P-C-610A
May 29, 1969
SUPERSEDING
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September 10, 1964

FEDERAL SPECIFICATION

CORROSION REMOVING COMPOUND; SCALE REMOVER (PHOSPHORIC ACID BASE)

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE

1.1 This specification covers a scale and corrosion removing compound for use in removing soil, scale and corrosion in the cleaning of metal surfaces (see 6.1).

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.

Federal Specifications:

QQ-A-250/GEN - (General Specification) Aluminum and Aluminum Alloy Plate and Sheet.
QQ-A-250/2 - Aluminum Alloy 3003, Plate and Sheet.
QQ-S-766 - Steel Plates, Sheets, and Strip - Corrosion Resisting.
TT-E-485 - Enamel, Semi-Gloss, Rust-Inhibiting.

Federal Standards:

Fed. Std. No. 123 - Marking for Domestic Shipment (Civilian Agencies).
Fed. Std. No. 595 - Colors.

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.

(Single copies of this specification and other Federal specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, D.C., Atlanta, Chicago, Kansas City, Mo., Fort Worth, Denver, San Francisco, Los Angeles, and Seattle, Washington.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Specification:

MIL-D-40030 - Drums, Plastic, Molded Polyethylene.

Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129 - Marking for Shipment and Storage.

(Copies of Military Specifications and Standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

Laws and Regulations:

21 CFR 191.1 Federal Hazardous Substances Act

(The Code of Federal Regulations (CFR) and the Federal Register (FR) are for sale on a subscription basis by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. When indicated, reprints of certain regulations may be obtained from the Federal agency responsible for issuance thereof.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials (ASTM) Standard:

D 1331 - Methods of Test for Surface and Interfacial Tension of Solutions of Surface-Active Agents.

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

National Classification Board:

National Motor Freight Classification.

(Application for copies shall be addressed to the National Classification Board, 1616 P Street, N. W., Washington, D. C. 20036.)

Uniform Classification Committee:

Uniform Freight Classification.

(Application for copies shall be addressed to the Uniform Classification Committee, 202 Union Station, 516 West Jackson Boulevard, Chicago, Illinois 60606.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. REQUIREMENTS

3.1 Composition. The corrosion removing compound shall consist of an aqueous solution of phosphoric acid, a surfactant, and a corrosion inhibitor, and shall conform to the requirements as shown in table I.

TABLE I. Chemical requirements

Composition	Percent by weight
Phosphoric acid (as H_3PO_4) minimum	56.0
Mineral acids other than phosphoric	None
Surfactant	Present 1/

1/ Presence of surfactant is indicated by conformance with 3.4.

3.2 Stability.

3.2.1 Undiluted. The undiluted corrosion removing compound shall be clear, homogeneous, and free from suspended matter and sediment. It shall show no phase separation, cloudiness or sludge formation when tested as specified in 4.2.3.

3.2.2 Diluted. The corrosion removing compound diluted with water shall show no phase separation when tested as specified in 4.2.3.

3.3 Corrosion. The corrosion removing compound shall not corrode the metals shown in table II to a greater extent than that specified, when tested as specified in 4.2.3.

3.4 Surface tension. A one percent solution by volume of the corrosion removing compound in distilled water shall have a surface tension of not more than 38 dynes per centimeter at 25°C. when tested as specified in 4.2.3.

TABLE II. Corrosive effect on metals

Metal	Concentration of cleaner			
	1gm/250ml,	2 percent by weight	10 percent by weight	20 percent by weight
	Loss of weight of metal in milligrams per day per square decimeter			
Aluminum alloy 3-S sheet bright surface temper H-14, QQ-A-250/2	8.2	28	370	780
Brass, yellow	63	56	37	37
Bronze, commercial hardware	16	17	32	30
Copper	15	16	17	26
Cast Iron	52	170	1410	2100
Steel 1010	60	190	1010	1900
Steel, corrosion resisting sheet standard polish, class 304, QQ-S-766.	3.6	3.2	1.7	6.3

3.5 Labeling. The head of each drum of corrosion removing compound shall be durably and legibly marked in accordance with the Federal Hazardous Substances Act and the following:

"CORROSION REMOVING COMPOUND; SCALE REMOVER

(PHOSPHORIC ACID BASE)

Specification Number
Name of Manufacturer
Federal Stock Number
Contents
Contract Number

DIRECTIONS FOR USE

Dilute one part of corrosion removing compound with four parts of water by weight. Heat to 160° - 180°F."

