

[INCH-POUND]
MIL-G-24696B(SH)
25 May 1995
SUPERSEDING
MIL-G-24696A(SH)
30 December 1992
(See 6.8)

MILITARY SPECIFICATION

GASKET, SHEET, NON-ASBESTOS

This specification is approved for use by the Naval Sea 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 establishes the requirements of non-asbestos sheet gasket material for non-propulsion and propulsion steam and water applications and for all petroleum based hydraulic oil applications.

1.2 Part or identifying number (PIN) A part numbering system for gasket materials contained in this specification is described in MIL-G-24696/1.

2 APPLICABLE DOCUMENTS

2.1 Government documents.

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

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, SEA 03R42, Naval Sea Systems Command, 2531 Jefferson Davis Hwy, Arlington, VA 22242-5160 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 5330

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SPECIFICATIONS

FEDERAL

L-P-378 Plastic Sheet and Strip, Polyolefin
 PPP-B-1055 Barrier Material, Waterproofed, Flexible
 PPP-F-320 Fiberboard, Corrugated and Solid, Sheet Stock
 (Container Grade), and Cut Shapes

MILITARY

MIL-P-116 - Preservation, Methods of
 MIL-L-19140 - Lumber and Plywood, Fire Retardant Treated
 MIL-G-24696/1 - Gasket, Sheet Non-Asbestos Sizes and Tolerances

STANDARDS

FEDERAL

FED-STD-313 - Material Safety Data, Transportation Data and
 Disposal Data for Hazardous Materials Furnished
 to Government Activities

MILITARY

MIL-STD-2073-1 - DoD Materiel Procedures for Development and Appli-
 cation of Packaging Requirements

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094)

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 (see 6.2)

AMERICAN NATIONAL STANDARDS INSTITUTE, INC (ANSI)
 B16.5 - Pipe Flanges and Flanged Fittings

(Application for copies should be addressed to the American National Standards Institute, Inc, 11 West 42nd Street, 13th Floor, New York, NY 10036)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D 512 - Standard Test Methods for Chloride Ion in Water
 D 1179 - Standard Test Methods for Fluoride Ion in Water
 (DoD adopted)
 D 1246 - Standard Test Method for Bromide Ion in Water.
 (DoD adopted)
 D 3223 - Standard Test Method for Total Mercury in Water
 (DoD adopted)
 D 3557 - Standard Test Methods for Cadmium in Water (DoD adopted)
 D 3559 - Standard Test Methods for Lead in Water (DoD adopted)

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ASTM (Continued)

- D 3951 - Standard Practice for Commercial Packaging (DoD adopted)
- D 4190 - Standard Test Method for Elements in Water by Direct-Current Argon Plasma Atomic Emission Spectroscopy
- D 4327 - Standard Test Method for Anions in Water by Ion Chromatography
- F 36 - Standard Test Method for Compressibility and Recovery of Gasket Materials (DoD adopted)
- F 37 - Standard Test Methods for Sealability of Gasket Materials (DoD adopted)
- F 38 - Standard Test Methods for Creep Relaxation of a Gasket Material (DoD adopted)
- F 104 - Standard Classification System for Nonmetallic Gasket Materials (DoD adopted)
- F 147 - Standard Test Method for Flexibility of Non-Metallic Gasket Materials
- F 152 - Standard Test Methods for Tension Testing of Nonmetallic Gasket Materials. (DoD adopted)

(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 specification sheets), 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 Specification sheets The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the applicable specification sheet, the latter shall govern.

3.1.1 Qualification Gaskets furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list at the time of award of contract (see 4.3 and 6.4).

3.2 Material.

3.2.1 Composition The sheet gasket material shall be composed of various organic or inorganic materials and binders according to the contractor's design. The material shall meet the requirements of this specification (see 6.3 and 6.4) and shall not contain any asbestos.

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3 2 2 Recovered materials Unless otherwise specified herein, all material incorporated in the products covered by this specification shall be new and may be fabricated using materials produced from recovered materials to the maximum extent practicable without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification unless otherwise specifically specified.

3 2 3 Material safety data sheet (MSDS) The contracting activity shall be provided a material safety data sheet at the time of the contract award. The MSDS shall be provided in accordance with the requirements of FED-STD-313. The MSDS shall be included with each shipment of the material covered by this specification (see 6 5).

3 2 4 Toxic products The material shall have no adverse effect on the health of personnel when used for its intended purpose. Conformance shall be determined by a health hazard risk assessment (HHRA) as specified in 4.1 2. Products meeting this requirement will be issued a letter of approval by the Naval Sea Systems Command. Letters of approval shall apply solely to those products specifically evaluated for toxicity. Formulation changes in the product shall require a re-evaluation of the product for toxicity and a new letter of approval. Approval letters will be in effect for a maximum of three years, after which, re-issue may be requested. Manufacturers shall provide a copy of the approval letter applicable to offered products to the contracting activity before the product will be accepted (see 6.2). Questions pertaining to health hazards shall be referred by the contracting activity to Chief, Bureau of Medicine and Surgery, Department of the Navy, who will act as an advisor to the contracting agency.

3 3 Dimensions and tolerances The dimensions and tolerances of sheet gasket material shall be in accordance with table I and II of MIL-G-24696/1A(SH), as specified (see 4 5 1 1, 4 5 1 2, and 6 2).

3 4 Tensile strength Using a thickness of 1/16 inch, tensile strength shall be a minimum of 1700 pounds per square inch (lb/in²) in the weakest axis (see 4.5.2).

3.5 Sealability The gasket shall have a leak rate not greater than 1 milliliter (mL) per hour (see 4 5 4).

3.6 Compressibility and recovery Compressibility shall be within the range of 7 to 17 percent. Recovery shall be not less than 40 percent (see 4 5 5).

3.7 Creep relaxation Creep relaxation shall be not greater than 60 percent (see 4 5 6).

3 8 Adhesion Adhesion shall be not greater than step (3) of the scale specified in 60.1(g) of appendix A (see 4 5 7).

3 9 Flexibility The material shall not crack or delaminate when bent around a mandrel with a diameter 12 times the nominal thickness of the gasket material (see 4 5 8).

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3 10 Detrimental materials

3 10 1 Total detrimental materials Detrimental materials shall not exceed the maximum concentrations as specified in table I (see 4 5 3 and 6.3)

TABLE I Detrimental materials.

