

MIL-I-85062(AS)
20 December 1977MILITARY SPECIFICATION
INHIBITOR, CORROSION, VOLATILE,
TRANSMISSION AND GEARBOX

This specification is approved for use by the Naval Air Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers a volatile corrosion inhibitor used, when added to a lubricating oil, for the preservation of non-operating transmissions and gearboxes.

2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The following documents of the issue in effect on the date of invitation for bids or request for proposal form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

- | | |
|------------|---|
| QQ-A-250/4 | - Aluminum Alloy 2024, Plate and Sheet |
| QQ-A-671 | - Anode, Cadmium |
| QQ-B-626 | - Brass, Leaded and Nonleaded, Rod, Shaped, Forgings, and Flat Products with Finished Edges (Bar and Strip) |

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Engineering Specifications and Standards Department (Code 93), Naval Air Engineering Center, Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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FEDERAL (continued)

- QQ-M-44 - Magnesium Alloy Plate and Sheet (AZ31B)
- TT-T-291 - Thinner, Paint, Volatile Spirits (Petroleum-Spirits)
- PPP-C-96 - Can, Metal, 28 Gage and Lighter

MILITARY

- MIL-S-7952 - Steel, Sheet and Strip, Uncoated, Carbon (1020 and 1025) (Aircraft Quality)
- MIL-L-23699 - Lubricating Oil, Aircraft Turbine Engine, Synthetic Base

STANDARD

FEDERAL

- FED-STD-313 - Material Safety Data Sheet, Preparation and Submission of

3. REQUIREMENTS

3.1 Qualification. Volatile inhibitors furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.3 and 6.3).

3.2 Material. The inhibitor shall be a volatile material compounded and processed to assure compliance with this specification.

3.3 Toxic products and formulations. The material shall have no adverse effect on the health of personnel when used for its intended purpose while observing Occupational Safety and Health Administration (OSHA) guidelines (see 6.5). Questions pertaining to this effect shall be referred by the procuring activity to the appropriate departmental medical service who will act as an advisor to the procuring agency.

3.4 Solubility. When tested as specified in 4.6.1, there shall be no evidence of separation, precipitation or suspended particles.

3.5 Vapor inhibitor ability (VIA). When tested as specified in 4.6.2, the test specimens shall show no evidence of corrosion, etching or pitting.

3.6 Vapor inhibitor ability after exhaustion. When tested as specified in 4.6.3, the test specimens shall show no greater degree of corrosion, etching or pitting, than the specimens exposed to the control formula.

3.7 Effect on metals. When tested as specified in 4.6.4, there shall be no pitting of the metal specimen. Any staining or discoloration shall be no greater than that of the specimen exposed to the control formula.

3.8 Storage stability. After storage for one year as specified in 4.6.5, the inhibitor shall show no evidence of deterioration and shall meet all the requirements of this specification.

3.9 Workmanship. When the inhibitor is in solution (see 4.3), the solution shall be homogeneous and free from undissolved or suspended matter, grit or foreign particles.

4. QUALITY ASSURANCE PROVISIONS

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

4.2 Classification of inspection. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.4)
- b. Quality conformance inspection (see 4.5)

4.3 Inspection conditions. Unless otherwise specified herein, all inspections shall be performed at a relative humidity of 50 ± 2 percent and temperature of 18.3°C to 23.9°C (65°F to 75°F). The test sample shall consist of a solution of 43 grams of inhibitor dissolved in 71 grams of tri-o-tolyl phosphate. This solution is then dissolved in one litre of lubricating oil conforming to MIL-L-23699.

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4.3.1 Preparation of equipment and specimens for tests.4.3.1.1 Cleaning.

- a. The utensils and cloths used in the preparation of panels and test specimens shall be clean and free of contamination. Solvents shall be clean and renewed frequently. In all stages of treatment handling panels with bare hands shall be avoided. Test panels shall be handled with hooks or forceps at all times. Panels shall not be permitted to contact contaminated surfaces during the cleaning procedure.
- b. After polishing metal panels and test specimens as specified for each procedure, they shall be cleaned with surgical gauze and then scrubbed in a beaker of hot petroleum spirits conforming to type I, grade A of TT-T-291 with a surgical gauze swab. This shall be followed by successive immersions in hot petroleum spirits, boiling 95 percent methanol and boiling absolute methanol, and then allowed to dry. The panels shall then be stored in a desiccator until ready for use. If storage of more than 24 hours occurs, the surface preparation shall be repeated starting with the hand polishing.
- c. Apparatus used in the VIA test and exhaustion procedure shall be cleaned in a solution of hot water and soap, followed by a double rinse in hot tap water and a final rinse in distilled water.