3.5.1 Precautionary marking.

"CAUTION"

KEEP OUT OF REACH OF CHILDREN.

Causes skin irritation. Avoid contact with skin and eyes. In case of contact, flush skin or eyes with plenty of water for at least fifteen minutes. For eyes, obtain medical attention immediately. Items coming in contact with food must be rinsed with liberal amounts of potable water following treatment."

3.6 Toxicity. The corrosion removing compound shall have no adverse effects on the health of personnel when used for its intended purpose. Questions pertinent to this effect shall be referred by the procuring agency to the appropriate departmental medical service which will act as advisor to the procuring agency.

3.7 Workmanship. The corrosion removing compound shall be a clean, homogeneous liquid, uniform in appearance, and free from foreign matter. The corrosion removing compound shall conform to the quality established by this specification.

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, the supplier may utilize his own facilities or any commercial laboratory acceptable to 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 prescribed requirements.

4.2 Inspection. Sampling for inspection shall be performed in accordance with MIL-STD-105, except where otherwise indicated hereinafter.

4.2.1 Inspection of materials and components. In accordance with 4.1 above, components and materials shall be inspected and tested in accordance with all the requirements of referenced specifications and standards unless otherwise excluded, amended, modified or qualified in this specification or applicable purchase documents.

4.2.2 Inspection of the end item.

4.2.2.1 Examination of the end item. The end item shall be examined for the defects in the applicable subparagraphs at the inspection levels and acceptable quality levels (AQL's) set forth in 4.2.2.1.5. Random samples shall be drawn from each lot of end items offered for inspection. The lot size, for purposes of determining the sample size in accordance with MIL-STD-105, shall be expressed in units of filled unit containers of the same capacity for the examinations in 4.2.2.1.1, 4.2.2.1.2 and 4.2.2.1.3 and in units of shipping containers for the examination in 4.2.2.1.4.1.

4.2.2.1.1 Examination of the container for visual defects in construction and marking. The sample unit for this examination shall be one filled container.

Examine	Defects
Construction	Not in container specified. Any leakage or seepage of contents. Any split, break, dent, hole, tear, puncture or other defect. Seams or closures not as specified Polyethylene drum liner missing.
Exterior coating	Not in accordance with requirements. Not color specified.
Markings (Label or printing)	Omitted, illegible, incorrect, incomplete, not in accordance with requirements. Label or printing not clear, smeared, ink not as specified. Directions for use or precautionary marking not as specified (see 3.5 and 5.2).

4.2.2.1.2 Examination for defects in net contents. The sample unit for this examination shall be one filled container. The quality of the lot shall be unacceptable if the average net content per container is less than the specified or indicated quantity.

4.2.2.1.3 Examination of corrosion removing compound for defects in workmanship. The sample unit for this examination shall be the contents of one filled container.

Examine	Defects
Workmanship	Not in liquid form. Not homogeneous. Not clean; not uniform; any foreign matter.

4.2.2.1.4 Examination of preparation for delivery.

4.2.2.1.4.1 Examination for packaging, packing and marking. An examination shall be made to determine that packaging, packing, and markings comply with the requirements of section 5 of this specification. Defects shall be scored in accordance with the list below. The sample unit for this examination shall be one shipping container fully prepared for delivery, and need not be sealed. Shipping containers fully prepared for delivery shall be examined for defects of closure. The lot size shall be the number of shipping containers in the end item inspection lot.

Examine	Defects
Markings (exterior and interior)	Omitted; incorrect; illegible; of improper size, location, sequence, or method of application.
Materials	Any component missing. Any component damaged.
Workmanship	Improper closure of shipping container. Bulged or distorted container.

4.2.2.1.5 Inspection levels and acceptable quality levels (AQL's) for examinations. The inspection levels, for determining the sample size, and the acceptable quality levels (AQL's), expressed in defects per 100 units, shall be as follows:

Examination paragraph	Inspection levels	AQL's
4.2.2.1.1	S-2	2.5
4.2.2.1.2	S-2	---
4.2.2.1.3	S-2	1.5
4.2.2.1.4	S-2	2.5

4.2.3 Testing of the end item. The end item shall be tested for the characteristics listed in table IV. The sample unit shall be one quart. Each sample unit shall be drawn from a different container in the lot. All requirements are applicable to the sample unit. The number of determinations per sample unit shall be as follows:

For corrosion at each solution strength - Average of 3
All other characteristics - As indicated

The lot size for purposes of sampling shall be expressed in units of one gallon each. The sample size shall be as indicated in table III. The lot shall be unacceptable if there is any evidence of failure of any characteristic to meet the requirement specified.

