

MIL-I-8574E
12 August 1982
SUPERSEDING
MIL-I-8574D
10 September 1974

MILITARY SPECIFICATION

INHIBITORS, CORROSION, VOLATILE, UTILIZATION OF

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

1. SCOPE

1.1 Scope. This specification covers procedures for the use of volatile corrosion inhibitors in the packaging of equipment (see 6.1).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

* 2.1.1 Specifications, standards, and handbooks. Unless otherwise specified, the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation, form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

| | |
|------------|--|
| QQ-A-1876 | Aluminum Foil |
| PPP-B-1055 | Barrier Material, Waterproofed, Flexible |

MILITARY

| | |
|-----------|--|
| MIL-P-116 | Preservation, Methods of |
| MIL-B-121 | Barrier Material, Greaseproofed, Waterproofed, Flexible |
| MIL-B-131 | Barrier Material; Watervaporproof, Flexible, Heat Sealable |

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.

NO DELIVERABLE DATA
REQUIRED BY THIS DOCUMENT

AREA PACK

MIL-I-8574E

SPECIFICATIONS (Continued)

MILITARY (Continued)

| | |
|-------------|--|
| MIL-P-3420 | Packaging Materials, Volatile Corrosion Inhibitor, Treated, Opaque |
| MIL-B-22019 | Barrier Materials, Transparent, Flexible, Sealable, Volatile Corrosion Inhibitor Treated |
| MIL-B-22020 | Bags, Transparent, Flexible, Sealable, Volatile Corrosion Inhibitor, Treated |
| MIL-I-22110 | Inhibitors, Corrosion, Volatile, Crystalline |
| MIL-B-40028 | Bags, Barrier, with Volatile Corrosion Inhibitor Treated Liners |

STANDARDS

MILITARY

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

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

* 2.1.2 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

* 3.1 First article. When specified, a sample shall be subjected to first article inspection (see 4.2.1 and 6.2).

3.2 Materials. The volatile corrosion inhibitors (VCI) shall conform to Specification MIL-P-3420, MIL-B-22019, MIL-I-22110, or MIL-B-40028, and shall be selected for the intended applications from the approved types, classes, and styles covered in the respective specification.

* 3.2.1 Handling of material. The VCI's shall be stored in a cool dry area. The packaged VCI material shall not be opened until ready for use. During the use operations, the material shall be kept protected from excessive heat, direct sunlight, moisture, strong drafts and excessive dust. In continuous preservation operations, the VCI-treated material shall be kept in a closed, self-sealing container.

MIL-I-8574E

If the self-sealing container is not available, the VCI-treated material shall be replaced in the original container at the end of each working day and the container shall be closed. If this is impractical, the VCI treated material shall be wrapped with a barrier material conforming to QQ-A-1876, MIL-B-121 Grade A, MIL-B-131, or PPP-B-1055 Class C-1, and the wrap secured in place. Where packages of VCI materials are opened and non-operational periods of indeterminate length occur then the material shall be replaced within its original container or in another container affording comparable protection, the container sealed, and placed in a cool dry area. If the material has been subjected to a damaging or adverse condition, the effectiveness of the material can be re-verified by conducting the vapor inhibitor ability (VIA) test of the material specification under which it was originally produced.

3.2.1.1 Lined barrier bags. Punctured or otherwise damaged bags shall be discarded.

3.2.1.2 Bore tubes. VCI-treated tubes for insertion into boxes or cavities shall be kept in a closed container. The container shall be opened only for withdrawal of tubes for immediate use.

3.2.1.3 Environmental effects.

a. Temperature.

(1) VCI should not be applied to metal items whose surface temperature is greater than 150°F, or where the stored item may be occasionally exposed to temperature of such magnitude.

(2) At low temperatures, VCI may not be effective; however, little corrosion will normally occur at these temperatures (less than 40°F) even without a preservative, so that VCI may be used where occasional exposure to such temperature levels is encountered.

(3) In long term storage in warm areas, (i.e., tropical climates) packages should be well sealed to retard the loss of VCI through evaporation and migration from the package.

