

NOT MEASUREMENT SENSITIVE

MIL-C-40084C  
 8 June 1990  
 SUPERSEDING  
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## MILITARY SPECIFICATION

## CORROSION PREVENTIVE COMPOUND, WATER-EMULSIFIABLE, OIL TYPE

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

## 1. SCOPE

1.1 Scope. This specification covers a fire-resistant, water-emulsifiable, oil type corrosion preventative compound to be used as a rust inhibiting coating.

## 2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

## SPECIFICATIONS

## FEDERAL

O-C-291	- Chloroform, Technical
O-M-232	- Methanol (Methyl Alcohol)
QQ-A-250/1	- Aluminum 1100, Plate and Sheet
QQ-C-576	- Copper Flat Products with Slit, Slit and Edge-Rolled, Sheared, Sawed or Machined Edges (Plate, Bar, Sheet and Strip)
QQ-P-416	- Plating, Cadmium (Electrodeposited)
QQ-S-698	- Steel; Sheet and Strip, Low Carbon
RR-S-366	- Sieve, Test
TT-N-95	- Naphtha, Aliphatic

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Director, U.S. Army Laboratory Command, Materials Technology Laboratory, ATTN: SLCMT-MEE, Watertown, MA 02172-0001 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 8030

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## MILITARY

- MIL-P-116 - Preservation, Methods of
- DOD-P-16232 - Phosphate Coatings, Heavy, Manganese or Zinc Base  
(for Ferrous Metals)

## STANDARDS

## FEDERAL

- FED-STD-141 - Paint, Varnish Lacquer and Related Materials, Methods of Inspection, Sampling and Testing
- FED-STD-313 - Material Safety Data Sheets Preparation and the Submission of
- FED-STD-791 - Lubricants, Liquid Fuels and Related Products; Methods of Testing

## MILITARY

- MIL-STD-129 - Marking for Shipment and Storage
- MIL-STD-290 - Packaging, of Petroleum & Related Products

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM B69 - Zinc Rolled
- ASTM D92 - Flash and Fire Points by Cleveland Open Cup
- ASTM D94 - Petroleum Products, Saponification Number of
- ASTM D95 - Petroleum Products and Bituminous Materials By Distillation, Water in
- ASTM D97 - Pour Point
- ASTM D445 - Liquids, Transparent and Opaque, (and the Calculation of Dynamic Viscosity)
- ASTM D482 - Petroleum Products, Ash From
- ASTM D974 - Number, Neutralization by Color-Indicator Titration

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

## UNIFORM CLASSIFICATION COMMITTEE, AGENT

Uniform Freight Classification

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(Application for copies should be addressed to the Uniform Classification Committee, Rm 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC., AGENT

National Motor Freight Classification

(Application for copies should be addressed to the American Trucking Association, Inc., Traffic Dept., 1616 P St., NW, Washington, DC 20036.)

(Non-Government standards and other publications are normally available from the organizations that prepare or 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 document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

3.1 Materials. The compound covered by this specification shall be a fraction of mineral oil compounded with additives necessary to meet the requirements of the specification. When emulsified with water it shall be free of skin formation. The compound and emulsion shall be free of detrimental odors or ingredients either harmful to handlers or adversely affecting serviceability.

#### 3.2 Physical and Chemical Properties of the Compound.

3.2.1 Flash point. The compound shall have a minimum flash point of 205°F (96°C) when tested as specified in table II.

3.2.2 Pour point. The compound shall have a maximum pour point of 32°F (0°C) when tested as specified in table II.

3.2.3 Moisture content. The maximum moisture content of the compound shall be 8.0 percent when tested as specified in table II.

3.2.4 Stability. The compound shall show no evidence of separation when stored at a temperature of 0°F (-18°C) for a minimum of 16 hours, and no evidence of gelling or separation when subsequently raised to 77° ± 5°F (25° ± 2°C) when tested as specified in 4.3.2.

3.2.5 Emulsification. The compound, as received and after one year shelf storage at 50°-100°F (10°-38°C) shall be capable of emulsification with distilled water and with synthetic hard water prepared as described in 4.3.4.1.2. The emulsions shall be free of unemulsified oil or curdy material when tested as specified in 4.3.3.