Material	Maximum concentration permitted (ppm)
Asbestos	None permitted
Halogens (total of chloride, fluoride, and bromide) <u>1/</u>	1000
Lead	250
Mercury and compounds (none intentionally added) <u>2/</u>	10
Sulfur	10,000

1/ Materials containing greater than 1000 parts per million (ppm) total halogens are acceptable provided only fluorine exceeds 250 ppm and total leachable halides do not exceed 250 ppm (see 4.5 3).

2/ During manufacturing, fabrication, handling, packaging, and packing, the gasket material shall not come in contact with mercury or mercury compounds

3 11 Performance

3 11 1 Steam exposure The gasket material shall provide a seal on two standard piping flange assemblies for 300 hours at 150 lb/in² gauge and maintained at a temperature of 366 degrees Fahrenheit (°F) (185 degrees Celsius (°C)) (appendix B) and one standard piping flange assembly for 100 hours (appendix D) tests respectively at saturated steam conditions at no less than 150 lb/in² during thermal cycles (see 4.5 9.1) Appearance of water or wetting at the fluid boundary formed by the gasket is cause for either rejection of the gasket or retorquing of the flange bolts.

3.11 2 Water exposure.

3 11.2 1 Water exposure (appendix C only) The gasket material shall provide a seal on two standard piping flange assemblies for 300 hours at 400 lb/in² and be maintained at a temperature of 300°F (149°C) during thermal cycles. Water system pressure shall be not less than 400 lb/in² gauge after each 100-hour cycle and at normal system pressure checks (see 4 5.9.1). Appearance of water or wetting at the fluid boundary formed by the gasket is cause for either rejection of the gasket or retorquing of the flange bolts

3 11 2 2 Water exposure (appendix E only) The gasket material shall provide a seal for 100 hours at 315 lb/in² gauge minimum and be maintained at ambient temperature (see 4 5.9 1) Appearance of water or wetting at the fluid boundary formed by the gasket is cause for either rejection of the gasket or retorquing of the flange bolts

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3 11 3 Lube oil exposure The gasket material shall provide a seal on two (1-inch, appendix F and 3-inch, appendix H) standard piping flange assemblies for 500 hours at 150 lb/in² gauge and shall be maintained at a temperature of 250°F (121°C) during thermal cycles. Appearance of lube oil or wetting at the fluid boundary formed by the gasket is cause for either rejection of the gasket or retorquing of the flange bolts (see 4.5 9)

3 11 4 Hydraulic oil exposure The gasket shall provide a seal on both raised face and flat faced flanges for the conditions described herein. Raised face, (Appendix G) gasket shall seal for 500 hours at 600 lb/in² gauge and shall be maintained at a temperature of 180°F (82°C) during thermal cycles (see 4 5 10 3). Flat faced, (Appendix I) gasket shall seal for 500 hours at 150 lb/in² gauge and shall be maintained at a temperature of 250°F (121°C) during thermal cycles (see 4 5.9 2). Appearance of hydraulic oil or wetting at the fluid boundary formed by the gasket is cause for either rejection of the gasket or retorquing of the flange

3 12 Identification markings Unless otherwise specified (see 6 2), each sheet shall be legibly and permanently marked with the following information

- (a) Non-asbestos
- (b) Specification number
- (c) Manufacturer's name
- (d) Manufacturer's product identification

Markings shall be not less than 3/8 inch in height, on one side only, and on every square foot or less of the material

3 13 Workmanship The gasket material shall be uniform in quality and condition. It shall be clean, smooth, and free from all foreign materials and defects that will impair material use and serviceability

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 shall meet all requirements of sections 3 and 5. The inspections 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 the 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 accept defective material

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4.1.2 Toxicity The manufacturer shall provide sufficient information to permit a toxicological evaluation of his product to the Navy Environmental Health Center (NEHC), accompanied with a request to perform a health hazard risk assessment (HHRA). As a minimum, the information shall include name, formula, and approximate percentage by weight of each ingredient in the product; identification of its pyrolysis products, and any other such information as may be needed to permit an accurate appraisal of any toxicity problem associated with the handling, storage, application, use, removal, disposal, or combustion of the product. The request for a HHRA shall also include a product material safety data sheet and a copy of the product label. The manufacturer shall provide any other information requested by NEHC to perform their evaluation. Proprietary data, which is clearly marked as such, will be held in the strictest confidence by NEHC. The request for a HHRA shall be addressed to the Commanding Officer, Navy Environmental Health Center, 2510 Walmer Avenue, Norfolk, Virginia 23513-2617, Attn: C I.H./NEHC-34. The manufacturer shall also send a copy of the letter which requests the HHRA to the Chief, Bureau of Medicine and Surgery (MED-03B4), Washington, DC 20372-5120. Upon receipt of the HHRA performed by the NEHC, the manufacturer shall send a copy to the Naval Sea Systems Command, Code 514, Washington, DC 20362-5101, with a request for approval.

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

- (a) Qualification inspection (see 4.3)
- (b) Quality conformance inspection (see 4.4)

4.2.1 Inspection conditions Unless otherwise specified (see 6.2), all inspections shall be performed in accordance with the test conditions specified herein.

4.3 Qualification inspection Qualification inspection shall be conducted at a laboratory satisfactory to the Naval Sea Systems Command (NAVSEA). Qualification inspection shall consist of examinations and tests specified in table II.

TABLE II Qualification inspection

Inspection	Requirement	Test method
Dimensions:		
Thickness	3.3	4.5.1.1
Width and length	3.3	4.5.1.2
Tensile strength	3.4	4.5.2
Total detrimental materials	3.10.1	4.5.3
Sealability	3.5	4.5.4
Compressibility/recovery	3.6	4.5.5
Creep relaxation	3.7	4.5.6
Adhesion	3.8	4.5.7
Flexibility	3.9	4.5.8
Steam/water/lube oil/ hydraulic oil exposure (performance)	3.11	4.5.9
Identification markings	3.12	4.4.5
Workmanship	3.13	4.4.5

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4 4 Quality conformance inspection Quality conformance inspection shall be as specified in table III (for groups A, B, and C) and 4 4 1 through 4 4.5 (see 6 3)

TABLE III Quality conformance inspection

Inspection	Requirement	Test method
Group A		
Thickness	3 3	4 5 1.1
Width and length	3 3	4 5.1.2
Identification markings	3 12	4 4.5
Workmanship	3 13	4 4 5
Group B		
Tensile strength	3 4	4 5 2
Total detrimental materials <u>1/</u>	3 10 1	4.5 3
Sealability <u>1/</u>	3 5	4 5 4
Flexibility	3 9	4 5 8
Group C		
Compressibility/recovery	3 6	4 5.5
Creep relaxation <u>1/</u>	3 7	4 5 6
Adhesion <u>1/</u>	3 8	4 5.7
Steam/water/lube oil/ hydraulic oil exposure (performance) <u>1/</u>	3 11	4 5.9

1/ See 4.4.4

4.4 1 Lot For the purpose of quality conformance inspection and test sampling, a lot is defined as all sheets of the same composition, thickness, width, and length produced in one facility, using the same production processes and materials, and being offered for delivery at one time

4 4 2 Sampling

4 4 2 1 Sampling for examination of gasket material As a minimum, the contractor shall randomly select a sample quantity from each lot of completed rolls or sheets as specified in table IV and inspect them as specified in 4.4.5 for the characteristics of table VI (see 6.6 1).

