

INCH-POUND
MIL-PRF-907F
17 November 2004
SUPERSEDING
MIL-PRF-907E
18 June 1985

PERFORMANCE SPECIFICATION

ANTISEIZE THREAD COMPOUND, HIGH TEMPERATURE

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

1. SCOPE

1.1 Scope. This specification covers antiseize compound for use on threads of steel nuts, studs, bolts and other mating surfaces, including those of superheated steam installations, at temperatures up to 1050 degrees Fahrenheit (°F) (566 degrees Celsius (°C)).

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-680 - Degreasing Solvent.

MIL-DTL-1222 - Studs, Bolts, Hex Cap Screws and Nuts.

Comments, suggestions, or questions on this document should be addressed to Commander, Naval Sea Systems Command, ATTN: SEA 05Q, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to commandstandards@navsea.navy.mil, with the subject line "Document Comment". Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <http://assist.daps.dla.mil>.

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DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-1916 - DoD Preferred Methods for Acceptance of Product.

FEDERAL STANDARDS

FED-STD-791 - Lubricants, Liquid Fuels and Related Products; Methods of Testing.

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch> or dodssp.daps.dla.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

BUREAU OF MEDICINE AND SURGERY (BUMED)

BUMED INST 6270.8 - Procedures for Obtaining Health Hazard Assessments Pertaining to Operational Use of a Hazardous Material.

(Copies of this document are available online at <https://bumed.med.navy.mil> or from Bureau of Medicine and Surgery, Department of the Navy, 2300 E Street, NW, Washington, DC 20372-5300.)

NAVAL SEA SYSTEMS COMMAND (NAVSEA)

S9510-AB-ATM-010 Rev 2 of 30 July 1992 - Nuclear Powered Submarine Atmosphere Control Manual.

(Copies of this document are available from the Naval Sea Systems Command, Code SEA 05Z9, 1333 Isaac Hull Avenue, SE, Stop 5133, Washington Navy Yard DC 20376-5133.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

ASTM INTERNATIONAL

- ASTM A 109 - Standard Specification for Steel, Strip, Carbon (0.25 Maximum Percent), Cold-Rolled. (DOD adopted)
- ASTM A 193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service. (DOD adopted)
- ASTM A 194 - Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both. (DoD adopted)
- ASTM A 515 - Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service. (DOD adopted)

(Copies of these documents are available from www.astm.org or ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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3. REQUIREMENTS

3.1 Qualification. The compound furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.2 and 6.3).

3.2 Material. The compound supplied under this specification shall be a smooth homogeneous mixture, uniform in appearance, free from lumps, abrasive materials, or other undesirable fillers or impurities. There shall be no odor of rancidity or perfume.

3.3 Corrosion on copper. After 24 hour exposure, the compound shall show no green color, no pitting or etching on the copper, nor shall a dark brown or black stain remain on the copper strip after washing with N-hexane. A slight brown stain shall not be cause for failure.

3.4 Toxicity. When evaluated in accordance with 4.4.4, the compound shall have no adverse effect on the health of personnel when used for its intended purpose and shall not cause any environmental problems during waste disposal (see 4.4.4 and 6.5).

3.5 Homogeneity. The compound shall be completely homogeneous at the time of inspection or during storage awaiting completion of the qualification tests. It shall possess a smooth greasy consistency without lumps, crusts or granular particles when examined.

3.6 Oil separation. The vehicle of the compound shall separate not more than 10 percent of the compound's weight in 30 hours when tested at $150 \pm 5^\circ\text{F}$ ($66 \pm 3^\circ\text{C}$).

3.7 Storage stability. After the compound has been stored for 6 months at a temperature of $150 \pm 5^\circ\text{F}$ ($66 \pm 3^\circ\text{C}$), it shall be examined. The compound shall be a smooth homogeneous mixture free from lumps and granular materials.

3.8 Performance. There shall be no galling of the stud threads, the nut threads, the nut contacting surface and the corresponding plate contacting surface when the test apparatus is disassembled following the performance test. The average breakaway torque for loosening of the nuts from the studs shall be as specified in 4.4.2.1.4.