3.2.6 Corrosion stain. The compound shall not contain agents or inhibitors which will stain polished metal surfaces. The compound shall be capable of protection against corrosion and stain during compressed contact at temperatures up to 180°F (82°C) when tested as specified in 4.3.4.4.4.

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3.3 Properties of water emulsion of the compound. Water emulsions shall contain one part compound to four parts water.

3.3.1 Emulsion stability. When tested as in 4.3.4.1, the emulsion of the compound shall show no phase separation after storage at temperatures from 72°-175°F (22°-79°C). After storage, there shall be no evidence of a complete oil ring formed on the surface, nor any other evidence of phase separation. However, a slight oil film or creaming will be permitted.

3.3.2 Salt tolerance. When tested as in 4.3.4.2, the emulsion shall remain homogeneous for 24 hours after saturated sodium chloride is added. After storage at 77°F (25°C) there shall be no evidence of a complete oil ring formed on the surface, nor any other evidence of phase separation. However, a slight oil film or creaming will be permitted.

3.3.3 Sensitivity to hydrogen ion concentration. When tested as in 4.3.4.3, the emulsion shall remain homogeneous when its hydrogen ion concentration is varied between pH 11 and pH 3. After storage at 77°F (25°C) there shall be no evidence of a complete oil ring formed on the surface, nor any other evidence of phase separation. However, a slight oil film or creaming will be permitted.

3.3.4 Corrosion protection.

3.3.4.1 Humidity protection. When tested as specified in 4.3.4.4.1, the emulsion shall be capable of protecting metal parts against corrosion during continuous moisture condensation on the parts at temperatures up to 120°F (49°C). The adequacy of the compound for this purpose shall be determined using a 1 to 10 water emulsion.

3.3.4.2 Salt-spray protection. When tested as specified in 4.3.4.4.2, the emulsion shall be capable of protecting parts against corrosion during continuous moisture condensation caused by a 20 percent sodium chloride solution at a temperature of 50°F (10°C).

3.3.4.3 Wetting property. When tested as specified in 4.3.4.4.3, the emulsion shall be capable of protecting metal parts against corrosion in the presence of contamination caused by oil or grease at temperatures up to 180°F (82°C).

3.3.4.4 Corrosion stain. When tested as specified in 4.3.4.4.4, the emulsion shall not contain agents or inhibitors which will stain polished metal surfaces. The emulsion shall be capable of protection against corrosion and stain during compressed contact at temperatures up to 180°F (82°C).

3.3.4.5 Corrosion immersion. When tested as specified in 4.3.4.4.5, there shall be no corrosion inducing agents or inhibitors present in the emulsion which will produce visually evident pitting, etching, or a weight change in excess of the following. In addition, the specimens shall show no dark discoloration.

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<u>Metal</u>	<u>Milligrams per square centimeter</u>
Aluminum.....	0.2
Copper.....	0.2
Steel.....	0.2
Zinc.....	0.4
Cadmium Plate.....	0.4
Zinc Phosphate.....	0.4

3.3.5 Removability. When tested as specified in 4.3.4.5, upon completion of the corrosion protection tests, the emulsion shall be capable of removal by a naphtha solvent rinse.

3.3.6 Foaming. When tested as specified in 4.3.4.6, fifteen minutes after mixing, the foam on the surface of the emulsion shall not exceed 30 milliliters.

3.3.7 Film characteristics. The emulsion shall produce a film that does not become gummy, tacky or hard after storage at 210°F (99°C) when tested as specified in 4.3.4.7.

3.3.8 Film thickness. The emulsion shall produce a coating with a maximum film thickness of 0.002 inches when tested as specified in 4.3.4.8.

3.3.9 Film flaking. The emulsion shall produce a cohesive film capable of withstanding impact without flaking at a temperature of -65°F (-54°C), or colder, when tested as specified in 4.3.4.9.

3.4 Toxic products and formulations. The material shall have no adverse effect on the health of personnel when used for its intended purpose. Questions pertinent to this effect shall be referred by the contracting activity to the appropriate departmental medical service who will act as an advisor to the contracting agency (see 4.4).

