METRIC

MIL-R-53086
8 November 1988

MILITARY SPECIFICATION

RUST CONVERTER, METRIC

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

1. SCOPE

1.1 Scope. This specification covers rust converting compounds, for application on rusted steel surfaces of military items.

1.2 Classification. The compound covered by this specification shall be of the types specified below. Unless otherwise specified herein, all requirements and inspections apply to all type I, II and III compounds (see 6.2).

Type I - Tannic acid based.
Type II - Phosphoric acid based.
Type III - Oxime based.

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 Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL

PPP-P-1892 - Paint, Varnish, Lacquer, and Related Materials, Packaging, 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, ATIN: 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 8030

DISTRIBUTION STATEMENT A. Approved for public release, distribution is unlimited.

MILITARY

DOD-P-15328	- Primer (Wash), Pretreatment (Formula no.117 for Metals).
MIL-C-46168	- Coating, Aliphatic Polyurethane, Chemical Agent Resistant.
MIL-P-53022	- Primer, Epoxy Coating, Corrosion Inhibiting, Lead and Chromate Free.
MIL-C-53039	- Coating, Aliphatic Polyurethane, Single Component, Chemical Agent Resistant.
MIL-C-62218	- Corrosion Preventive Compounds, Cold-Application.

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.

MILITARY

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

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Naval Publications and Forms Center, (ATTN; NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

2.2 Non-Government publications. The following document(s) form a part of this document 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 (sss 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

B 117	- Salt Spray (Fog) Testing.
D 610	- Method for Evaluating Degree of Rusting on Painted Steel Surfaces.
D 714	- Method for Evaluating Degree of Blistering of Paints.
D 1654	- Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
D 2247	- Coated Metal Specimens at 100% Relative Humidity.
D 2794	- Test Method Resistance of Organic Coatings on the Effects of Rapid Deformation (Impact).
D 2801	- Test Method for Leveling Characteristics of Paints by Draw-Down Method.

D 3170 - Chip Resistance of Coatings.
D 3359 - Standard Methods for Measuring Adhesion by Tape Test.
G 53 - Recommended Practice for Operating Light- and Water Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials.

(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 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, (except for related associated detail specifications, specification sheets or MS standards), 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 First article. Unless otherwise specified (see 6.2) rust converters furnished under this specification shall be subjected to first article inspection (see 4.4 and 6.3). Any changes in the formulation of a tested product will necessitate its first article retesting. The rust converter supplied under the contract shall be identical within formulation tolerances, to the product originally tested. Approval of the first article will not relieve the contractor of his obligation to furnish a rust converter conforming to this specification.

3.2 Materials. The material shall be an aqueous, non-flammable solution, compatible with both chemical agent resistant coating (CARC) and bituminous coatings and containing no latex. All ingredients used in the rust converter shall be suitable for the intended use and shall meet all OSHA and EPA requirements.

3.2.1 Safety. 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.

3.2.1.1 Lead. The rust converter shall not contain any lead.

3.2.1.2 Chromium. The rust converter shall not contain any hexavalent chromium.

3.3 Surface preparation. Panels shall be prepared in accordance with the procedure in 4.5.2.1

3.4 Application. The material shall be suitable for treatment of the prepared metal in accordance with the suppliers instructions. The resultant coating shall be air dried, unless otherwise stated in suppliers instructions. The film shall be continuous and shall be free from breaks, scratches, flaws or other defects which will reduce serviceability.

3.5 Appearance. The rust converter shall have no effect on the paint or coating system that is applied on top of it.

3.6 Storage stability. The rust converters conforming to this specification shall have a minimum shelf life of 36 months. Storage samples shall not be opened or agitated during the stipulated storage period. The temperature of the storage location shall be between 2 and 35 ^{o}C. After storage the rust converter shall be homogeneous, free from precipitate and shall conform to all applicable requirements of this specification. Only those products that have met all the applicable requirements of this specification shall be tested for storage stability (see 4.6.5).

3.7 General physical properties.

3.7.1 Wet adhesion. The converted and coated panel shall resist peeling from the substrate by adhesive tape after the panel has been soaked in distilled water (see 4.6.3.1).

3.7.2 Reverse impact. The converted and coated panel shall be free from cracks when subjected to rapid deformation (impact) (see 4.6.3.2).

3.7.3 Chip resistance. The converted and coated panel shall resist chipping damage due to stones or other flying objects (see 4.6.3.3).

3.7.4 Environmental.

3.7.4.1 Low temperature flexibility. The converted and coated panel shall be flexible at temperatures down to -29 oC (see 4.6.4.1).

3.7.4.2 Salt fog. The converted and coated panel as tested in 4.6.4.2 shall show not more than a trace of rusting in accordance with ASTM D 610, No.9 and not more than five scattered blisters, none larger than 1 mm in diameter. On removal of the coating, there shall be not more than a trace of rusting, pitting or corrosion on the substrate.