3.9 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.10 Off-gassing. The compound shall meet the requirements in the Nuclear Powered Submarine Atmosphere Control Manual, NAVSEA Technical Manual S9510-AB-ATM-010 Rev 2 of 30 July 1992, for a usage category of Limited (see 4.4.5 and 6.7).

4. VERIFICATION

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

- a. Qualification inspection (see 4.2).
- b. Conformance inspection (see 4.3).

4.2 Qualification inspection. Qualification inspection shall be conducted at a laboratory acceptable to the command or agency concerned. Qualification inspection shall consist of examination and tests specified in 4.3 and 4.4.

4.3 Conformance inspection.

4.3.1 Lot. For the purposes of sampling, a lot shall consist of all compound manufactured as one batch.

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4.3.2 Examination of filled containers. A sample of filled containers selected from each lot in accordance with MIL-STD-1916 as specified in the contract or order shall be examined to verify compliance with all stipulations of this specification regarding fill, closure, marking and other requirements not involving tests. Containers shall be examined for defects of the container and the closure, for evidence of leakage, and for unacceptable markings; each sample filled container shall also be weighed to determine the amount of the contents. Any container in the sample having one or more defects, or under required fill shall cause rejection of the container and if the number of defective containers in any sample exceeds the acceptable number for the appropriate sampling plan as specified in the contract or order, this shall cause rejection of the lot represented by the sample.

4.3.2.1 Examination of compound material. Portions of the compound material shall be taken from top, bottom and intermediate parts of the sample of containers and examined visually to determine that there is no apparent difference in appearance or consistency. The material shall be homogeneous and show a smooth greasy consistency without lumps, crusts or granular particles. It shall not have an odor of rancidity or perfume.

4.3.3 Sample material for testing. From each lot, a 5-pound container shall be selected, sealed and marked. The 5-pound sample specimen shall be retained by the manufacturer or contractor for verification testing, if required, at a later date.

4.3.4 Sampling for production check tests. Unless otherwise specified (see 6.2), from the first lot produced on a contract or order and thereafter at such intervals as may be considered necessary by the command or agency concerned to verify the consistency of production quality, one 2-pound sample and two 1-pound samples of compound shall be forwarded to a laboratory acceptable to the command or agency concerned. These samples shall meet the requirements of 3.6 and any other tests deemed necessary by the command or agency concerned to determine conformance of the product.

4.4 Tests.

4.4.1 Test procedures. The following tests shall be performed in accordance with Table I.

TABLE I. Test methods.

Test	Applicable FED-STD-791 test method	Test paragraph	Acceptance criteria	Required for qualification
Corrosion on copper	5309	-----	3.3	X
Oil separation (150°F)	321	-----	3.6	X
Storage stability	3467	4.4.3	3.7	X
Performance		4.4.2	3.8	X

4.4.2 Performance tests.

4.4.2.1 Torque, galling and seizing test.

4.4.2.1.1 Apparatus. The test apparatus shall consist of the following: A fixture made of carbon steel, using material in accordance with ASTM A 515, grade 70, 13 by 3 inches by approximately 1-1/2 inches thick for the end blocks which have 5 equally spaced holes, 13/16 inch in diameter, with surface finish of 250 roughness height rating (RHR), to allow for insertion of 3/4 inch 10 UNC studs (see Figure 1). The top and bottom faces of the steel end blocks shall have a surface finish of 250 RHR and be parallel within ± 0.002 . Five unused coarse thread studs, in accordance with grade B16 of MIL-DTL-1222, ASTM A 193 or equal, cut from the same length of a continuously threaded stud stock and ten unused nuts, in accordance with grade 4 of MIL-DTL-1222, ASTM A 194 or equal, shall be used for this test. Each stud shall be 12.000 ± 0.125 inches long and shall have end surfaces which are perpendicular to the axis of the stud to a degree which shall allow stud length measurements of the required

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accuracy. Two carbon steel face plates in accordance with ASTM A 109, 13 by 3 inches and 0.125 inch thick with a surface finish of 62 RHR or smoother and five equally spaced holes to match those of the above described end blocks, shall be furnished for this test. Components for this test shall be as shown on Figure 1. A torque wrench shall be used which is easily readable, graduated in foot-pounds (ft-lb) and has a degree of accuracy of ± 5 percent. The overall length of each stud shall be measured with a dial indicator type device or equal, graduated in 0.0001 inch divisions, having an overall accuracy of ± 0.0001 inch.