#### 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 (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase 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 this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for

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acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Sampling and inspection. Sampling and inspection shall be performed in accordance with method 1022 of Fed. Test Method Std. No. 141.

4.2 Classification of tests. All tests required for the testing of this material are classified as quality conformance tests, except the one year storage emulsification and the humidity protection tests.

4.3 Test methods.

4.3.1 Test conditions. The routine and referee testing conditions shall be in accordance with Section 7 of Fed. Test Method Std. No. 141, except as otherwise specified herein. Failure of any test result to fall within the ranges specified in 3.2, 3.3 or as applicable, shall constitute failure of the applicable test.

4.3.1.1 Test procedures. The following tests (see table II) shall be conducted in accordance with Fed. Test Method Std. No. 791 or designated ASTM Methods and as specified herein. The right is reserved to make any additional tests deemed necessary to determine that the material meets the requirements of this specification.

TABLE II Test methods.

Test	ASTM Method
Flash and Fire Points	ASTM D92
Saponification Number	ASTM D94
Moisture Content	ASTM D95
Pour Point	ASTM D97
Viscosity At 100°F (38°C)	ASTM D445
Ash Content	ASTM D482
Neutralization Number	ASTM D974

4.3.2 Stability test. Fifty milliliters of compound shall be placed into a tall form, 4 oz sample bottle. The bottle shall be stoppered and subjected to a temperature of 0°F (-18°C) for 16 hours. The compound shall then be examined for evidence of phase separation. The compound shall be warmed to 77° + 5°F (25° + 2°C) and examined for phase separation or gelling. Non-conformance to 3.2.4 shall constitute failure of the test.

4.3.3 Emulsification tests. Place 80 milliliters of distilled water maintained at 77° + 5°F, (25° + 2°C) into a 150 milliliter graduated cylinder. Within 2 minutes add 20 milliliters of compound into the water. Lower a stirring paddle with dimensions approximately 3/4 by 1/16 by 4-3/8", attached to a stirring apparatus, to within "1/4 of the bottom" of the cylinder and stir for



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5 minutes at 500 revolutions per minute (RPM). A similar emulsion shall be prepared utilizing synthetic hard water prepared as described in 4.3.4.1.2. Non-conformance to 3.2.5 shall constitute failure of test.

4.3.4 Tests on the properties of the emulsions. Except as otherwise specified, a sufficient quantity of 1:4 emulsion shall be prepared by mixing for 5 minutes at 500 RPM with a stirring paddle as described in 4.3.3.1. The emulsion shall be subjected to the following physical and chemical tests.

4.3.4.1 Emulsion stability test.

4.3.4.1.1 Preparation of the emulsions. Two emulsions shall be used for the stability test. One emulsion shall be prepared with distilled water and the other emulsion shall be prepared with synthetic hard water as specified in 4.3.4.1.2.

4.3.4.1.2 Synthetic hard water. Dry several grams of special reagent calcium carbonate ( $\text{CaCO}_3$ ) powder, low in heavy metals, alkalies and magnesium at  $225^\circ + 5^\circ\text{F}$  ( $107^\circ + 2^\circ\text{C}$ ) until a constant weight is obtained. Weigh 0.125 grams into a 5 milliliter volumetric flask and slowly add dilute hydrochloric acid (HCl) until the powder is dissolved. Add 200 milliliters of distilled water and boil until the carbon dioxide ( $\text{CO}_2$ ) has been expelled. Cool the solution to  $77^\circ + 5^\circ\text{F}$  ( $25^\circ + 2^\circ\text{C}$ ), add several drops of methyl red indicator and adjust to an intermediate orange color by adding dilute ammonium hydroxide or dilute HCl as required. Add distilled water to the 500 milliliter mark on the flask. Dilute this solution with an equal amount of distilled water in order to produce hard water containing 125 parts per million  $\text{CaCO}_3$ .