TABLE III. Sampling for end item testing

Lot size (gallons)	Sample size
800 or less	2
801 up to and including 22,000	3
22,001 or more	5

TABLE IV. Instructions for testing of the end item.

Characteristic	Specification Reference		Number Determination Per Sample Unit	Results Reported As	
	Requirement	Test Method		Pass or Fail	Numerically to Nearest
Stability:					
Undiluted	3.2.1	4.3.1.1	1	X	
Diluted with water	3.2.2	4.3.1.2	1	X	
Corrosion:					
Aluminum alloy - 3S - H14	Table II	4.3.2			
1 g. per 250 ml. solution					mg.
2 percent solution					mg.
10 percent solution					mg.
20 percent solution					mg.
Brass, yellow	Table II	4.3.2			
1 g. per 250 ml. solution					mg.
2 percent solution					mg.
10 percent solution					mg.
20 percent solution					mg.
Bronze, commercial hardware	Table II	4.3.2			
1 g. per 250 ml. solution					mg.
2 percent solution					mg.
10 percent solution					mg.
20 percent solution					mg.
Copper	Table II	4.3.2			
1 g. per 250 ml. solution					mg.
2 percent solution					mg.
10 percent solution					mg.
20 percent solution					mg.

TABLE IV. Instructions for testing of the end item. (con.)

	Specification Reference		Number Determination Per Sample Unit	Results Reported As	
	Requirement	Test Method		Pass or Fail	Numerically to Nearest
Cast iron	Table II	4.3.2			
1 g. per 250 ml. solution					mg.
2 percent solution					mg.
10 percent solution					mg.
20 percent solution					mg.
Steel 1010	Table II	4.3.2			
1 g. per 250 ml. solution					mg.
2 percent solution					mg.
10 percent solution					mg.
20 percent solution					mg.
Steel, corrosion resisting: Sheet 304	Table II	4.3.2			
1 g. per 250 ml. solution					mg.
2 percent solution					mg.
10 percent solution					mg.
20 percent solution					mg.
Surface tension	3.4	4.3.3	Average of 2		dyne
Phosphoric acid content	Table I	4.3.4	Average of 2		percent
Mineral acids other than phosphoric acid	Table I	4.3.5	Average of 2	X	

4.3 Test methods.

4.3.1 Stability.

4.3.1.1 Undiluted. Place 100 mls. of undiluted corrosion removing compound in an unstoppered, 100 ml. graduated cylinder, and allow to stand for 72 hours at room temperature ($75^{\circ} \pm 5^{\circ}$F.). Examine for sludge, sediment, cloudiness or phase separation.

4.3.1.2 Diluted. Add 20 mls. of the corrosion removing compound to a 100 ml. graduated cylinder and fill to the mark with synthetic hard water (5 to 7 grains hardness). Shake well and note if any separation occurs. Synthetic hard water shall be prepared by dissolving 0.141 grams calcium chloride dihydrate ($CaCl_2 \cdot 2H_2O$) and 0.048 grams magnesium chloride hexahydrate ($MgCl_2 \cdot 6H_2O$) in distilled water and diluting to 1 liter.

4.3.2 Corrosion. Prepare test panels of the applicable metals shown in table II. The panels may vary in size from 3 to 5 square inches of surface. The surface areas shall be evenly abraded with 3/0 emery cloth and thoroughly cleaned with suitable solvents until distilled water will uniformly wet the surface of the specimen. Accurately measure the surface area in square decimeters to the second decimal. Dry specimen in an oven at $105^{\circ} \pm 2^{\circ}$C. to constant weight. Record the weight of the specimen in milligrams. Place each panel vertically in a glass container and add 100 mls. of prepared solution having a concentration shown in table II. The container, equipped with lid and sealed during the test or otherwise covered, shall be of such size that the solution will completely cover the test panel. Permit the containers to stand for 96 hours at $71^{\circ} \pm 1^{\circ}$C. Do not stir the solution during this period. At the end of 96 hours remove the panels, rinse them thoroughly with distilled water and dry in an oven at $105^{\circ} \pm 2^{\circ}$C. to constant weight. Record the weight in milligrams. Compute the loss in weight in milligrams per square decimeters per day (24 hours).