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TABLE IV. Sampling for visual examination of gasket material.

Lot size (rolls or sheets)	Sample size (rolls or sheets)
2 to 50	5
51 to 90	7
91 to 150	11
151 to 280	13
281 to 500	16
501 to 1,200	19
1,201 to 3,200	23
3,201 to 10,000	29
10,001 to 35,000	35

4.4.2.2 Sampling for tests. As a minimum, the contractor shall randomly select a sample quantity, each 12 by 12 inches, from each lot of completed gasket material as specified in table V and test them as specified in 4 5.2 through 4 5 9 (see 6.6 2)

TABLE V Sampling for tests

Lot size (rolls or sheets)	Sample size (rolls or sheets)
2 to 25	3
26 to 50	5
51 to 90	6
91 to 150	7
151 to 280	10
281 to 500	11
501 to 1,200	15
1,201 to 3,200	18
3,201 to 10,000	22
10,001 to 35,000	29

4 4 3 Noncompliance If a sample fails to pass all of the inspections in groups B and C, the contractor shall notify the contracting activity and the cognizant inspection activity of such failure and take corrective action on the materials or processes, or both, as warranted, and on all units of product which can be corrected and which are manufactured under essentially the same materials and processes, and which are considered by the qualifying activity to be subject to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action, acceptable to the contracting activity has been taken. After the corrective action has been taken, all of the inspections in groups B and C shall be repeated on additional sample units (all tests and examinations, or the test which the original sample failed, at the option of the contracting activity). Group A inspections may be performed again, but final acceptance and shipment shall be withheld until group B and C inspections have shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure shall be furnished to the cognizant inspection activity and to the contracting activity.

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4 4 4 Certification The product shall meet the requirements specified in 3 4 through 3 11, of this specification (see 6 3)

The tests specified in 4 5 4 and 4 5 6 may be omitted only if both of the following are true

- (a) If within 18 months prior to shipment, the material has been tested and found in conformance to 3 5 and 3 7, and
- (b) If the material offered for delivery is manufactured the same in all respects as that previously tested

The tests specified in 4 5 3, 4 5 7, and 4 5 9 may be omitted only if both of the following are true

- (a) If within 3 years prior to shipment, the material has been tested and found in conformance to 3 10 1, 3 8, and 3 11, and
- (b) If the material offered for delivery is manufactured the same in all respects as that previously tested

4 4 4 1 (Changes to product) Any changes in basic ingredients or processes which would affect compliance with this specification must be reported to both the contracting activity and NAVSEA. The Government reserves the right to require that all tests specified in this specification be conducted on all lots before shipment is made

4 4 5 Visual examination Each of the sample rolls or sheets selected shall be surface examined for the defects classified in table VI. Gasket material delivered in rolls shall be unrolled sufficiently to expose the required sample area (square foot). Both sides (faces) of the material shall be inspected, regardless of whether flat sheet or roll materials are being inspected (see 6.6).

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TABLE VI. Classification of defects.

Category	Item	Defect
Major		
101	Sheets	Thickness is not as specified
102	Sheets	Width is less than specified
103	Sheets	Length is less than specified.
104	Sheets	Marking is not as specified; class, type (if applicable), and manufacturer's name and brand missing.
105	Sheets	Surface is not smooth
106	Sheets	Evidence of lubricant on the sheets.
107	Sheets	Sheet is damaged, not suitable for making gaskets.
108	Circular	OD is less than specified
109	Circular	ID is more than specified.
110	Circular	ID is less than specified.
111	Holes	Number of holes is other than specified
112	Holes	Size of holes is other than specified
113	Holes	Size of holes exceed the tolerance specified
Minor		None defined.

4 5 Test methods4 5 1 Dimensions and tolerances

4.5.1.1 Thickness. Thickness shall be determined in accordance with ASTM F 104 (see 3 3)

4 5.1 2 Width and length Width and length shall be determined by direct measurement using steel ruler with 1/64-inch graduations (see 3.3)

4 5.1 3 Circular dimensions and bolt holes ID, OD and bolt hole sizes shall be determined by direct measurement using a steel ruler with 1/64-inch graduations

4 5 2 Tensile strength Tensile strength shall be determined in accordance with method A of ASTM F 152 (see 3 4)

4 5.3 Total detrimental materials.

4 5.3.1 Heavy metals. Heavy metals shall be analyzed in accordance with the methods specified in ASTM D 3223, D 3557, D 3559, or D 4190 NAVSEA approval to use equivalent methods is not required (see 3.10)

4 5 3.2 Water leachable halides For determination of water leachable halides, the following test method shall be used (see 3 10)

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- (a) Two gasket material test specimens shall be taken. Each test specimen shall weigh not less than 15 grams and shall be taken from a different sample. The test specimen of gasket material shall be representative of the sample cross section.
- (b) The test specimens shall be cut into pieces not larger than 1/8 by 1/4 inch.
- (c) Each test specimen shall be weighed, transferred to a pressure vessel (that is, Parr bomb or equivalent) covered with 200 to 300 mL of distilled or demineralized water and maintained at approximately 500°F (260°C) for a minimum of 6 hours. The leach water shall then be separated by filtration and the filter rinsed. A blank determination shall be run using similarly cleaned equipment and distilled or demineralized water from the same source.
- (d) The concentration of bromide, chloride and fluoride ions in each filtrate shall be determined by ASTM D 1246, D 512, D 1179, and D 4327, as appropriate, and shall be corrected by the results of the blank determination. NAVSEA approval to use equivalent analysis methods is not required but should be highlighted in the test information.
- (e) The results of each test shall be calculated as net ppm of extractable halide ion by weight of the test specimen.

4 5 4 Sealability Sealability shall be determined in accordance with method B of ASTM F 37 (see 3 5). An external compressive load of 3000 lb/in² gauge, a control pressure of 30 lb/in² gauge, and ASTM standard fuel A shall be used.