4.4 Qualification inspection. The qualification inspection shall consist of a visual examination and all the tests required under this specification (see 3.1 and 6.3).

TABLE I. Qualification inspection

Inspection	Requirement paragraph	Test method paragraph
Visual	3.2	4.5.3.1
Solubility	3.4	4.6.1
Vapor inhibiting ability (VIA)	3.5	4.6.2
Vapor inhibiting ability after exhaustion	3.6	4.6.3
Effect on metals	3.7	4.6.4
Storage stability	3.8	4.6.5

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4.4.1 Retention of qualification. The retention of qualification of products approved for listing on the Qualified Products List (QPL) shall be accomplished by a periodic verification to determine continued compliance of a supplier's product with the requirements of this specification. The verification intervals shall not exceed two years. Unless otherwise specified by the activity responsible for the Qualified Products List, verification of qualification may be made by certification.

4.4.2 Qualification samples. The qualification sample shall consist of two 500-gram samples. The samples shall be forwarded to the Supply Officer, Naval Air Development Center, Warminster, PA 18974, ATTN: Director, Aircraft and Crew Systems Technology Directorate, Code 60622. Samples shall be plainly identified by securely attached durable tags with the following information:

Sample for qualification inspection
Inhibitor, Corrosion, Volatile, Transmission and Gearbox
Manufacturer's formula No. _____
Date compounded _____
Manufacturer's name _____
Batch or lot number _____
Submitted by (name) (date) for qualification inspection
in accordance with the requirements of specification
MIL-I-85062 (AS) under authorization of (reference
authorizing letter)

4.4.3 Qualification tests. Qualification tests shall consist of all the tests required under this specification.

4.4.4 Toxicological data and reports. The manufacturer shall furnish the following data when submitting samples for testing:

- a. Two copies of a certified test report covering all the requirements of this specification
- b. The contractor shall furnish the toxicological data and formulations required to evaluate the safety of the material for the proposed use. The data shall include a complete formula of the finished material plus the formula and percent of each ingredient.

4.5 Quality conformance inspection. Quality conformance inspection of the inhibitor shall consist of all the examinations and tests under this specification except storage stability.

4.5.1 Lot formation. A lot shall consist of all the inhibitor produced by one manufacturer, at one plant, from the same materials, and under essentially the same conditions provided the operation is continuous. In the event the process is a batch operation, each batch shall constitute a lot.

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4.5.2 Quality conformance inspection sampling. A 500-gram sample shall be selected at random from each inspection lot and subjected to all the applicable tests of this specification. The manufacturer shall furnish with each lot a certificate, signed by a responsible official of the company, indicating that the inhibitor has been produced in the same manner as the approved qualification sample. If any test result fails to meet the requirement, the lot shall be rejected.

4.5.3 Inspection of end item. Inspection of the end item shall be as specified in 4.5.3.1 and 4.5.3.2.

4.5.3.1 Visual examination. The sample unit for this examination shall be one filled unit container. The content shall be examined for the defects listed in table II. The sample size shall be in accordance with table III. Any evidence of non-conformance shall be cause for rejection of the lot.

TABLE II. Examination of end item.

Examine	Defect
Material	Not as specified
Appearance	Presence of foreign matter

4.5.3.2 Examination of filled container. The sample unit for this examination shall be one filled container. The sample size shall be as specified in table III. The lot shall be unacceptable if the average net content per container for all units examined is less than specified.

TABLE III. Net content.

Lot size (containers)	Sample size (containers)
Up to 50	5
51- 500	7
501 -35,000	8
35,001 and over	11

4.5.4 Packaging inspection. The sampling and inspection of the preservation-packaging, packing and container marking shall be in accordance with the requirements of PPP-C-96.

4.6 Test methods.

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4.6.1 Solubility. Add 4.5 grams of the inhibitor to 7.5 grams of tri-o-tolyl phosphate. Agitate the mixture until solution has been effected. Pour 100 millilitres (ml) of lubricating oil conforming to MIL-L-23699 into a 200-ml graduated cylinder equipped with a ground glass stopper. Add the freshly prepared inhibitor solution. Insert the stopper and shake the solution gently for 30 seconds. Allow the cylinder to stand undisturbed for 48 hours. At the end of the 48 hour period, examine the solution for evidence of precipitation or undissolved or suspended matter.