4.3.4.1.3 Test procedure. The emulsions shall be placed in separate 150 milliliter graduated cylinders, stored for 24 hours at  $77^\circ + 5^\circ\text{F}$  ( $25^\circ + 2^\circ\text{C}$ ) and examined for phase separation. They shall then be placed in a temperature of  $175^\circ + 5^\circ\text{F}$  ( $80^\circ + 2^\circ\text{C}$ ), for 24 hours. At the end of the  $77^\circ\text{F}$  ( $25^\circ\text{C}$ ) and  $175^\circ\text{F}$  ( $79^\circ\text{C}$ ) storage period, examine for evidence of a complete oil ring on the surface, or any other evidence of phase separation. Non-conformance to 3.3.1 shall constitute failure of this test.

4.3.4.2 Salt tolerance test. Place 100 milliliters of emulsion into a 200 milliliter Florence flask and add dropwise 0.5 milliliter of saturated sodium chloride solution. Cork and shake vigorously. Store for 25 hours at  $77^\circ + 5^\circ\text{F}$  ( $25^\circ + 2^\circ\text{C}$ ). After storage, examine for evidence of a complete oil ring on the surface, or any other evidence of phase separation. Non-conformance to 3.3.2 shall constitute failure of this test.

4.3.4.3 Test for pH sensitivity. Place 20 milliliters of emulsion into each of two 3 by 15 centimeter test tubes. One normal (1N) ammonium hydroxide is added dropwise with agitation from a burette to one emulsion until it indicates pH 11. The pH of the emulsion is determined by use of hydriion pH paper. In the same manner add 1N hydrochloric acid to other emulsion until it indicates pH 3. Shake the two test tubes and store for 24 hours at  $77^\circ + 5^\circ\text{F}$  ( $25^\circ + 2^\circ\text{C}$ ). After storage examine for evidence of a complete oil ring on the surface, or any other evidence of phase separation. Non-conformance to 3.3.3 shall constitute failure of this test.

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4.3.4.4 Corrosion protection tests. Except as otherwise specified, a sufficient quantity of 1:4 emulsion shall be prepared by mixing for 5 minutes at 500 RPM with a stirring paddle as described in 4.3.4.4.1.

4.3.4.4.1 Humidity protection tests.

4.3.4.4.1.1 Test panels. The test panels shall be 2 by 4 by 1/8"; cold rolled steel conforming to QQ-S-698. Badly rusted stock shall not be used for making test panels. The edges of the panels shall be rounded and suspension holes reamed prior to cleaning.

4.3.4.4.1.2 Cleaning test panels. The test surfaces of the panels shall be cleaned with naphtha conforming to TT-N-95 and methanol conforming to O-M-232, Grade A, as follows:

- (a) While cleaning the test panels, they shall be handled with hooks or forceps at all times. All precautions shall be taken to guard against impurities on the test panels by avoiding contact with any type of contaminated surfaces. The utensils and solvents used must be clean and free from contamination.
- (b) The solvents shall be maintained at a temperature high enough to keep the temperature of the panels above the dew point during handling operations when they are not submerged in solvent or stored in a desiccator.
- (c) Wipe the surfaces clean with solvent soaked rags and scrub with surgical gauze swabs in a beaker of hot naphtha.
- (d) Rinse in a beaker of hot methanol. Air dry the panels and store in a desiccator until further processing.

4.3.4.4.1.3 Sandblasting test panels. Test panels shall be sandblasted to a fresh, uniformly, abraded surface with clean white, dry, sharp sand, or a size that will allow all of it to pass through a number 10 sieve conforming to RR-S-366, a minimum of 90 percent to pass through a number 20 sieve and not more than 10 percent to pass through a number 50 sieve. Immediately after sandblasting, the panels shall be placed into a container of anhydrous methanol. Remaining residue and contamination shall be removed by holding the panels in a rack at 25° from the vertical and spraying downward with naphtha. Flush the test surfaces progressively downward, spraying first the test surface, then the back of the panel and the test surface again. The panels shall then be rinsed in hot naphtha and hot methanol. After the panels are dry they shall be stored in a desiccator and used the same day as prepared.

4.3.4.4.1.4 Test procedure. Three test panels shall be immersed in an emulsion of 1 part compound to 10 parts distilled water prepared by mixing for 5 minutes at 500 RPM.