4.4.2.1.2 Preparation. Dry-cleaning solvent shall be in accordance with type I of MIL-PRF-680. Each component shall be cleaned in the dry-cleaning solvent and dried just prior to lubrication. The test equipment shall be assembled using the two plates as specified in 4.4.2.1.1. The threads of the studs and nuts shall be evenly coated with the antiseize compound as follows:

- a. A liberal quantity of compound shall be applied to the studs and nuts.
- b. The nuts shall then be run to the ends of the studs (prior to assembly with the block).
- c. The excess compound shall be removed from the ends of nut travel on the studs and from the edges of the nuts after removal from the studs.

The block and plate shall be assembled with a stud in each of the five holes. The surface of the plates and the mating surfaces of the nuts shall be coated with a light coating of the antiseize compound. The nuts shall be run on to the studs, hand tight, against the plates. The overall length of each stud shall be measured to ± 0.0001 inch and recorded.

4.4.2.1.3 Procedure. The nuts shall be tightened until an elongation of 0.0162 ± 0.0001 inch is obtained, which corresponds to a stress of approximately 50,000 pounds per square inch (PSI) at the root area of the stud thread. The torque required for each nut and stud tightening shall be recorded. The test block assembly shall be placed in an electronically heated oven and subjected to $1050 \pm 10 - 0^\circ\text{F}$ for 6 hours. Then the assembly shall be removed from the oven and allowed to cool to room temperature. The breakaway torque to loosen the nuts shall be measured and recorded. The length of the studs shall be measured. The nuts shall be tightened to re-establish the elongation of the stud length (that is, 0.0162 ± 0.0001 inch) and the torque required recorded. The heating, cooling, torque measurements, and stud length measurements shall be repeated. Then for the third time the assembly shall be heated, cooled and subjected to a spray of 20 percent aqueous solution of sodium chloride for 7 days. At the end of this period, the assembly shall be removed and allowed to dry at room temperature for 24 hours. The torque required to loosen the nuts shall be determined and recorded. The condition of the threads and other contact surfaces, seizing of the nuts and shearing of the studs shall be noted and properly recorded. A five-point check of the torque wrench calibration against another calibrated wrench at 150 ft-lb shall be made prior to torquing and untorquing each assembly. If the torque wrench is dropped or otherwise damaged during its use, its calibration shall be completely rechecked (five points) before further usage. The torque wrench calibration shall be considered acceptable if the torque reading is within 5 percent of the actual torque.

4.4.2.1.4 Acceptance criteria.

- a. No nuts shall seize during this test.
- b. There shall be no galling evident on the threads of the nuts or studs, the nut surfaces and the plate surfaces (under the nut faces). Only one nut per stud need be removed to inspect for galling on threads. Mating surfaces of each nut and plate shall be inspected after disassembly. No galling is defined as no raised metal on any contacting surfaces as can be observed with 20-20 vision at 1X magnification within the distance range of $\frac{1}{2}$ to 2 feet.
- c. The average breakaway torque for the loosening of the nuts from the five studs shall not exceed 250 ft-lb.

4.4.3 Storage stability. Storage stability shall be in accordance with method 3467 of FED-STD-791 with the modifications specified herein. Two one-pound cans shall be stored covered in an oven at a temperature of $66 \pm 3^\circ\text{C}$ ($150 \pm 5^\circ\text{C}$) for 6 months. The sample shall then be examined in accordance with 4.4.2.1 and for presence of crystalline material. No crystalline material or lumps are acceptable.

4.4.4 Toxicity. The compound shall be evaluated by the Navy Environmental Health Center (NAVENVIRHLHCEN) using the administrative Health Hazard Assessment (HHA). A flowchart for this process

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can be found as enclosure (1) of BUMEDINST 6270.8. The HHA is a review of the compound based on information submitted by the manufacturer, to assess health hazards associated with the handling, application, use and removal of the product. Sufficient data to permit a HHA of the product shall be provided by the manufacturer/distributor to the NAVENVIRHLTHCEN. To obtain current technical information requirements specified by the NAVENVIRHLTHCEN, see 6.5.