4 5 5 Compressibility and recovery Compressibility and recovery shall be determined in accordance with procedure A of ASTM F 36 (see 3 6).

4.5.6 Creep relaxation Creep relaxation shall be determined in accordance with method B of ASTM F 38 using steel platens and 1/16-inch thick material (see 3.7).

4 5 7 Adhesion Adhesion shall be determined in accordance with the procedure specified in appendix A (see 3.8).

4.5.8 Flexibility Flexibility shall be determined in accordance with ASTM F 147. A mandrel with a diameter 12 times the nominal thickness of the specimen shall be used (see 3 9).

4 5 9 Performance

4 5 9 1 Performance (steam and water) Performance testing shall be as specified in 4 5 9 1 1 and 4 5 9 4 as applicable, using the procedure of appendices B and D for steam and the procedure of appendices C and E for water exposure (see 3 11).

4 5 9 1 1 Flange assemblies Two standard flange assemblies shall be required as test fixtures. The flange assembly configuration described in appendices B and C and shown on figure 1 shall be as follows.

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- (a) 1-inch steel flange in accordance with ANSI B16.5, class 300
- (b) 8-inch steel flange in accordance with ANSI B16 5, class 300

The flange assemblies for these configurations shall be raised-face with surface finishes between 150 and 500 root mean square (rms) Surface to be serrated with a concentric or phonographic pattern in accordance with ANSI B 16.5. The configuration for the third flange assembly is described in appendices D and E.

4 5 9 2 Performance (lube oil and hydraulic oil) Performance testing shall be specified in 4 5 9 2, 4 5 9 3 and 4.5 9.4 using the procedures of appendices F and H for lube oil and the procedures of appendices G and I for hydraulic oil exposure (see 3.11).

4 5 9 2.1 Flange assemblies for lube oil. Both raised-face and flat-faced flanges shall be used in test assemblies The requirements and configurations for each are described below.

4.5.9.2 2 Raised-face flange assemblies for lube oil. Two standard raised-face assemblies shall be required as test fixtures The flange assembly configuration described in appendix F and shown on figure 4 shall consist of the following

- (a) 1-inch steel flange in accordance with ANSI B16 5, class 150
- (b) 3-inch steel flange in accordance with ANSI B16 5, class 150.

The raised-face flange assemblies for this configuration shall possess surface finishes between 150 and 500 rms The surface shall be serrated with a concentric or phonographic pattern in accordance with ANSI B16 5

4 5.9.2.3 Flat-faced flange assembly for lube oil. One standard flange assembly shall be required as a test fixture. The flange assembly configuration described in appendix H and shown on figure 5 shall consist of a 3-inch steel flange in accordance with ANSI B16 5, class 150. The flat-faced flange shall have a phonographic surface finish of 250 roughness height rating (RHR).

4.5.9.3 Flange assemblies for hydraulic oil. Both raised-face and flat-faced flanges shall be used in test assemblies The requirements and configurations for each are described below.

4.5 9.3.1 Raised-face flange assembly for hydraulic oil. One standard flange assembly shall be required as a test fixture. The flange assembly configuration described in appendix G and shown on figure 2 shall consist of a one-inch steel flange in accordance with ANSI B16.5, class 600. The raised-face flange assembly for this configuration shall possess a surface finish between 150 and 500 rms The surface shall be serrated with a concentric or phonographic pattern in accordance with ANSI B16.5

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4 5 9 4 Testing the material

4 5 9 4 1 Testing the material (steam and water) The gasket material shall be tested, using the three flange assemblies, for 300 (appendices B and C) and 100 hours (appendices D and E) respectively The assemblies shall be allowed to cool to ambient temperature at the end of 100-hour periods to evaluate thermal cycling Retorquing of the flange bolts is permitted on start-up cycles, if required A maximum of two retorques of all bolts is permitted, per test

4 5 9 4 2 Testing the material (lube oil and hydraulic oil) The gasket material shall be tested, using the appropriate flange assemblies, for 500 hours The assemblies shall be allowed to cool to ambient temperature at the end of 100-hour periods to evaluate thermal cycling Retorquing of the flange bolts is permitted on start-up cycles, if required A maximum of two retorques of all bolts is permitted per test

4 6 Inspection of packaging Sample packages and packs, and the inspection of the preservation, packing, and marking for shipment, stowage, and storage shall be in accordance with the requirements of section 5 and the documents specified therein

5 PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition.)

5 1 Preservation Preservation shall be level A or commercial as specified (see 6 2)

5 1.1 General Unless otherwise specified (see 6 2), compressed sheet gasket material shall be furnished in roll form Unless otherwise specified (see 6.2), roll weight shall be in accordance with the contractor's normal practice. Rolls shall consist of only one width and length of material.

5 1 2 Level A Rolls shall be individually protected as specified herein and shall pass the requirements for method IC (waterproof) of MIL-P-116. Rolls shall be restrained from unwinding Each roll shall be wrapped with either an opaque or transparent barrier material conforming to PPP-B-1055 or L-P-378 respectively at the contractor's option The barrier wrap closures, seams, and joints shall be sealed to be as waterproof as the protective barrier wrap. A minimum of 2-inch overlap shall be provided at all overlapping edges

5 1 3 Commercial Unit packaging shall be in accordance with ASTM D 3951.

5 2 Packing Packing shall be level A, B, C, or commercial as specified (see 6.2).

5 2 1 General requirements for levels A, B, and C

5 2 1 1 Containers Containers selected shall be of uniform size, of minimum weight and cube to be consistent with the protection required, and shall contain identical quantities of identical gasket material

5 2 1 2 1 Lumber and plywood Unless otherwise specified (see 6 2), all lumber and plywood including laminated veneer material used in shipping container and pallet construction, members, blocking, bracing, and reinforcing shall be fire-retardant treated material conforming to MIL-L-19140 as follows:

Level A and B - Type II - weather resistant
Category 1 - general use

Level C - Type I - non-weather resistant
Category 1 - general use

5 2 1 3 Levels A, B, and C containers Gasket material preserved as specified (see 5 1), shall be packed in exterior shipping containers for the level of packing specified (see 5 2), in accordance with the exterior shipping container requirements, as specified in appendix C of MIL-STD-2073-1 and herein Unless otherwise specified (see 6 2), container selection shall be at the contractor's option

5 2.1.3 1.1 Caseliners Unless otherwise specified (see 6.2), level A shipping containers containing gasket material commercially preserved shall be provided with waterproof caseliners in accordance with MIL-STD-2073-1.