The panels shall be suspended by means of stainless steel or monel hooks and drained for 2 hours at 77° + 50°F (25° + 20°C). The panels shall then be subjected to 30 days humidity cabinet test at conditions of 95 percent humidity and 100°F (38°C). At the end of the test, no more than 3 corrosion dots, none of which exceeds 1 millimeter (mm) in diameter, shall be evident on the



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combined surfaces of the test panels. Non-conformance to 3.3.4.1 shall constitute failure of this test.

#### 4.3.4.4.2 Salt spray test.

4.3.4.4.2.1 Test panels. Three 2 by 4 by 1/8 inch test panels of the same material and prepared in the same manner as those used in the humidity protection test (see 4.3.4.4.1) are required.

4.3.4.4.2.2 Test procedure. The test panels shall be immersed in the emulsion for 15 seconds without agitation. The panels shall be suspended by means of stainless steel or monel hooks and drained for 2 hours at  $77^{\circ} + 50^{\circ}\text{F}$  ( $25^{\circ} + 20^{\circ}\text{C}$ ). The panels shall then be subjected to 72 hours of the Protection Salt Spray (Fog) test, method 4001.1, Federal Test Method Standard No. 791. At the end of the test, no more than three corrosion dots, none of which exceeds 1 mm in diameter, shall be evident on the combined surfaces of the test panels. Non-conformance to 3.3.4.2 shall constitute failure of this test.

#### 4.3.4.4.3 Wetting property test.

4.3.4.4.3.1 Test panels. Three 2 by 4 by 1/8 inch test panels of the same size and material and cleaned in the same manner as those used in the humidity protection test 4.3.4.4.1 are required.

4.3.4.4.3.2 Polishing test panels. Test panels shall be polished to  $15 \pm 5$  microinches (RMS) using 280 grit aluminum oxide or silicon carbide abrasive, having cloth or paper backing. (The use of "wet or dry" paper or cloth is not permitted.) Wipe off superficial dust and rub the abraded surface with 3 inch surgical gauze held in a blotter holder until there is no dark stain on a clean section of cloth. Remaining residue and contamination shall be removed by holding the panels in a rack at  $25^{\circ}$  from the vertical and spraying downward with naphtha. Flush the test surfaces progressively downward, spraying first the test surface, then the back of the panel and the test surface again. The panels shall then be rinsed in hot naphtha and hot methanol. After the panels are dry, store in a desiccator and use the same day as prepared.

4.3.4.4.3.3 Test procedure. On the center of each panel, using a cork 1 inch in diameter, place an imprint of SAE 30 grade, non-inhibited, lubricating oil. Immerse the panel for 15 seconds without agitation in the emulsion maintained at  $175^{\circ} + 50^{\circ}\text{F}$  ( $80^{\circ} + 20^{\circ}\text{C}$ ). Suspend the panels by means of stainless steel or monel hooks and drain in a forced draft oven for 1 hour at  $180^{\circ} + 50^{\circ}\text{F}$  ( $82^{\circ} + 20^{\circ}\text{C}$ ). Cool for 2 hours at  $77^{\circ} + 50^{\circ}\text{F}$  ( $25^{\circ} + 20^{\circ}\text{C}$ ). The panels shall then be subjected to 200 hours of the humidity cabinet test as specified in 4.3.4.4.1.4. At the end of the test only the imprinted areas shall be examined for corrosion. No more than three corrosion dots, none of which exceed 1 mm in diameter, shall be evident in the combined imprinted areas of the test panels. Non-conformance to 3.3.4.3 shall constitute failure of this test.

#### 4.3.4.4.4 Corrosion stain test.

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4.3.4.4.4.1 Test specimens. The test specimens used for the corrosion stain test shall be 0.975 inch in diameter and 1/16 inch thick. They shall be of the same material and cleaned in the same manner as specified for the humidity protection test (4.3.4.4.1).

4.3.4.4.4.2 Polishing test specimens. The test specimens shall be polished by use of a slow speed, horizontal metallurgical polishing wheel, with the final polishing being done with 280 grit silicon carbide or aluminum oxide paper moistened with naphtha. The specimen shall be held in a suitable holder to avoid contact with the operator's hands. The specimens shall then be cleaned with hot naphtha and rinsed in warm anhydrous methanol. After the specimens are dry they shall be stored in a desiccator and used the same day as prepared.