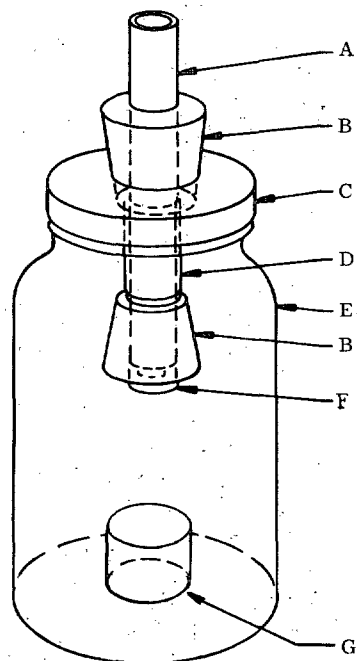
4.6.2 Vapor inhibitor ability (VIA).

4.6.2.1 Preparation of steel specimen. Specimens of SAE-1020 cold finished steel, round bar, 5/8 inch (1.6 centimetres) diameter, 1/2 inch (1.3 centimetres) long, shall be flat bottom drilled in the center of each specimen. The hole shall have a depth of 3/8 inch (1.0 centimetre) and a diameter of 3/8 inch (1.0 centimetre). The undrilled surface shall be surface ground. Prior to use, the surface ground face shall be hand polished with 240 grit silicon carbide or aluminum oxide cloth or paper. Iron oxide or so-called "wet or dry" papers or cloths shall not be used. The abraded face shall then be hand polished with 400 aluminum oxide paper at 90 degrees to the previously abraded marks. The specimens shall be polished to a surface roughness of 4-6 micro-inches (10.2 - 15.2 micro-cm) (rms). The specimens shall be wiped clean with surgical gauze and the test surface examined microscopically for signs of corrosion or other defects. Defective specimens shall not be used. Immediately prior to use, specimens shall be cleaned as specified. The specimens shall be stored in a desiccator until ready to use. If storage of more than 24 hours occurs, the surface preparation shall be repeated starting with the hand polishing using 400 aluminum oxide paper. Used specimens may be recovered by surface grinding to remove rust, pits or defects, and then hand polished as described.

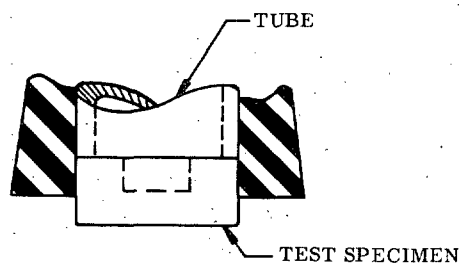
4.6.2.1.1 Surface roughness of the test specimens can be determined by comparison with a 2 by 4 inch (5.1 by 10.2 centimetre) SAE-1020 steel panel which has been polished in the specified manner and measured by means of a profilometer. It has been found that approximately twenty complete strokes (alternating back and forth) on a fresh surface of paper, and this procedure repeated, will produce the desired finish.

4.6.2.2 Preparation of test assembly. The test assembly and components are illustrated and described in figure 1. The aluminum tube shall be forced through the rubber stopper until the bottom of the stopper is 2-1/4.

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- A - Water Retainer - Aluminum tube 4-1/2 (10.5) in length, 5/8 (1.6) OD and 1/2 (1.3) ID. The tube shall have a capacity of 16 ml of distilled water at $23.9 \pm 1.7^\circ \text{C}$ ($75 \pm 3^\circ \text{F}$)
- B - Rubber Stoppers - two #6-1/2 rubber stoppers with 1/2 (1.3) hole bored through centers.
- C - Jar Lids - Plastic screw type lid, hole 1-3/16 (3.0) drilled through center.
- D - Insulating Sleeve - 1/2 (1.3) ID rubber tubing length 1-1/2 (3.8).
- E - Jars - Quart size (946 ml), mouth size 2-3/8 (6.0) dia., 7 (17.8) in height, ID of 3-1/4 (8.3).
- F - Steel Specimen - 5/8 (1.6) ID, 1/2 (1.3) long with flat bottom drilled in center with hole 3/8 (1.0) deep and 3/8 (1.0) dia.
- G - Jars - one ounce (30 ml), cylindrical, wide mouth, approximately 1-5/8 (4.1) in height by 1-3/4 (3.5) ID.



ENLARGED VIEW OF "F"

DIMENSIONS IN INCHES (CENTIMETRES)

FIGURE 1. VIA test components.

