° ± 2° Fahrenheit for a period of 24 hours. At the end of this period, while still maintained at the temperature, a determination shall be made of the fluid flow rate from the gun, using a pressure of 35 ± 3 pounds per square inch, gage (psig), on the fluid container. For this determination, the atomizing pressure valve shall be closed and the needle travel regulator adjusted for maximum travel of the gun's trigger. A small tared weighing bottle shall be placed in front of the nozzle of the gun in position to catch the stream of fluid which flows from the gun when the trigger is pulled. After a measured time of flow, the weight of fluid in the beaker shall be determined, and the flow rate in grams per second calculated. Following this, the atomizing pressure valve shall be opened, the pattern valve turned completely in, the atomizing pressure adjusted to 40 psig maximum, and fluid pressure to a constant 35 ± 3 psig. The chilled compound shall then be sprayed on a glass plate which is held vertically and is approximately 12 inches away from the nozzle of the gun. The gun shall make one pass over the panel at the rate of 1 inch per second. The sprayed panel shall be allowed to dry for 24 hours at 40° Fahrenheit in a horizontal position. The film shall then be visually examined for continuity.

4.5.4 Coverage for type I. Weigh a fully filled, tared, pressurized container to the nearest 0.1 gram. Carefully and completely coat by spraying several square feet of surface. Reweigh container and from weight difference and square feet coated, calculate coverage of the contents of the container.

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4.5.5 Flash point. Flash point shall be determined in accordance with ASTM D1310.

4.5.6 Humidity test. Three specimens of bare aluminum alloy no. 6061, prepared as specified in 4.5.1 and suspended by corrosion resisting hooks, shall be exposed for 500 hours in a humidity cabinet constructed and operated in accordance with JAN-H-792. At the completion of the exposure period, the compound shall be considered as having passed this test if after removal no one of the panels shows more than a trace of basis metal corrosion on the leading test surface of the panel. A trace of corrosion is defined as not more than three corrosion spots, no one of which is larger than 1 millimeter in diameter. Corrosion within 1/4 inch of edges shall not be considered.

4.5.7 Salt spray test. Three specimens of each metal as shown on table II, prepared as specified in 4.5.1, shall be exposed for the periods shown on table II in accordance with salt spray procedure specified in method 6061 of FED-STD-141. Five percent salt spray shall be used. The specimens shall be mounted or suspended at approximately 6 degrees from vertical. The panels shall be examined at the end of the exposure period and evaluated as specified in 4.5.6.

4.5.8 Fungus resistance test. Three specimens of bare aluminum alloy no. 6061 prepared as specified in 4.5.1 shall be tested as outlined in MIL-E-5272.

4.5.9 Heat resistance test. Three specimens of bare aluminum alloy no. 6061 prepared as specified in 4.5.1 shall be tested as outlined in method 6051 of FED-STD-141. Specimens shall be heated for  $10 \pm 1$  minutes at  $500^\circ \pm 5^\circ$  Fahrenheit. No panel shall show evidence of cracking, peeling, flaking, or lifting. A 1/8-inch-diameter mandrel shall be used.

4.5.10 Flexibility test. Three specimens of bare aluminum alloy no. 6061 prepared as specified in 4.5.1 shall be tested as outlined in method 6221 of FED-STD-141. No panel shall show evidence of cracking, peeling, flaking, or lifting. A 1/8-inch-diameter mandrel shall be used.

4.5.11 Paint adhesion test. One specimen of bare aluminum alloy no. 6061 shall be prepared as specified in 4.5.1 and top coated with a single coat of acrylic enamel and oven cured per manufacturer's instructions. Adhesion of the paint film shall be tested per method 6303 of

FED-STD-141. There shall be no evidence of the paint's peeling, flaking, or lifting.

## 5. PREPARATION FOR DELIVERY

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

5.1.1 Type I compound. Type I compound shall be furnished in a nominal 10-fluid-ounce unlined metal can conforming to PPP-C-96 type IX, class 2. Each can shall be furnished with an aerosol valve of the spray forming category.