4.3.4.4.4.3 Test procedure. Four test specimens shall be used for the test. Using a spatula the polished surface of one of the specimens shall be coated by smearing with approximately 1/64 inch film of the compound. A similar specimen is placed on top with the compound sandwiched between the two polished surfaces. In the same manner sandwich 0.5 cubic centimeter (cc) of the emulsion between the polished surfaces of the other two test specimens. Align the edges of the specimens and place a 100-gram weight on top of each sandwich for a period of 60 seconds. Place the sandwiches in a rack which will prevent the specimens from slipping out of alignment and place in a forced draft oven for 24 hours at 180° + 50°F (82° + 2°C). At the end of the heating period the specimens shall be removed and processed as follows: (1) remove the coatings with a spatula and wipe the specimens with a cloth, (2) dip the specimens in hot naphtha and wipe them with chloroform conforming to O-C-291 soaked cloth, (3) rinse in hot naphtha, (4) rinse in hot methanol, (5) store in a desiccator until cool. After the specimens have cooled, they shall be examined for stain. Non-conformance to 3.3.4.4 shall constitute failure of this test.

#### 4.3.4.4.5 Corrosion immersion test.

4.3.4.4.5.1 Test specimens. The corrosion immersion tests shall be conducted with 1 by 2 by 1/4 inch specimens of metal conforming to the following: Aluminum, QQ-A-250/1; Copper, QQ-C-576; Steel, QQ-S-698; and Zinc, ASTM B69.

4.3.4.4.5.2 Preparation of test specimens. One each of the aluminum, copper, steel, and zinc specimens shall be cleaned as specified for the humidity cabinet test (see 4.3.4.4.1) and polished as specified for the corrosion stain test (see 4.3.4.4.2). In addition, one steel specimen shall be cadmium plated in accordance with QQ-P-416, Type I, Class 1. One steel specimen shall be zinc phosphate coated in accordance with MIL-P-16232, Type Z, Class 4. The cadmium plated and zinc phosphated specimens shall not be polished, however, they shall be cleaned as specified for corrosion stain test (4.3.4.4.2).

4.3.4.4.5.3 Test procedure. Weigh each specimen and place in a wide mouth jar approximately 3 inches in diameter and fitted with a screw cap. A suitable means should be used to ensure that the specimens do not touch each other. Cover the specimens with 300 milliliters of the emulsion. The sealed

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jar shall then be placed in an oven maintained at  $130^{\circ} + 5^{\circ}\text{F}$  ( $54^{\circ} + 2^{\circ}\text{C}$ ) for 7 days. Upon completion of the test, remove the compound and any corrosion products from the specimens by swabbing with naphtha, followed by methanol, employing surgical gauze pads. Follow each swabbing operation by a rinse in clean solvent. Reweigh the specimens and calculate the change in weight in milligrams per square centimeter. Non-conformance to 3.3.4.5 shall constitute failure of this test.

4.3.4.5 Removability test. The test panels used in the corrosion protection tests 4.3.4.4 shall be rinsed by agitating for approximately 1 minute in solvent conforming to Specification TT-N-95 to assure ease of removal. Non-conformance to 3.3.5 shall constitute failure of this test.

4.3.4.6 Foaming test. Prepare 100 milliliters of emulsion exactly as described in 4.3.3 except the emulsion shall be stirred at 1500 RPM. Non-conformance to 3.3.6 shall constitute failure of this test.

4.3.4.7 Film characteristics test. Coat a 1/2 by 3 by 1/32 inch glass panel with emulsion and drain at a 45 degree angle for 24 hours at  $77^{\circ} + 5^{\circ}\text{F}$  ( $25^{\circ} + 2^{\circ}\text{C}$ ). Store the panel in a horizontal position in an oven for 24 hours at  $210^{\circ} + 5^{\circ}\text{F}$  ( $99^{\circ} + 2^{\circ}\text{C}$ ). Non-conformance to 3.3.7 shall constitute failure of this test.