3.7.4.3 Weatherometer. The converted and coated panel shall resist rusting and blistering in accordane to ASTM D 610 and D 714, when tested for light and water exposure (see 4.6.4.3).

3.8 Material Safety Data Sheets (MSDS). A MSDS shall be prepared by the manufacturer and supplied with the product in accordance with FED-STD-313 (see 4.7, 6.2 and 6.6).

3.9 Special labeling. Each container shall have affixed a lithographed or stencilled warning label. Under "contains" shall be inserted the appropriate active materials (such as chromates, fluorides, etc.). For unit containers that

also serve as shipping containers, any conflict with ICC Regulations shall be resolved by reasonable modification of size of label or use of warning statement without label design. All ready for use (premixed) materials shall be marked with the date of mixing (month and year) on the label of all unit containers.

3.9.1 Warning label. The container shall be labeled as hazardous material and the following shall appear on each container:

"WARNING: Material may be reactive and could present a potential fire and explosion hazard in contact with strong oxidizing materials. Avoid storing or mixing surface treatment materials in containers previously containing strong oxidizers."

3.9.2 Instructions for use. Containers shall bear a printed label (all printed labels shall be overcoated with a clear coating for waterproofing) containing specific instructions for mixing the rust converter materials, use and application procedures or at the option of the supplier this information shall be contained in a multi-page document in a polyethylene envelope inside the container.

3.10 Workmanship. Workmanship shall be of such quality as to assure that the compound furnished under the specification is uniform in qualities and condition, and free from foreign materials (see 4.5.2.1).

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 the specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must 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 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 acceptance of defective material.

4.2 Classification of inspection. The inspection requirements for materials, specified herein, shall all be classified as follows:

a. First article inspection (see 4.4).
b. Quality conformance inspection (see 4.5).
c. Inspection of packaging (see 4.8).

4.3 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in applicable test method document or applicable paragraphs in the specification.

4.4 First article inspection.

4.4.1 Examination. The rust converter shall be examined as specified in 4.5.2. Presence of one or more defects shall be cause for rejection.

4.4.2 Tests. The rust converter shall be tested for conformance to 3.7.1 through 3.7.4.4. Unless otherwise indicated, test results shall be based upon the average of three panels. Failure of any test shall be cause for rejection.

4.5 Quality conformance inspection.

4.5.1 Sampling.

4.5.1.1 Lot. Unless otherwise specified in the contract or order (see 6.2), a lot of the rust converter material shall consist of one production batch, produced by one manufacturer under the same continuous production run, using the same ingredients, process or conditions and offered for delivery at one time. If the material cannot be identified by batch, a lot shall consist of not more than 1500 gallons of liquid material offered for delivery at one time.

4.5.1.2 Sampling for examination. Samples for quality conformance examination shall be selected from a random sample of packaged containers from each lot in accordance with MIL-STD-105. A sample shall be selected at inspection level II and acceptable quality levels equal to 1.5 percent defective to verify compliance with product requirements in regard to fill closure, packaging, packing, marking, and other requirements not involving tests.

4.5.1.3 Sampling for tests. Samples for tests shall be selected from a random sample from each lot in accordance with MIL-STD-105. A sample shall be selected at inspection level S-1, with an acceptable quality level equal to 1.0

4.5.2 Examination.

4.5.2.1 Defects. Conformance to 3.9 shall be determined by examination for defects listed in table I. Examination shall be visual, tactile, or by measurement with standard inspection equipment.

4.5.2.2 Classification of defects. For examination purposes, defects shall be classified as listed in table I.

TABLE I. Classification of defects.

Category	Defect	Method of examination
Major	Identification marking, improper (see 5.2)	Visual
Minor	Packing, incorrect (see 5.2)	Visual & SIE 1/
	Workmanship, faulty (see 3.9)	Visual

1/ SIE = Standard Inspection Equipment.

4.5.3 Test.

4.5.3.1 Lot acceptance tests. Each lot shall be tested for conformance to 3.7.1 using the CARC coating system. Every tenth lot shall be tested for conformance to 3.7.1 through 3.7.4.4.

4.5.3.2 Failure. Failure to conform to any of the requirements of this specification shall be cause for rejection of material submitted for qualification or of the lot of rust converter material represented by the nonconforming specimens.

4.6 Methods of inspection.

4.6.1 Materials. Conformance to 3.2 through 3.2.1.2 shall be determined by inspection of contractor records providing proof or certification that processing and materials conform to requirements. Applicable records shall include specifications, design data, receiving inspection records, processing and quality control standards, vendor catalogs and certifications, industry standards, test reports, and rating data.

4.6.2 Test panels. All panels used for testing shall be made of cold rolled steel and be 0.032 inches thick, with a dull matte finish.