* b. Humidity.

VCI package interiors should not be allowed to remain at a high humidity level (greater than 85-90% RH) for prolonged periods of time.

c. Light.

VCI paper or chemicals should be used inside lightproof packages for long term storage applications.

d. Air flow.

VCI packages should be protected from winds and drafts. If exposure is excessive and continuous airflow around the package is unavoidable, the package should be well sealed.

MIL-I-8574E

e. Acids or their vapors.

(1) Hydrochloric acid type metal cleaners and any solvents containing sulfides should not be used for cleaning of items to be VCI protected.

(2) VCI protected items should not be exposed to industrial fumes containing hydrogen chloride, hydrogen sulfide, sulfur dioxide or other acidic vapors.

3.3 Limitations on use. Unless otherwise specified, VCI's shall not be used to protect assemblies containing optical systems or precision moving parts which have already been coated with a preservative or lubricant. Bonded films shall not be included in this category (see 5.4). Additionally, VCI materials shall not be used in applications where they might come in contact with high explosives or propellants associated with ammunition.

3.3.1 Caution with nonferrous metals. Parts, subassemblies, and assemblies containing zinc plate, cadmium, cadmium plate, zinc-base alloys, magnesium-base alloys, lead-base alloys, and alloys of other metals (including solders and brazing alloys) containing more than 30 percent of zinc or 9 percent lead shall not be packaged with VCI's. This restriction does not apply to surfaces coated with manganese phosphate or zinc phosphate, with or without supplementary treatment. In all cases, direct contact of the VCI with non-ferrous metals except magnesium and aluminum-base alloys shall be avoided unless specific permission is granted by the acquiring activity.

3.3.2 Caution with plastic, painted, or rubber parts. Assemblies containing plastic, painted, or rubber components or varnished or lacquered parts shall not be packaged with VCI until after the contractor has furnished proof to the acquiring activity that the specific inhibitor and specific component have passed the compatibility tests specified in 4.3.1.

3.3.3 Restriction on use of different inhibitors in single pack. Combinations of qualified VCI products may be used in the same pack, provided prior proof of compatibility has been furnished to the acquiring activity.

3.4 Cleaning and drying. When bare metal parts are to be protected with VCI, no residues foreign to the item shall remain after cleaning. When a vapor degreaser is used, precautions shall be taken to maintain the cleaning solvent within the prescribed cleanliness and temperature limits to prevent corrosion due to presence of water or decomposition of solvent with subsequent corrosion or release of toxic vapors. All other precautions as furnished by the manufacturer of the particular equipment shall be strictly observed.

3.5 Use of VCI with operational lubricants. Where VCI's are to be applied to assemblies containing operational lubricants, the contractor shall furnish proof to the contracting activity that such lubricants in conjunction with the specific VCI have satisfactorily passed the compatibility test of 4.3.1. Prior to application of VCI to the assemblies, the excess oil shall be drained off (not applicable to bonded films) (see 6.4).

3.6 Application of VCI material.

3.6.1 General.

a. VCI-treated packaging material (Specification MIL-P-3420, MIL-B-22019, MIL-B-22020, and MIL-B-40028). Unless otherwise specified, the VCI-treated materials shall be applied so as to completely enclose the item, or the part shall be wrapped with strips of the material without any other material between the part and the wrapping. Complete wrapping, where feasible, is preferred. The VCI-treated side of the packaging materials shall face the part being wrapped, and shall be applied so that any air entering the package shall pass through or over the surface of the VCI before reaching the part. Surfaces to be protected shall be not more than 12 inches from the VCI-treated materials. All enclosures shall be sealed since the degree of protection afforded by the VCI vapors is directly proportional to the gas tightness of the enclosure. When VCI material is used as an overwrap, the amount of air within the wrap shall be kept to a minimum.

b. VCI crystals (Specification MIL-I-22110). This VCI shall be sprayed, atomized or dusted over the entire surface of the item. Whenever feasible, the VCI shall also be sprayed, dusted or atomized into the enclosing container after which the container shall immediately be sealed.