4.3.4.8 Film thickness test. Dip a weighed test panel that has been polished with a 280-grit polishing medium so that an area approximately 2 by 3 inches is coated with corrosion preventive. Allow the panel to drain and dry in a vertical position for 16 hours at  $77^{\circ} + 5^{\circ}\text{F}$  ( $25^{\circ} + 2^{\circ}\text{C}$ ). Provision shall be made to eliminate the bead produced on the bottom of the test panel. Weigh the panel and calculate the thickness of the dry film as follows:

$$\text{Film thickness (inches)} = \frac{W-P}{2.54 DA}$$

where:

W = Weight of panel plus film (gm)

P = Tare weight of panel (gm)

D = Density of corrosion prevention (gm/ml) determined by any convenient means

A = Area covered by film on both sides of panel (sq cm)

Non-conformance to 3.3.8 shall constitute failure of this test.

4.3.4.9 Film flaking test. Two 2 by 4 by 1/8" polished steel panels, prepared as specified in 4.3.4.4.1.1, 4.3.4.4.1.2, and 4.3.4.4.1.3 shall be immersed in the emulsion for 15 seconds, drained for 2 hours at  $77^{\circ} + 5^{\circ}\text{F}$  ( $25^{\circ} + 2^{\circ}\text{C}$ ) and stored for 3 hours at  $-65^{\circ} + 3^{\circ}\text{F}$  ( $-54^{\circ} + 2^{\circ}\text{C}$ ). Immediately after removing the panels from storage each panel shall be dropped 3 times from a distance of 4 feet so the bottom edge of the panel strikes a metal surface. Non-conformance to 3.3.9 shall constitute failure of this test.

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4.4 Toxicological product formulations. The contractor shall have the toxicological product formulations and associated information available for review by the contracting activity to evaluate the safety of the material for the proposed use (see 3.4).

4.5 Inspection of packaging. Except when commercial packaging is specified, the sampling and inspection of the preservation and interior package marking shall be in accordance with groups A and B quality conformance inspection requirements of MIL-P-116. The sampling and inspection of the packing for shipment and storage shall be in accordance with the quality assurance provisions of the applicable container specification shown in section 5. The inspection of marking for shipment and storage shall be in accordance with MIL-STD-129. The inspection of commercial packaging shall be as specified in the contract (see 6.2).

## 5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-STD-290. The level of packaging shall be A or C and the level of packing shall be A, B, or C as specified (see 6.2).

5.2 Marking. Marking shall be in accordance with MIL-STD-129. Each container shall be legibly marked with the following instructions:

"Distilled or de-ionized water should be used in emulsifying this compound."

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The water emulsifiable corrosion preventive compound covered by this specification is intended for use whenever a low-cost, fire-resistant, soft-film, corrosion preventive can be utilized. The compound is formulated to be emulsified in distilled or de-ionized water, normally at a 1 to 4 ratio, reducing the volatile content of the corrosion preventive to a minimum. Maximum corrosion resistance is obtained as a dry finish over zinc phosphated surfaces at 20 to 30% by volume concentration. Immersion is used for maximum protection, however, spraying at low concentrations can be used for in-plant protection of metal surfaces. It is designed to be used over massive zinc phosphated coatings to produce a dry-to-touch corrosion resistant film. It has proven efficient for use on small hardware or parts of uniform contour. Overheating for extended periods of time will reduce the efficiency of the emulsifiers. When using at 120°-140°F, (49°-60°C) 3 minutes is optimum.

6.2 Acquisition Requirements. Acquisition documents must specify the following:

- (a) Title, number and date of this specification.
- (b) Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.).

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(c) Degree of packing and packaging required (see 5.1)

6.3 Conditions for use of level B preservation. When level B preservation is specified (see 5.1), this level of protection should be reserved for the acquisition of (name of commodities) for resupply worldwide under known favorable handling, transportation, and storage conditions.

6.4 Material Safety Data Sheets. Contracting officers will identify those activities requiring copies of completed Material Safety Data Sheets prepared in accordance with FED-STD-313. The pertinent Government mailing addresses for submission of data are listed in FED-STD-313.

6.5 Subject term (key word) listing.

Corrosion                      Rust Inhibiting  
Coating

6.6 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:

Army - MR  
Navy - AS

Preparing activity:

Army - MR

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Review activities:

Army - AV, GL, ME, AT, SM  
Navy - AS, SA

User activities:

Army - AR, AL  
Navy - MC, SH, YD, SA