5 2.1 3 1.2 Closure. Container closure, reinforcing, or banding shall be in accordance with the applicable container specification or appendix thereto except that weather-resistant fiberboard boxes shall be closed in accordance with method V and reinforced with non-metallic or tape banding. Domestic or fire-retardant fiberboard boxes shall be closed in accordance with method I using pressure sensitive tape

5 2 1.3 1 3 Weight Wood, plywood, and cleated type containers exceeding 200 pounds gross weight shall be modified by the addition of skids in accordance with MIL-STD-2073-1 and the applicable container specification or appendix thereto

5.2.1.4 Commercial Material preserved as specified (see 5.1) shall be packed for shipment in accordance with ASTM D 3951 and herein.

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5 3 Palletized unit loads When specified (see 6 2), shipping containers shall be palletized in accordance with MIL-STD-2073-1

5 4 Marking

5 4 1 Levels A, B, C, and commercial In addition to any special marking required (see 3 13, 6 2, or herein), interior packs, shipping containers and palletized unit loads shall be marked including bar coding for shipment, storage, and stowage in accordance with MIL-STD-2073-1

6. NOTES

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

6 1 Intended use Sheet gasket material is intended for non-propulsion and propulsion use in steam piping joints for service up to 150 lb/in² gauge, 425°F (218°C), and for use in water service applications up to 400 lb/in² gauge, 300°F (149°C) Sheet gasket material is also intended for use in lube oil service up to 150 lb/in² gauge, 250°F (121°C) and for use in all petroleum based hydraulic oil service applications up to 600 lb/in² gauge, 180°F (82°C) Gasket material designated in this specification is generally described in ASTM F 104 as type 7, class 1 or class 2 material

6 2 Acquisition requirements Acquisition documents must specify the following

- (a) Title, number, size (see 3 3) and date of this specification
- (b) 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)
- (c) Submittal of Naval Sea Systems Command approval letter regarding toxicity (see 3 2 4)
- (d) Thickness, length and width required (see 3.3, table II and MIL-G-24696/1A)
- (e) Identification markings, if other than as specified (see 3.12).
- (f) Inspection conditions, if other than as specified (see 4.2.1).
- (g) Level of preservation and packing required (see 5.1 and 5 2).
- (h) If form other than rolls is required (see 5 1.1)
- (i) Roll weight, if other than specified (see 5.1.1).
- (j) When fire-retardant treatment is not required (see 5 2 1.2.1).
- (k) When the flame spread index and specific optical density requirements of PPP-F-320 shall not apply (see 5.2 1 2 2)
- (l) When container selection is other than contractor's option (see 5 2 1 3)
- (m) When caseliners are not required (see 5 2 1 3 1.1).
- (n) Palletization when required (see 5 3)
- (o) Special marking required (see 5 4 1)

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6.3 Consideration of data requirements The following data requirements should be considered when this specification is applied on a contract. The applicable Data Item Descriptions (DIDs) should be reviewed in conjunction with the specific acquisition to ensure that only essential data are requested/provided and that the DIDs are tailored to reflect the requirements of the specific acquisition. To ensure correct contractual application of the data requirements, a Contract Data Requirements List (DD Form 1423) must be prepared to obtain the data, except where DoD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

<u>Reference paragraph</u>	<u>DID number</u>	<u>DID title</u>	<u>Suggested tailoring</u>
3.10.1, 4.4, and 4.4.4	DI-NDTI-80809	Test/inspection reports	----
3.2.1	DI-MISC-80678	Certification/data report	10.3.1 does not apply

The above DIDs were those cleared as of the date of this specification. The current issue of DoD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DIDs are cited on the DD Form 1423.

6.3.1 Quality conformance test report The test report (see 4.4) should contain the evaluated degree of adhesion for each of the three specimens tested on each platen material.

6.4 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. 24696 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 purchase orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Sea Systems Command, SEA 03R42, Department of the Navy, 2531 Jefferson Davis Hwy, Arlington, VA 22242-5160 and information pertaining to qualification of products may be obtained from that activity. Application for qualification tests must be made in accordance with "Provisions Governing Qualification SD-6" (see 6.4.1).

6.4.1 Copies of "Provisions Governing Qualification SD-6" may be obtained upon application to Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

6.5 Materials Safety Data Sheets 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 FED-STD-313.

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6 6 Lot acceptance and rejection criteria

6 6 1 Visual examination If one or more defects are found in any sample, the entire lot should be rejected. The contractor has the option of screening 100 percent of the lot for the defective characteristic(s) or providing a new lot which should be inspected in accordance with the sampling plan contained herein. The contractor should maintain for a period of 3 years after contract completion all records of inspections, tests, and any resulting rejections.

6 6 2 Tests If one or more defects are found in any sample, the entire lot should be rejected. The contractor has the option of screening 100 percent of the lot for the defective characteristic(s) or providing a new lot which should be inspected in accordance with the sampling plan contained herein.