4.6.2.1 Preparation of test panels.

4.6.2.1.1 Pre-corrosion. Panels to be used in testing the rust converter shall be pre-corroded using the following procedure:

a. Panels shall be backed with a protective coating (primer or paint).
b. Degrease panels.
c. Wash panels with a surfactant and rinse to assure a water breakfree surface.
d. Place the panels in a salt spray chamber and run for 5 minutes.
e. Turn the salt spray off and let the panels remain in the chamber for 4 hours.

f. Set the panels outside on racks at a 45 degree angle to the horizontal for 2-3 weeks so that a uniform film of corrosion forms on the surface. Panels shall be power washed once during the exposure period.

4.6.2.1.2 Coating. The rust converter compound shall be applied according to the manufacturers' specifications. To establish uniformity, the following procedure shall be used:

a. Degrease the rusted panel.
b. Power wash the panel to remove any loose corrosion.
c. Tilt the panel to allow excess water such as puddles to run off.
d. Brush on the first application of rust converter on the wet panel.
e. Let the panel dry for not less than 12 hours.
f. Power wash the panel and repeat step 3.
g. Brush on a second coat of rust converter on the wet panel.
h. Let panel dry for not less than 12 hours.
i. Neutralize the panels with sodium bicarbonate (3 minutes.)
j. Rinse panels with running water and let dry.
k. Apply appropriate coating for the system being tested:

(1) CARC system - Apply primer conforming to MIL-P-53022 by spraying to a 0.0015 inch (1.5 mil) dry film thickness (DFT). Test pieces shall be allowed to dry 168 hours before testing.
(2) Bituminous - Apply compound conforming to MIL-C-62218 by draw down method in accordance with ASTM D 2801 to a 0.0055 inch (5.5 mil) minimum dry film thickness.

4.6.3 General properties.

4.6.3.1 Wet adhesion.

4.6.3.1.1 CARC system. To determine conformance to 3.7.1 three test panels shall be prepared, coated and air dried as specified in 4.6.2.1. The panels shall be scribed with four cuts that are 1.5 inch (40 mm) long. The first 2 cuts shall be parallel to each other and spaced 1/2 inch (13 mm) apart. These two lines shall be at 45° to the horizontal. The last two cuts shall be placed at 90° to the first cuts and also be 1/2 inch (13 mm) apart, centered on the original cuts to form a diamond shaped grid. The panels shall then be tested in accordance with FED-STD-141, method 6301 and evaluated in accordance with ASTM D 3359. Any rating lower than 3B shall constitute nonconformance.

4.6.3.1.2 Bituminous system. This test is not applicable for panels with bituminous coating.

4.6.3.2 Reverse impact.

4.6.3.2.1 CARC system. This test is not applicable for panels with CARC coating.

4.6.3.2.2 Bituminous system. Conformance to 3.7.2 shall be determined by preparing and coating three panels according to 4.6.2.1. These panels shall then be placed in a cold temperature chamber and cooled to -34 ±1 °C for two hours prior to testing. This temperature is 5 °C colder than the actual test temperature of -29 °C to allow for the 10 second warm up period from the time the chamber is opened to the time the test is started. The panels shall then be tested for reverse impact resistance according to ASTM D 2794. Any sign of crack in the coating or visible metal as seen under 10x magnification constitutes non-conformance.

4.6.3.3 Chip resistance. To determine conformance to 3.7.3 three test panels shall be prepared, coated and air dried as specified in 4.6 .2.1. The panels shall then be cooled so that the actual test temperature is -29 ±1 °C. The upper half of the panels shall then be tested according to ASTM D 3170 and evaluated. The panels are then placed in a salt spray chamber for 336 hours in accordance with ASTM B 117. Once removed the panels are to be rinsed in tapwater, dried, and evaluated according to ASTM D 714 and D 1654. Once again the panels are cooled to -29 ±1 °C and this time the lower half of the panel is tested according to ASTM D 3170 and evaluated. An ASTM D 3170 rating of less than 3A or an ASTM D 714 evaluation showing more than 5 blisters any larger than 1 mm or an ASTM D 1654 rating of less than 9 constitutes nonconformance.

4.6.4 Environmental.

4.6.4.1 Low temperature flexibility. To determine conformance to 3.7.5.1 three test panels shall be prepared, coated and air dried as specified in 4.6.2.1. The test panels and equipment shall then be conditioned to -29 ±1 °C for two hours. The test should then be conducted at this temperature. Each test panel shall then be bent around a cylindrical mandrel, 1/4 inch in diameter. Gloves shall be worn when handling panels. The tested panels shall then be examined. Any evidence of delamination or peeling of the coating constitutes non-conformance. If equipment limitations do not allow for the test to be performed in a cold box, the following procedure can be substituted. Condition the test panels to -34 ±1 °C for two hours. This temperature is 5 °C colder than the actual test temperature to allow for the 10 second warm up period from the time the chamber is opened to the time the test is started (see ASTM D 3170).