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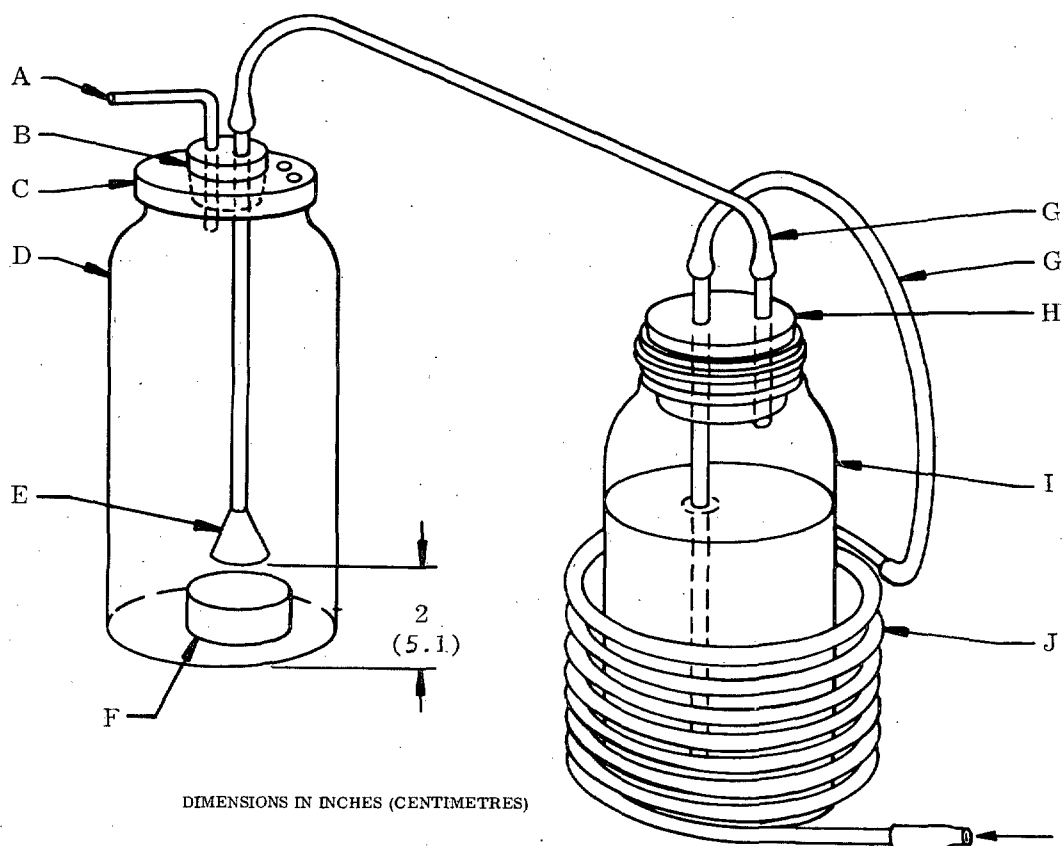
inches (5.7 centimetres) from the top end of the tube. The insulating sleeve shall be placed over the bottom end of the aluminum tube until contact is made with the base of the rubber stopper. This unit shall be placed through the center hole in the jar lid. The second rubber stopper shall be forced onto the aluminum tube until contact is made between the insulating sleeve and the base of the stopper. Lens paper shall be used in forcing the steel test specimens into the rubber stopper. Ten millilitres (ml) of a synthetic glycerine-water solution having a specific gravity of 1.076 at $23.9 \pm 1.7^{\circ}\text{C}$ ($75 \pm 3^{\circ}\text{F}$) to effect an atmosphere of 90 percent relative humidity shall be introduced into the bottom of the jar. Twenty-five millilitres of material shall be poured into a one ounce (30 ml) ointment jar and placed inside the quart (946 ml) test jar. The jar shall then be tightly closed and the junction of the glass with the lid sealed with tape. Each material shall be run in triplicate along with a blank.

4.6.2.3 Procedure. All test assemblies shall remain for 20 hours at a temperature of $23.9 \pm 2.8^{\circ}\text{C}$ ($75 \pm 5^{\circ}\text{F}$). Cold water at a temperature of 22.2°C (40°F) below the ambient shall be added to the aluminum tubes until full. After 3 hours the water shall be removed from the tubes and the specimens immediately evaluated. A blank shall be run along with the test. If the blank specimen does not rust, the test shall be rerun. The test shall be repeated if one of the three specimens tested shows light or incipient corrosion. In the repeat test, three specimens shall be used, and all three specimens shall pass the test satisfactorily for acceptance.