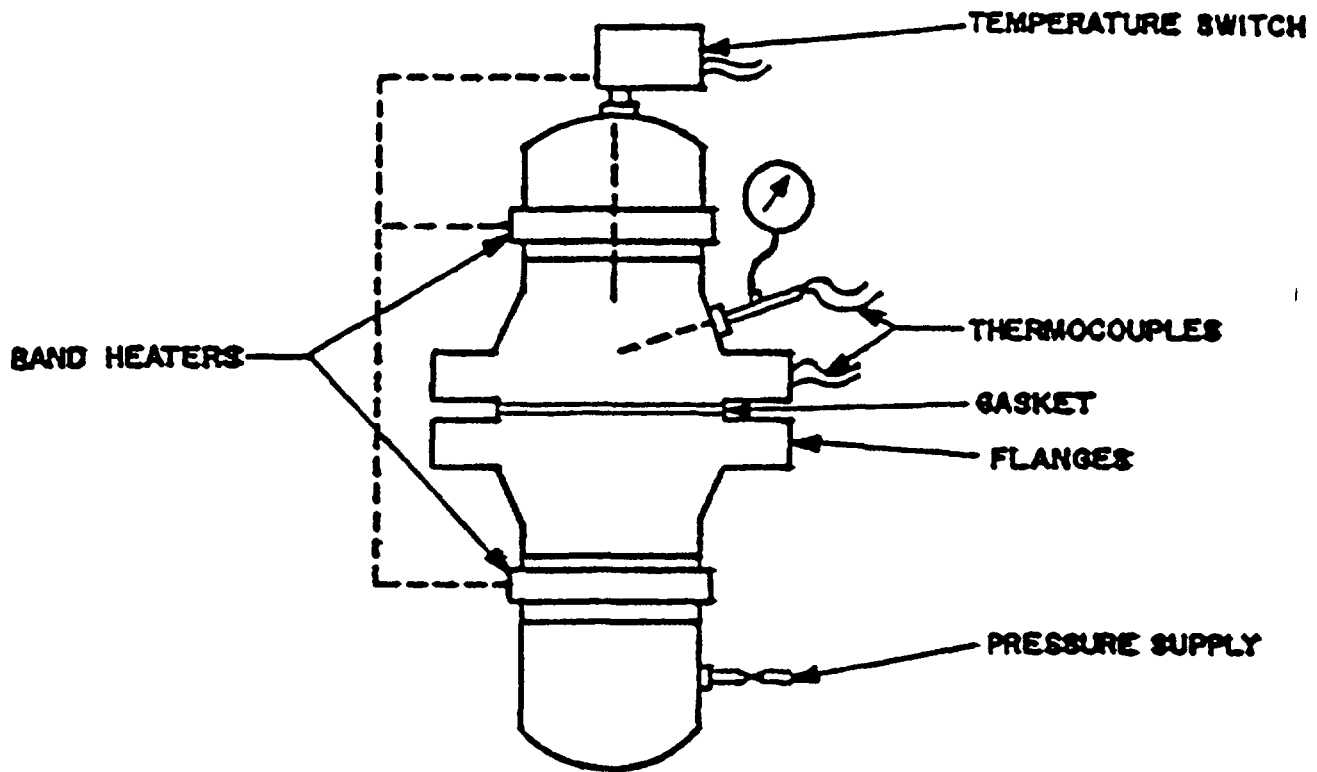
6 7 Subject term (key word) listing

Binders
Inorganic materials
Plastic sheet
Polyolefin
Rolls
Waterproofed

6 8 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Preparing activity
Navy - SH
(Project 5330-N158)

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NOTE. This is a typical schematic of a test assembly. The actual vessel used must conform to all applicable code requirements for pressure vessels.

Flange data				Gasket specimen dimensions (inches)		
Flange size (inches)	Type	Class	Assembly vol. ¹ / ₁ (liters)	Id	Od	Thickness
1	ANSI B16.5	300	2.54	1.31	2.88	1/32
8	ANSI B16.5	300	20.32	8.62	12.12	1/8
1	ANSI B16.5	150	2.3	1.31	2.88	1/32
1	ANSI B16.5	600	2.3	1.31	2.88	1/32
3	ANSI B16.5	600	4.5	3.50	5.38	1/16
3	ANSI B16.5	150	4.5	3.50	5.38	1/16

¹/₁ Tolerance value is plus or minus 2 percent.

FIGURE 1 Test flange assembly

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APPENDIX A

PROCEDURE TO DETERMINE GASKET MATERIAL
ADHESION TO METAL SURFACES

10 SCOPE

10 1 Scope This appendix describes the method used to determine the degree to which gasket materials will adhere to metal surfaces while under compression. It consists of procedures in accordance with ASTM F 607. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

10 2 Plan This test procedure involves placing a gasket material sample between flat platens of various metallic compositions, compressing the gasket material to a desired clamping load, and subjecting the assembly to a specified set of conditions. The force required to separate the platens and the condition of the gasket is then evaluated (see 3 8).

20 APPLICABLE DOCUMENTS

20 1 Government documents

20 1.1 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 listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6 2).

SPECIFICATIONS

MILITARY

MIL-L-24478 - Lubricant, Molybdenum Disulfide In Isopropanol.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

20 2 Non-Government publications The following documents 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 (see 6 2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

F 607 - Standard Test Method for Adhesion of Gasket Materials to Metal Surfaces (DoD adopted)

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

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SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

J429 - Mechanical and Material Requirements for Externally Threaded Fasteners

(Application for copies should be addressed to the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096)

(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)

30 TEST APPARATUS

30.1 Equipment Test equipment shall include the following

- (a) Condition cabinet or room, maintained at 70 to 85°F (21 to 29°C) and at 50 to 55 percent relative humidity
- (b) Controlled temperature oven, maintained at $366 \pm 7^\circ\text{F}$ ($185 \pm 4^\circ\text{C}$)
- (c) Metal platens - flat, circular plates of metal (as specified below) having a diameter of 3 inches and a minimum thickness of 1 inch. A 0.405-inch diameter hole shall be drilled through the center of each platen to accommodate a 3/8- by 3-inch bolt in accordance with grade 7 of SAE J429, 24 threads per inch. Platens shall be fabricated from the following metals
 - (1) Bronze to bronze.
 - (2) Carbon steel to carbon steel
- (d) Socket set and torque wrench calibrated in foot-pounds.
- (e) Sharp knife, flat-bladed screwdriver, and a small hammer or mallet.

40 TEST SPECIMENS

40.1 Material. Three circular test specimens of each material shall be tested. The surface of the gasket material shall be kept clean and free of oil deposits and other foreign matter. No substances shall be used during the cutting operation for die lubrication or for any other purpose where they may come in contact with the specimen. Care shall be taken to cut cleanly, with minimum burrs or loose fibers. Specimens shall be cut from 1/16-inch gasket stock with an inside diameter of 1.27 ± 0.02 inches and an outside diameter of 2.04 ± 0.02 inches.

40.2 Platens. The metal platens used in the test shall be finished to assure good parallelism of the surfaces. The platen faces shall be finished to a profile of 60 microinches roughness absolute (Ra) maximum. The platens shall be chamfered slightly on all edges. They shall be washed clean with a non-ozone depleting solvent to remove any traces of oil, grease, or other foreign substance. Care should be taken after cleaning the platens to handle them by the edges prior to assembly for testing.

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50 CONDITIONING

50 1 Preparation Specimens shall be pre-conditioned for 1 hour at $212 \pm 3.6^{\circ}\text{F}$ ($100 \pm 2.0^{\circ}\text{C}$) and cooled to 70 to 85°F (21 to 29°C) in a desiccator containing anhydrous calcium chloride.