4.4.5 Off-gassing. The compound shall be tested in accordance with the Nuclear Powered Submarine Atmosphere Control Manual, NAVSEA Technical Manual S9510-AB-ATM-010/(U), by a Government approved testing facility. The results shall be submitted to the Government for evaluation and approval for use (see 3.10 and 6.7).

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

6.1 Intended use. The antisieze compound covered by this specification is intended for use on carbon steel materials. Specifically, it is to be used on threads of nuts, studs, bolts and other mating surfaces at temperatures up to 1050°F.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Packaging requirements (see 5.1).
- c. Material Safety Data Sheet (MSDS), when required. (see 6.4)
- d. Toxicity conformance (see 3.4 and 6.5).
- e. Production check test sample size if other than specified (see 4.3.4)
- f. Off-gassing conformance (see 3.10 and 6.7)
- g. Shelf life requirements, when required. (see 6.6)

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL No. 907 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, 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. Information pertaining to qualification of products may be obtained from Commander, Naval Sea Systems Command, ATTN: SEA 05Q, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160.

6.4 Material safety data sheets. When required, contracting officers will identify those activities requiring copies of completed Material Safety Data Sheets prepared in accordance with FED-STD-313. In order to obtain the MSDS, FAR clause 52.223-3 must be in the contract.

6.5 Toxicity evaluation. The NAVENVIRHLTHCEN requires sufficient information to permit a HHA of the product. Any questions concerning toxicity, information required to conduct a HHA, and requests for a HHA should be addressed to the Commanding Officer, Navy Environmental Health Center, ATTN: Hazardous Materials

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Department, Industrial Hygiene Directorate, 620 John Paul Jones Circle, Suite 1100, Portsmouth, VA 20378-2103. Upon receipt of the HHA, a copy should be provided to Commander, Naval Sea Systems Command, ATTN: SEA 05M3, 1333 Isaac Hull Ave., SE, Stop 5133 Washington Navy Yard, DC 20376-5133.

6.6 Shelf life. This specification covers items where shelf life is a consideration. When required, specific shelf-life requirements will be specified in the contract or purchase order by the contracting officer. The shelf-life codes are contained in the Federal Logistics Information System Total Item Record. Additive information for shelf-life management may be obtained from *DoD 4140.27-M, Shelf-life Management Manual*, or the designated shelf-life Points of Contact (POC). The POC should be contacted in the following order: (1) the Inventory Control Points (ICPs), and (2) the DoD Service and Agency administrators for the DoD Shelf-Life Program. Appropriate POCs for the DoD Shelf-Life Program can be contacted through the DoD Shelf-Life Management website: <http://www.shelflife.hq.dla.mil/>.

6.7 Off-gassing. Materials to be installed in submarines are to be controlled to prevent off-gassing, which contaminates the atmosphere and results in health hazards to personnel or deleterious effects on machinery. These controls are accomplished through the Submarine Material Control Program, which is described in the Nuclear Powered Submarine Atmosphere Control Manual, NAVSEA Technical Manual S9510-AB-ATM-010(U). Under the Submarine Material Control Program, all materials considered for use on submarines require certification and assignment of a usage category. Under the certification process, candidate materials are selected by Navy activities or contractors, and a request for certification is submitted to Commander, Naval Sea Systems Command, ATTN: SEA 05Z9, 1333 Isaac Hull Ave., SE, Stop 5122, Washington Navy Yard DC 20376-5122. The certification request is accompanied by detailed information, including descriptions of the material. A chemical analysis is conducted, which is normally accomplished through off-gas testing. The off-gas test is required to be conducted in a Government approved laboratory designated by the preparing activity. Information pertaining to this test requirement may be obtained from Commander, Naval Sea Systems Command, ATTN: SEA 05Z9, 1333 Isaac Hull Ave., SE, Stop 5160, Washington Navy Yard, DC 20376-5160. Based on the chemical analysis results, a usage category is assigned to the material defining whether, and to what extent, the material may be used on submarines.