5.1.2 Type II compound. Either 5 US gallons  $\pm 3$  fluid ounces or  $55 \pm 1/8$  US gallons, as specified (see 6.2), shall be furnished in a nominal 5-gallon pail or a 55-gallon drum, respectively. The 5-gallon pails shall be unlined and shall conform to type 2, class 1 or 3 of PPP-P-704. Exterior coating of the pails shall be required. Wire handles or bails shall be treated to resist corrosion. The 55-gallon drums shall be unlined and shall conform to type III or IV or PPP-D-729, as specified (see 6.2). Exterior coating of the drum shall be required unless otherwise specified in the contract or order. The coating shall conform to TT-E-485.

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

5.2.1 Type I container. The compound, packaged as specified in 5.1.1, shall be packed in accordance with PPP-C-96.

5.2.2 Type II containers. Five-gallon pails and 55-gallon drums will require no packing.

5.3 Marking. In addition to any special marking specified in the contract or order, each unit container and shipping container shall be marked in accordance with MIL-STD-129. In addition, each type I container shall include directions for use and precautionary statements necessary in order to prevent injury to personnel through its use. Spray container marking shall include warnings against puncturing cans or exposing them to heat and need for adequate ventilation to avoid continuous exposure to solvent in confined spaces.

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5.3.1 Safety data sheet. When required by the contract or purchase order, the supplier shall prepare a Safety Data Sheet in accordance with MIL-STD-1341. The Safety Data Sheet shall be submitted with each shipment of compound, as specified in MIL-STD-1341.

## 6. NOTES

6.1 Intended use. The corrosion preventive compound and surface sealer covered by this specification is intended for use on nonferrous metals. It may be also used as a sealer or treatment on anodized and conversion coated metals and as a pretreatment and primer for paint-type finishes.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number, and date of this specification
- (b) Type of compound (see 1.2)
- (c) Quantity
- (d) Levels of packaging and packing (see 5.1 and 5.2)
- (e) Size and type of container required (see 5.1.2)
- (f) Marking requirements if other than as specified (see 5.3).

6.2.1 Certification. In lieu of the testing required by 4.3, the supplier may certify that material supplied meets all requirements set forth herein. Supplier shall, at time of delivery and if requested by the procurement activity, furnish certified copies of test data to the procuring activity. The certification shall include data which compare the performance of the material with all of the requirements of this specification.

6.2.2 Contract data requirements. Data specified in 5.3.1 shall be delivered as identified on a numbered DD Form 1664 when specified on a DD Form 1423 incorporated into the contract.

6.3 Supersession data. This specification includes the requirements of Purchase Description WS 13535 dated 21 August 1970.

Custodian:  
Navy - OS  
Army - MU

Preparing activity:  
Navy - OS  
(Project No. 8030-0385)

Review activities:  
Navy - OS  
Army - MU

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 22-R255
<p><b>INSTRUCTIONS:</b> 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.</p>		
<p><b>SPECIFICATION</b> MIL-C-82594, Corrosion Preventive Compound and Surface Sealer for Nonferrous Metals</p>		
<p><b>ORGANIZATION</b></p>		
<p><b>CITY AND STATE</b></p>		<p><b>CONTRACT NUMBER</b></p>
<p><b>MATERIAL PROCURED UNDER A</b></p> <p><input type="checkbox"/> DIRECT GOVERNMENT CONTRACT      <input type="checkbox"/> SUBCONTRACT</p>		
<p>1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?</p> <p>A. GIVE PARAGRAPH NUMBER AND WORDING.</p>		
<p>B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES</p>		
<p>2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID</p>		
<p>3. IS THE SPECIFICATION RESTRICTIVE?</p> <p><input type="checkbox"/> YES      <input type="checkbox"/> NO (If "yes", in what way?)</p>		
<p>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.)</p>		
<p>SUBMITTED BY (Printed or typed name and activity - Optional)</p>		<p>DATE</p>

DD FORM 1426  
1 JAN 66

REPLACES EDITION OF 1 OCT 64 WHICH MAY BE USED.

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