3.6.2 Material in tiers or layers. When items are packed in tiers or layers, VCI shall be placed between the tiers. Where the VCI-treated materials are used in a carton containing separators, all faces of the separators shall be lined with the VCI-treated material in addition to lining the inside of the carton.

3.6.3 Cushioning and dunnage. Projections or sharp corners and edges shall be adequately cushioned with moldable barrier materials to prevent damage to either the part or the package. Where dunnage is required next to or around the item, a facing of VCI-treated barrier material shall be placed between the item and dunnage. In those unavoidable cases where the dunnage or other non-metallic materials used in the package may be hygroscopic or may give off corrosive vapors, the item and the VCI shall be isolated from this by use of aluminum foil or other suitable barrier materials. This is not necessary when such a barrier material is an integral part of the VCI-treated packaging material.

MIL-I-8574E

3.6.4 Quantity required.

a. VCI-treated packaging materials (Specification MIL-P-3420 and MIL-B-22019). When used as a complete over-wrap, the minimum amount of the treated area of VCI-treated packaging materials shall be at least equal to $\frac{3}{8}$ of surface area of the enclosing container. Otherwise, the amount of the VCI-treated material shall be at least equal to the surface area of the enclosing container.

b. VCI crystals (Specification MIL-I-22110). Amount of VCI shall be 1 gram of VCI per cubic foot of volume of the enclosing container.

3.6.5 Closed and blind-end components. Enclosed portions of assemblies, such as gear boxes, shall have VCI applied inside the enclosed space, and the enclosed volume shall be sealed. Open-end voids where the opening is small with relation to the void, shall be treated as specified above for enclosed portions of an assembly. Open-end voids of a depth greater than 6 inches shall have VCI inserted in the void. The minimum quantity of VCI required for protection of the enclosed spaces of closed and blind-end components shall be determined as specified in 3.6.4. Whenever an enclosed assembly is preserved with a VCI and sealed, an appropriate warning in the form of a label or a tag shall be applied to assure that the assembly will not be used prior to the application of the proper lubricant after removal of the VCI, if necessary.

3.6.6 Greaseproof barrier. Parts covered with operational oil films shall have a greaseproof barrier between the VCI and the outer packaging materials to prevent the latter from becoming oil soaked. Whenever possible, VCI-treated material conforming to Styles C and G of Specification MIL-P-3420, shall be used for this purpose since the barrier is an integral part of these VCI-treated materials.

3.7 Unit protection. Proper performance and preservative qualities of VCI are dependent upon the following:

a. Its use in a confined area where the circulation of air is limited.

* b. The application of the VCI being in accordance with the requirements of 3.6.1.

The degree of protection required for an item, when VCI is used, shall be governed by the nature (critical and noncritical) and composition of the item.

* 3.8 Marking. Unit and intermediate packages and shipping containers shall be marked in accordance with MIL-STD-129.

3.9 Depreservation. Crystalline or powdery deposits observed on the surfaces of critical moving parts may be removed by rinsing or scrubbing with methanol prior to the application of the operational lubricant.

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 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 assure supplies and services conform to prescribed requirements.

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

- a. First article inspection (see 4.2.1).
- b. Quality conformance inspection (see 4.2.2).

4.2.1 First article inspection. The first article inspection shall consist of examination and tests for all of the requirements of this specification. The inspection shall be performed by the first article inspection laboratory designated by the contracting officer (see 6.2). When specified, first article inspection shall be conducted by the contractor in the presence of a Government representative designated by the contracting officer. Approval of the first article inspection sample does not preclude the requirements for performing the quality conformance inspection. First article inspection may be waived when the acquiring activity or contract administration activity has data or other evidence to indicate that prior successful first article inspection has been conducted.