4.6.3 Vapor inhibitor ability after exhaustion. The test assembly and components are illustrated and described in Figure 2. The rubber stopper shall be fitted into the large center hole in the plastic screwtype lid. The glass funnel shall then be forced through the 1/4 inch (0.4 centimetre) hole in the rubber stopper until the largest diameter of the funnel rests 5 inches (12.7 centimetres) from the inside of the jar lid. The small piece of glass tubing shall also be forced through the rubber stopper. Twenty-five millilitres of material shall be poured into the one ounce (30 ml) jar and placed inside the quart (946 ml) test jar directly beneath the funnel. The test jar shall be tightly closed and the junction of the glass with the lid sealed with tape. The test assembly shall be connected to the inlet and outlet tubing in order that air maintained at 50 ± 2 percent relative humidity shall pass into the test jar containing the compound at a rate of 100 ml/minute. The completely assembled unit shall be maintained at $23.9 \pm 2.8^{\circ}\text{C}$ ($75 \pm 5^{\circ}\text{F}$) for a period of 7 days. At the end of this period, a completely assembled VIA lid with specimen in place shall be rapidly substituted for the lid containing the funnel. After tightening the lid, inject 10 ml of a synthetic glycerine-water solution

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- A - Pyrex glass tubing - 1/8 (0.3) ID, length to suit.
- B - Rubber stopper - No. 6 with two holes to suit insertions.
- C - Jar lid - plastic screw type, with hole 1-3/16 (3.0) dia drilled through center and two 1/4 (0.6) dia holes near periphery of lid.
- D - Quart (946 ml) glass jar - 2-3/8 (6.0) mouth diameter, 7 inches (17.8 cm) deep.
- E - Pyrex glass funnel - approximately 2 (5.1) ID at mouth, 6 inches (15.2 cm) long.
- F - Jars - one ounce (30 ml). Cylindrical, wide mouth, approximately 1-5/8 (4.1) in height by 1-3/4 (3.5) ID.
- G - Pyrex glass and rubber tubing - 1/4 (0.6) ID and 7/16 (1.1) OD.
- H - Rubber stopper No. 12 with suitable 7/16 (1.1) dia holes.
- I - Quart (946 ml) glass jar - 2-3/8 (6.0) mouth diameter, 7 (17.8) deep, containing synthetic glycerine-water solution (Sp GR 1.180) and maintaining the level of solution at 5 inches (12.7 cm) within the inlet tube immersed 4 inches (10.2 cm) in solution.
- J - Copper coil (OD 1/4 (0.6), ID 5/32 (0.4), length 10 ft (3.0 m) coil ID 4-3/8 (11.1)).

FIGURE 2. Exhaustion test components.

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by means of a pipette through one of the small holes to effect an atmosphere of 90 percent relative humidity. Reseal the holes and subject the assembly to the vapor inhibitor conditions of 4.6.2.3 of the Vapor inhibitor ability (VIA) test. This test shall be run in triplicate. The control formula and test material shall be run simultaneously and under identical conditions (see 6.6).

4.6.4 Effect on metals.

4.6.4.1 Preparation of panels. The panels, 3 x 1/2 x 1/16 inches (7.5 x 1.25 x 0.15 cm), shall be made from each of the metals specified in table IV. A hole 1/16 inch (0.2 cm) in diameter shall be drilled in each panel approximately one centimetre from one end. Four test panels shall be prepared from each metal. The cadmium coated panels shall be freshly plated. The remaining panels shall be polished to remove pits and irregularities from all surfaces. The final polishing shall be performed with 240 grit alundum. The use of "wet or dry" paper is prohibited. Iron oxide abrasives shall not be used. The final abrasion shall be in the direction parallel to the length of the panel. The panels shall be cleaned as specified in 4.3.

TABLE IV. Metals for corrosion test.