50 2 Before assembly Keep the test fixture assemblies (platens, bolts, washers, and nuts) at 70 to 85°F (21 to 29°C) for at least 4 hours before assembly

60 PROCEDURE

60 1 Steps The following steps shall be performed to determine gasket material adhesion to metal surfaces

- (a) Assemble the platens with the conditioned gasket specimens to form a sandwich with the specimen carefully centered between the platens
- (b) Lubricate the threads of the $3/8$ - by 3-inch bolt very lightly, using molybdenum disulfide (MIL-L-24478 or equal) in powder or spray form (do not use oil) Carefully insert the bolt through the two platens, install a flat plate washer to the threaded side of the bolt, and screw on the nut, finger tight. Avoid contaminating the gasket and the platen with the lubricant. Place the assembly in a vise or other holding mechanism, clamp the bolt head, and torque the nut to 30 foot-pounds.
- (c) Place the platen and gasket assemblies in a controlled oven and maintain a temperature of 366°F (185°C), within 7°F (4°C) for 2 days (48 hours)
- (d) Remove the platen and gasket assemblies from the oven and allow to cool at room temperature until platens have reached room temperature
- (e) Remove the nut, bolt, and washer from the platen and gasket assembly and test for adhesion.
- (f) Separate the platens from the gasket material If necessary, pry the platens apart with a knife or flat-bladed screwdriver. A small hammer or mallet may be required to tap the prying tool between the platens Take care to avoid or minimize damage to the surface of the platens
- (g) The degree of adhesion shall be recorded using the following scale as a guideline:
 - (1) Complete separation from both platens No indication of adhesion or very slight adhesion.
 - (2) Slight force necessary to separate platens. Moderate adhesion to one platen but gasket can be separated cleanly.
 - (3) Considerable force necessary to separate platens Considerable adhesion to one platen Gasket can be separated in one piece but surface fibers remain adhering to one or both platens

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APPENDIX A

- (4) Considerable force necessary to separate platens. Considerable adhesion to one platen. Gasket can be separated in one piece but small patches remain adhering to one or both platens.
- (5) Gasket torn or delaminated upon separation of platens. Cannot be removed from platen without further tearing. Must be scraped for complete removal.

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APPENDIX B

STEAM EXPOSURE TEST

10 SCOPE

10 1 Scope This appendix describes a steam exposure test for determining the performance of gasket materials covered by this specification. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

20 APPLICABLE DOCUMENTS

20 1 Government documents

20.1 1 Specification, 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 listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATION

MILITARY

MIL-A-907 - Antiseize Thread Compound, High Temperature

HANDBOOK

MILITARY

MIL-HDBK-267 - Guide for Selection of Lubricants and Hydraulic Fluids for Use in Shipboard Equipment

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

30 PROCEDURE

30 1 Steps The following steps shall be performed for the steam exposure test

- (a) Clean flange face
- (b) Install the test gasket material in the 1-, and 8-inch test assemblies
- (c) Calculate the amount of water required to fill each flange assembly with saturated steam when the test conditions are at least 150 lb/in² gauge. Place a measured amount of water, slightly greater than required, in each flange assembly prior to closing.

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- (d) Center the gasket on the flange and install the top half of the test flange. Lubricate and hand tighten the flange bolts, using lubricant specified in MIL-HDBK-267 such as MIL-A-907 (this lubricant is recommended for steel nuts and bolts of superheated steam applications at temperatures up to 1050°F). This lubricant shall not be used as a release agent for the gasket.
- (e) Using the proper bolt tightening sequence (an 8-bolt flange assembly is shown on figure 2 as an example), torque the flange bolts to the required torque values to obtain a proper seal. Maximum torque ratings for flange bolts as specified in standard ANSI specifications for flange bolt specifications shall not be exceeded. Maximum torque values are:

1-inch flange, 5/8-inch bolts - 160 foot-pounds
8-inch flange, 7/8-inch bolts - 440 foot-pounds

Record the torque value

- (f) Slowly heat the flange assemblies to at least 366°F (185°C), monitoring the flange temperature. The heaters are energized by temperature switches which sense the fluid temperature. Since the flange and pipe may heat up faster than the steam, the flange temperature shall be monitored carefully to ensure that overheating does not occur ^{1/}
- (g) If necessary, admit water to the assembly in very small quantities until at least 150 lb/in² gauge is obtained.
- (h) Monitor for 4 hours, checking for leakage and pressure decay. Use ultrasonic leak detector to assist with locating leakage. (Decreasing pressure indicates gasket leakages.)
- (i) If leakage occurs, retorque the flange bolts and record torque values required to provide a tight pressure seal. Adjust to at least 150 lb/in² gauge, as required. Verify tight seal for a 4-hour period.
- (j) Monitor the test assemblies for temperature and pressure three times per day using laboratory certified equipment.
- (k) After each 100 hours, secure the heaters allowing the test assemblies to cool. Re-energize the heaters after 24 hours and continue test at specified conditions.
- (l) If pressure decreases significantly, check the flange assembly for leakage using pressurized nitrogen. The minimum pressure requirement shall be met regardless of the source of the leakage. This pressure test (independent of temperature effects) verifies the gasket is the source of the leakage, not the fixture. Check

^{1/} Live steam may be substituted for the method described in 30.1(f) and 30.1(g) provided that a continuous supply of steam is available to permit an uninterrupted test for 100 hours or as described in 30.1(k). When using live steam, a pressure of at least 150 lb/in² gauge is required.

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APPENDIX B

the flange bolt torque to determine if it is loose. Tighten the bolts in 5-foot-pound increments until the required sealing torque is attained. Record the torque values. If the flange assembly is the source of leakage, it shall be corrected or the test shall stop and be considered a failure.

- (m) If gasket material leaks or fails to hold pressure after two retorques, the gasket shall be considered inadequate.
- (n) Recharge the flange assembly with the necessary amount of water prior to starting the next thermal cycle.
- (o) After testing each material and size, remove gasket from flange assembly.
- (p) Examine and note characteristics such as for adhesion, deformation, corrosion, permanent indentation, or cracks.

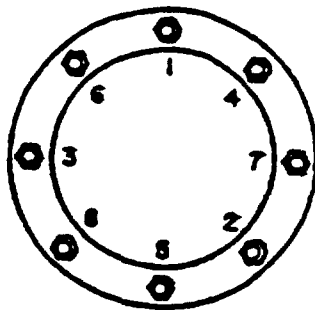


FIGURE 2 Circular eight bolt

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APPENDIX C

WATER EXPOSURE TEST

10 SCOPE

10.1 Scope This appendix describes a water exposure test for determining the performance of gasket materials covered by this specification. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

20 APPLICABLE DOCUMENTS

20.1 Government documents

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

SPECIFICATION

MILITARY

MIL-A-907 - Antiseize Thread Compound, High Temperature.