6.8 Subject term (key word) listing.

Thread lubricant

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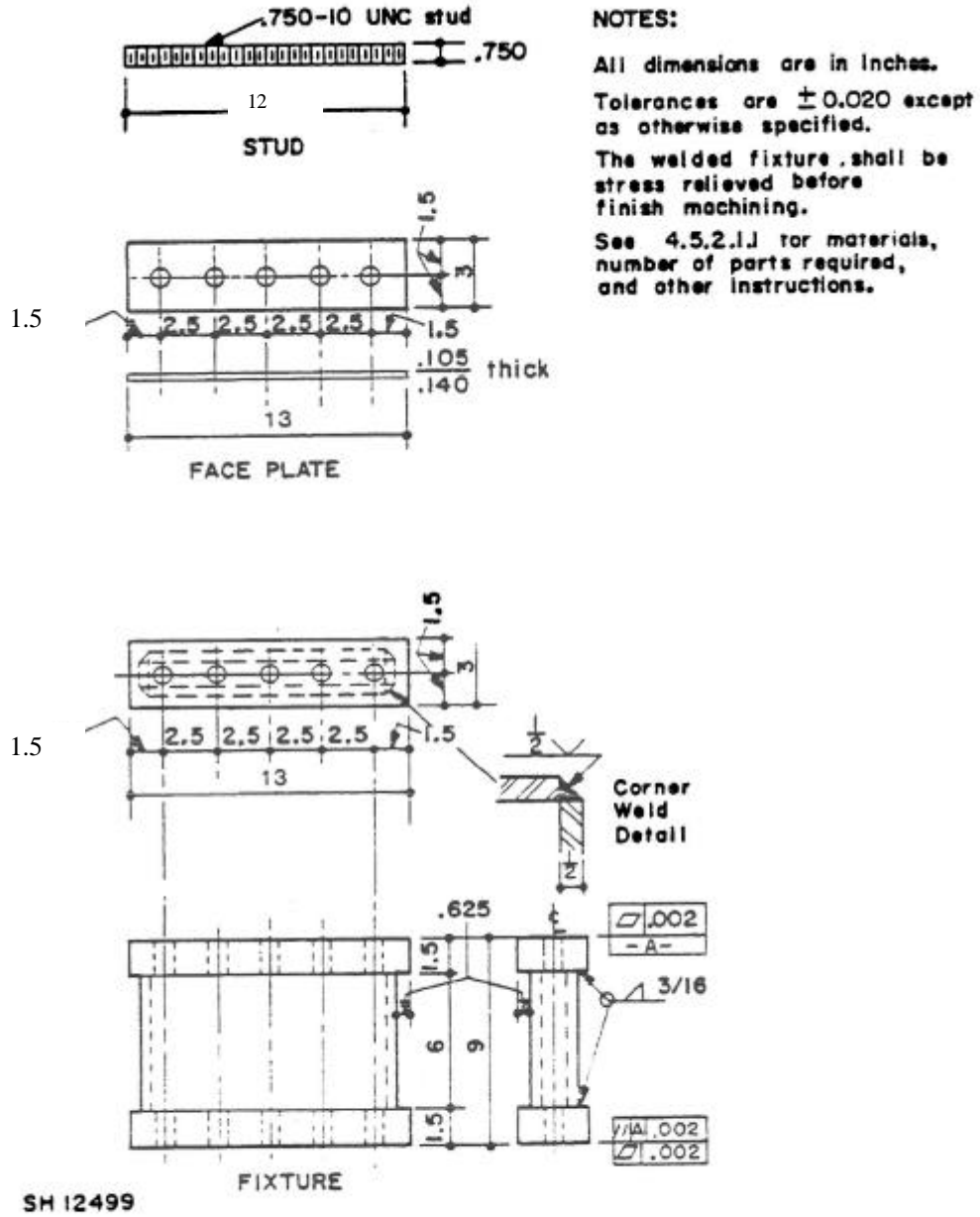


FIGURE 1. Test fixture.

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Custodians:

Army - MR
Navy - SH
Air Force - 99

Preparing Activity:

Navy - SH
(Project 8030-0825)

Review activities:

Army - AR, AT, EA, GL, MI
Navy - AS, MC, OS, YD
Air Force - 84

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