4.6.4.2 Salt fog.

4.6.4.2.1 CARC system. To determine conformance to 3.7.4.2 three panels prepared as specified in 4.6.2.1 and scribed as noted in 4.6.3.1.1. The panels shall be exposed to a 3.5 percent salt spray for 336 hours in accordance to ASTM B 117. Upon removal, wash the panels gently in warm water (38 °C) until free from any visible salt deposits and examine immediately for compliance with 3.7.4.2. Any evaluation lower than no. 9 of ASTM D 610 or no. 9 of ASTM D 1654 shall constitute nonconformance.

4.6.4.2.2 Bituminous system. To determine conformance to 3.7.4.2 three panels prepared as specified in 4.6.2.1 and scribed as noted in 4.6.3.1.1. The panels shall be exposed to a 3.5 percent salt spray for 500 hours in accordance to ASTM B 117. Upon removal, wash the panels gently in warm water (38 °C) until free

from any visible salt deposits and examine immediately for compliance with 3.7.4.2. Any evaluation lower than no. 9 of ASTM D 610 of no. 9 of ASTM D 1654 shall constitute nonconformance.

4.6.4.3 Weatherometer.

4.6.4.3.1 CARC system. To determine conformance to 3.7.4.3 three panels prepared as specified in 4.6.2.1 and topcoated with coating conforming to either MIL-C-46168 or MIL-C-53039 shall be placed in a weatherometer according to ASTM G 53 for a period of 336 hours. Upon removal from the weatherometer, the panels are to be evaluated in accordance to ASTM D 610 and D 714. Any evaluation lower than no.9 for ASTM D 610 or any panel containing any more than 5 blisters with any larger than 1 mm in diameter in accordance with ASTM D 714 shall constitute non-conformance.

4.6.4.3.2 Bituminous system. This test is not applicable for panels with bituminous coating.

4.6.5 Storage stability. After being stored in its original container for the specified amount of time the rust converter shall be examined or tested as applicable to determine compliance to 3.6.

4.7 MSDS. To determine conformance to 3.8, verify that the MSDS has been prepared in accordance with FED-STD-313.

4.8 Inspection of packaging. Inspection of packaging shall be in accordance with the applicable quality assurance provisions of PPP-P-1892 and for compliance with section 5 herein.

5. PACKAGING

5.1 Preservation. Preservation shall be level A or C as specified (see 6.2). Unit containers, of the size(s) and type(s) specified (see 6.2), shall be in accordance with the applicable packing requirements of PPP-P-1892. Intermediate containers, when required for the unit container size, shall be as specified herein.

5.2 Packing. Packing shall be level A, B, or C as specified (see 6.2) and shall be in accordance with the applicable packing requirements of PPP-P-1892.

5.3 Marking. In addition to any special or identification markings required by the contract or purchase order (see 6.2), all containers shall be marked in accordance with MIL-STD-129. Special labeling requirements shall be as specified in 3.9.

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 compound indicated in the specification is for use on a rusted steel surface in order to prepare the surface for application of an organic coating (bituminous compound, primer, topcoat). This compound is intended to eliminate the need for sandblasting or removing the adherent corrosion products.

6.2 Acquisition requirements. Acquisition documents shall specify the following:

a. Title, number and date of this specification.
b. Type of compound (see 1.2).
c. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2..1.1 and 2.2).
d. When a first article is required for inspection and approval, and number of units required (see 3.1 and 6.3).
e. Identify activities requiring copies of completed MSDS and specify when the MSDS will be inspected (see 3.8 and 6.5).
f. If responsibility for inspection shall be other than specified (see 4.1).
g. If inspection conditions shall be other than as specified (see 4.3).
h. Type and size of container (see 5.1).
i. Level of preservation, packing and marking (see 5.1 and 5.2).
j. Any special markings (see 5.3).

6.3 First article. When a first article inspection is required, the item should be a sample selected from the first article production lot. The first article should consist of 5 quarts. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, tests, and approval of the first article test results and disposition of the first article.

6.4 Subject term (key word) listing.

Bituminous
Coating
Rust converter

6.5 MSDS. 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 appendix B of FED-STD-313.

Custodians:
Army - ME
Navy - AS

Preparing activity:
Army - ME

Project 8030-A121

INSTRUCTIONS: In a continuing effort to make our standardization documents better, the DoD provides this form for use i submitting comments and suggestions for improvements. All users of military standardization documents are invited to provid suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge *(DO NOT STAPLE)*, an mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, w too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document*(s)* or to amend contractual requirements.

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-R-53086	Rust Converter, Metric

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ 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 *(Incl Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

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