4.2.1.1 First article samples. When specified by the contracting officer (see 6.2) the contractor shall submit a first article sample of sufficient material to conduct all tests required by this specification. The sample shall be produced by the contractor or furnished by a supplier and manufactured using the same production processes, procedures and equipment used in fulfilling the contract. Prior to submission the contractor shall inspect the sample to assure that it conforms to the requirements of the contract and shall submit a record of this inspection. A first article sample shall be submitted, as directed by the contracting officer, whenever a change occurs in manufacturing process or material used such as to significantly affect product uniformity as determined by the Government. Failure of the first article sample to meet all the requirements of the specification shall be cause for rejection.

* 4.2.2 Quality conformance testing. Quality conformance tests shall consist of examination of packages for conformance with all of the requirements of this specification, except for compatibility.

* 4.2.2.1 Sampling. Quality conformance test samples shall be selected at random from the inspection lot and the inspection shall be in accordance with MIL-STD-105, and the AQL shall be as specified in the respective VCI-treated material specification or MIL-P-116. An inspection lot shall consist of packages prepared with the same VCI and submitted for inspection at one time. The unit of inspection shall be one package or as specified in the VCI-treated material specification or MIL-P-116.

4.3 Test methods.

* 4.3.1 Compatibility. A representative unit pack of the item being tested for compatibility shall be used for this determination. The unit pack shall utilize an actual item and shall employ the exact preservation technique planned for packaging the item up to and including the first seal. The test pack shall be suitably suspended in a chamber over an adequate volume of a glycerin-water solution having a specific gravity of 1.079 at $75^{\circ} + 3^{\circ}\text{F}$ to effect a relative humidity of 90% at 140°F . The chamber shall then be placed in an oven maintained at 140°F for 72 hours. At the end of this period, the test package shall be opened and the item shall be examined. There shall be no evidence of delamination of the VCI material, corrosion, or surface deterioration of the item. When operational lubricants such as oils or other compounds in liquid or semisolid state are present as part of the test item, those oils or compounds shall be removed and the previously covered areas of the item shall be examined for corrosion or surface deterioration. Any plastic present shall not exhibit delamination, embrittlement, warping, discoloration or crazing. Slight deposits which can readily be removed by methanol shall not constitute an incompatibility failure.

5. PACKAGING

5.1 This section is not applicable to this specification.

6. NOTES

* 6.1 Intended use. The procedures covered by this specification are intended for use in the protection of parts and assemblies during handling, shipment, and storage within the limitations specified in 3.3. Desiccants should not be used within VCI packages.

6.1.1 Items preserved with volatile corrosion inhibitors should be enclosed in sealed waterproof wraps or containers. Opaque bags which incorporate volatile corrosion inhibitors are covered by Specification MIL-B-40028.

6.1.2 Transparent bags, which are sealable, and incorporate volatile corrosion inhibitors as an integral part of the bags, are covered by Specification MIL-B-22020. When bags of the required size are not readily available, they may be fabricated from material conforming to Specification MIL-B-22019.

6.1.3 Volatile corrosion inhibitors in loose crystalline form, conforming to Specification MIL-I-22110, can be applied by atomization to preserve engine components, the interior walls of assembled engine cylinders, or other components of assembled equipment. Orifices or openings thru which crystals are applied should be subsequently sealed.

* 6.2 Ordering data. Acquisition documents should specify the following:

- a. Title, number, and date of the specification.
- b. Where applicable, type, class, and style of the VCI to be used.
- c. If first article inspection is required.
- d. Instructions concerning location of inspection laboratory and submittal of first article samples (see 4.2.1 and 4.2.1.1).

* 6.3 The procedures described herein provide guidance where P-18 preservative of MIL-P-116 is utilized.

6.4 Bonded films. A bonded film is a solid lubricant dispersed in a binder which is bonded to a substrate.

* 6.5 Changes from previous issue. The margins of this specification are marked with an asterisk to indicate where a change from the previous specification was made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:

Army - SM
Navy - AS
Air Force - 69

Preparing activity:

Navy - AS
(Project No. PACK-0617)

Review Activities:

Army - AT, AV, GL, ME, EA
Navy - MC, SA, YD, OS
Air Force - 99
DSA - DH

User Activities:

Navy - SH