4.3.3 Surface tension. The surface tension shall be determined in accordance with ASTM D 1331.

4.3.4 Phosphoric acid content. Weigh a 5 ± 0.01 g. sample of the undiluted corrosion removing compound into a 250 ml. pyrex beaker. To the beaker, add 2 mls. of phenolphthalein indicator (prepared as a 0.1 percent solution in 90 percent ethyl alcohol by dissolving 0.1 g. of phenolphthalein powder in 100 mls. of 90 percent ethyl alcohol). Titrate the cleaner sample with standard 1 N sodium hydroxide to a permanent pink end point. Calculate the percent phosphoric acid (H_3PO_4) as follows:

4.3.4.1 Calculation.

$$\text{Percent } H_3PO_4 = \frac{4.9 \times A \times N}{S}$$

Where: N = normality of standard sodium hydroxide.
A = milliliters sodium hydroxide to phenolphthalein end point.
S = sample weight in g.

4.3.5 Mineral acids other than phosphoric acid. Repeat the titration procedure as in 4.3.4 except that 2 mls. of bromophenol blue indicator (prepared as a 0.1 percent neutralized aqueous solution) shall be used in place of the phenolphthalein indicator.

1/2 A must equal B $\pm$ 0.5 milliliter

Where: A = milliliter sodium hydroxide to phenolphthalein end point.
B = milliliter sodium hydroxide to bromophenol blue end point.

5. PREPARATION FOR DELIVERY

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

5.1.1 Level A. Fifty-three gallons of corrosion removing compound shall be filled into a style B, size 4 polyethylene drum conforming to MIL-D-40030. Each filled drum shall be packed in accordance with the appendix thereto. The exterior of each metal drum shall be coated overall with an enamel conforming to TT-E-485. The color shall match color No. X24087 of Fed. Std. No. 595.

5.1.2 Level C. The corrosion removing compound shall be packed in a manner to insure carrier acceptance and safe delivery at destination at the lowest transportation rate for such supplies. Containers shall be in accordance with Uniform Freight Classification Rules or National Motor Freight Classification Rules, as applicable.

5.2 Marking.

5.2.1 Civil agencies. In addition to labeling specified in 3.5 and any special marking required by the contract or order, shipping containers shall be marked in accordance with Fed. Std. No. 123.

5.2.2 Military agencies. In addition to labeling specified in 3.5, and any special marking required by the contract or order, shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The corrosion removing compound covered by this specification is intended for use as a soil, scale and corrosion remover in the cleaning of certain metal surfaces. This cleaner should not be used for cleaning zinc-coated or plated items, nor used as a metal conditioner for subsequent surface coating.

6.1.1 Application. The corrosion removing compound (liquid) when used at the recommended concentration and temperature will satisfactorily remove water deposits, products of corrosion, and certain types of food stains from metal surfaces (see 6.1). However, food stains not removed by the above treatment can be removed by a pretreatment in a hot alkaline bath followed by a water rinse. The solutions used in the pretreatment should have no greater corrosive action on the metal than the corrosion removing compound.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

(a) Title, number and date of this specification.
(b) Selection of applicable levels of packing (see 5.1).
(c) Marking required (see 5.2).

MILITARY INTEREST:

Custodians:

Army - GL
Navy - AS
Air Force - 68

Review activities:

Army - GL, MD, MU, SM
Navy - AS, MS
Air Force - 68, 03

User activities:

Army - MI
Navy - YD

Preparing activity:

Army - GL

CIVIL AGENCIES INTEREST:

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Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See section 2 of this specification to obtain extra copies and other documents referenced herein. Price 10 cents each.

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 22-R255

INSTRUCTIONS: This sheet is to be filled out by personnel, either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements.

SPECIFICATION

P-C-610A Corrosion Removing Compound; Scale Remover (Phosphoric Acid Base)

ORGANIZATION

CITY AND STATE

CONTRACT NUMBER

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

☐ YES ☐ NO *(If "yes", in what way?)*

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

SUBMITTED BY *(Printed or typed name and activity - Optional)*

DATE

DD FORM 1 JAN 66 1426

REPLACES EDITION OF 1 OCT 64 WHICH MAY BE USED.

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