Metal	Specification
Aluminum Alloy (2024)	QQ-A-250/4
Anode, Cadmium	QQ-A-671
Brass	QQ-B-626
Magnesium	QQ-M-44
Steel (FS 1020)	MIL-S-7952

4.6.4.2 Procedure. Add one millilitre (ml) of distilled water to 25 ml of the inhibited oil. Five panels, one from each metal specified in table IV, shall then be immersed completely in the inhibited fluid. After one minute, remove the panels and suspend each in such a manner that one half is in the fluid and the other half is in the vapor area. Care shall be taken that the panels do not touch. Three millilitres of distilled water shall be added to an open container suspended above the fluid. Place the test specimens in an oven maintained at $22 \pm 1^{\circ}\text{C}$ ($71.6 \pm 1.8^{\circ}\text{F}$) for 8 hours followed by $49 \pm 1^{\circ}\text{C}$ ($120.2 \pm 1.8^{\circ}\text{F}$) for 16 hours. This procedure shall be repeated for 20 cycles. When the test is interrupted by a week end, the test specimens shall be removed from the oven and left under conditions of temperature and humidity specified in 4.3. The test shall be run in triplicate. Five panels, one from each metal specified in table IV, shall be subjected to the test using a control formula (see 6.6). At the end of the 20 cycles, the panels shall be removed, allowed to cool to room temperature and cleaned with petroleum spirits conforming to type I, grade A of TT-T-291. The cleaned panels shall then be examined under 10X magnification for pits, stains or discoloration.

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4.6.5 Storage stability. The inhibitor shall be stored in an opaque container at $21.1 \pm 2.8^{\circ}\text{C}$ ($70 \pm 5^{\circ}\text{F}$) for 12 months. At the end of the storage period, the inhibitor shall be subjected to all the tests of this specification.

5. PREPARATION FOR DELIVERY

5.1 Packaging requirements. Unless otherwise specified, the inhibitor shall be furnished in quantities of 85.0 grams (3.0 ounces) in cans conforming to PPP-C-96 (see 6.2). The packaging, packing and marking of filled containers shall be in accordance with PPP-C-96 for the Level specified by the Contracting Officer.

5.2 Safety data. Material safety data sheets shall be prepared and submitted in accordance with FED-STD-313, one copy of which shall be forwarded to the preparing activity of this specification.

6. NOTES

6.1 Intended use. The inhibitor is intended for use in solution with tri-o-tolyl phosphate and lubricating oil (MIL-L-23699) to prevent corrosion in the transmissions and gearboxes of non-operating vehicles.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number, and date of this specification
- b. Quantity required in kilograms (pounds)
- c. Size of the unit container if other than specified (see 5.1)
- d. Level of packaging and packing (see 5.1)

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of the contractors' is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Air Systems Command, Department of the Navy, Washington, DC 20361; however information

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pertaining to qualification of products may be obtained from the Director, Aircraft and Crew Systems Technology Directorate, Code 60622, Naval Air Development Center, Warminster, Pennsylvania 18974.

6.4 Batch. A batch is defined as that quantity of material which has been manufactured by some unit chemical process or subjected to some physical mixing operation intended to make the final product substantially uniform.

6.5 Toxicity. Questions pertaining to the requirements of 3.3 should be referred by the procuring activity to the appropriate Naval Regional Medical Center listed in BUMEDINST 5450.116, CH-1, who will act as an advisor to the procuring activity.

6.6 Control formula. The control formula is prepared by dissolving 43 grams of Vaden 500 in 71 grams of tri-o-tolyl phosphate. This solution is then dissolved in one litre of lubricating oil conforming to MIL-L-23699. NOTE: Vaden 500 produced by Ronco Laboratories, Inc., 3617 Brownsville Rd., Pittsburgh, PA 15227 and tri-o-tolyl phosphate produced by Eastman Organic Chemicals, Rochester, NY 14650 have been found to be satisfactory. Material conforming to TT-T-656 or type I of MIL-T-9188 is an acceptable substitute for tri-o-tolyl phosphate.

Preparing activity:

Navy - AS

(Project No. 6850-N608)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

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DOCUMENT IDENTIFIER (Number) AND TITLE

MIL-I-85062(AS) INHIBITOR, CORROSION, VOLATILE, TRANSMISSION AND GEARBOX

NAME OF ORGANIZATION AND ADDRESS OF SUBMITTER

☐ VENDOR ☐ USER ☐ MANUFACTURER

1. ☐ HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? ☐ IS ANY PART OF IT TOO RIGID, RESTRICTIVE, LOOSE OR AMBIGUOUS? PLEASE EXPLAIN BELOW.

A. GIVE PARAGRAPH NUMBER AND WORDING

B. RECOMMENDED WORDING CHANGE

C. REASON FOR RECOMMENDED CHANGE(S)

2. REMARKS

SUBMITTED BY (Printed or typed name and address — Optional)

TELEPHONE NO.

DATE

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1 OCT 76

EDITION OF 1 JAN 72 WILL BE USED UNTIL EXHAUSTED.