HANDBOOK

MILITARY

MIL-HDBK-267 - Guide for Selection of Lubricants and Hydraulic Fluids for Use in Shipboard Equipment.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

30. PROCEDURE

30.1 Steps The following steps shall be performed for the water exposure test:

- (a) Clean flange face
- (b) Install the test gasket material in the 1-, and 8-inch test assemblies.
- (c) Center the gasket on the flange and install the top half of the test flange. Lubricate and hand tighten the flange bolts, using lubricant specified in MIL-HDBK-267 such as MIL-A-907 (this lubricant is recommended for steel nuts and bolts of superheated steam applications at temperatures up to 1050°F). This lubricant shall not be used as a release agent for the gasket.

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APPENDIX C

- (d) Using the proper bolt tightening sequence (an 8-bolt flange assembly is shown on figure 2 of appendix B as an example), torque the flange bolts to the required torque values to obtain a proper seal. Maximum torque ratings for flange bolts as specified in standard ANSI specifications for flange bolt specifications shall not be exceeded. Maximum torque values are

1-inch flange, 5/8-inch bolts - 160 foot-pounds
8-inch flange, 7/8-inch bolts - 440 foot-pounds

Record the torque value.

- (e) Fill the assembly with fresh water
- (f) Slowly heat the flange assemblies to 300°F (149°C) minimum, 350°F (177°C) maximum, monitoring the flange temperature. Pressurize to 400 lb/in² gauge minimum. The heaters are energized by temperature switches which sense the fluid temperature. Since the flange and pipe may heat up faster than the water, the flange temperature shall be monitored carefully to ensure that overheating does not occur.
- (g) Monitor for 4 hours, checking for leakage and pressure decay. Use ultrasonic leak detector to assist with locating leakage (Decreasing pressure indicates gasket leakages.)
- (h) If leakage occurs, retorque the flange bolts and record torque values required to provide a tight pressure seal. Adjust to 400 lb/in² gauge, as required. Verify tight seal for a 4-hour period.
- (i) Monitor the test assemblies for temperature and pressure three times per day using laboratory certified equipment conforming to the following tolerances: temperature plus or minus 10°F, plus or minus 5 lb/in² gauge.
- (j) After each 100 hours, secure the heaters allowing the test assemblies to cool. Re-energize the heaters after 24 hours and continue test at specified conditions.
- (k) If pressure decreases significantly, check the flange assembly for leakage using pressurized nitrogen. The minimum pressure requirement shall be met regardless of the source of the leakage. This pressure test (independent of temperature effects) verifies the gasket is the source of the leakage, not the fixture. Check the flange bolt torque to determine if it is loose. Tighten the bolts in 5-foot-pound increments until the required sealing torque is attained. Record the torque values. If the flange assembly is the source of leakage, it shall be corrected or the test shall stop and be considered a failure.
- (l) If gasket material leaks or fails to hold pressure after two retorques, the gasket shall be considered inadequate.
- (m) Recharge the flange assembly with the necessary amount of water prior to starting the next thermal cycle.
- (n) After testing each material and size, remove gasket from flange assembly.
- (o) Examine and note characteristics such as for adhesion, deformation, corrosion, permanent indentation, or cracks.

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APPENDIX D

STEAM EXPOSURE TEST REQUIREMENTS
WITH FLAT-FACED FLANGES

10 SCOPE

10.1 Scope This appendix describes a steam exposure test for determining the performance of gasket materials covered by this specification. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

20 APPLICABLE DOCUMENTS

20.1 Government documents

20.1.1 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 listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2)

SPECIFICATIONS

MILITARY

- MIL-A-907 - Antiseize Thread Compound, High Temperature.
- MIL-S-1222 - Studs, Bolts, Hex Cap Screws, Socket Head Cap Screws and Nuts
- MIL-F-20042 - Flanges, Pipe and Bulkhead, Bronze (Silver Brazing)
- MIL-L-24478 - Lubricant, Molybdenum Disulfide in Isopropanol.

HANDBOOK

MILITARY

- MIL-HDBK-267 - Guide for Selection of Lubricants and Hydraulic Fluids for Use in Shipboard Equipment.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094)

30 PROCEDURE

30.1 Steps The following steps shall be performed for the steam exposure test

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- (a) Clean flange face
- (b) Install the test gasket material in the 3-inch test assembly, ANSI B16.5 class 150 flat-faced flanges, group 3.4 (NICU), with 5/8-inch NICU bolts, made in accordance with MIL-S-1222. The flat-faced flanges shall have a phonographic surface finish of 250 RHR 1/
- (c) Calculate the amount of water required to fill each flange assembly with saturated steam when the test conditions are at least 150 lb/in² gauge. Place a measured amount of water, slightly greater than required, in each flange assembly prior to closing.
- (d) Center the gasket on the flange and install the test flange. Lubricate and hand tighten the flange bolts, using lubricant specified in MIL-HDBK-267 (such as Molykote) in accordance with MIL-L-24478 or equal. This lubricant shall not be used as a release agent for the gasket.
- (e) Using the proper bolt tightening sequence (a 4-bolt flange assembly is shown on figure 3 as an example), torque the flange bolts to 40 ft-lbs. Maximum torque value for a lubricated 5/8-inch NICU bolt is 60 foot-pounds (ft-lbs) (equivalent to 40 ksi minimum yield of NICU)
 - Record the torque value
 - If at any time during testing, the gasket leaks by, check torque to maintain 40 ft-lbs. If a tight seal cannot be maintained at 40 ft-lbs increase the torque as necessary up to 60 ft-lbs in 5-ft-lb increments
 - Record all torque values and leakage conditions
 - If a nickel-based containing antisize compound from MIL-A-907 is used as an alternative lubricant, the minimum and maximum torques shall be 50 ft-lb and 76 ft-lb, respectively
- (f) Slowly heat the flange assemblies to at least 366°F (185°C) monitoring the flange temperature. The heaters are energized by temperature switches which sense the fluid temperature. Since the flange and pipe may heat up faster than the steam, the flange temperature shall be monitored carefully to ensure that overheating does not occur 2/
- (g) If necessary, admit water to the assembly in very small quantities until at least 150 lb/in² gauge is obtained

1/ An alternative test flange is a 3-inch, 400-lb, MIL-F-20042 bronze flange with a phonographic surface finish of 250 RHR. The flange shall be used with four 3/4-inch bolts with a maximum torque of 85 ft-lbs, a minimum torque of 57 ft-lbs (these torque values are equivalent to those shown in step (e) for 5/8-inch NICU bolts), and gasket dimensions of 8.125 inch od and 4.25 inch id. The gasket area is equivalent to that of the 3-inch, 150-lb, ANSI B16.5 flange

2/ Live steam may be substituted for the method described in 30.1(f) and 30.1(g) provided that a continuous supply of steam is available to permit an uninterrupted test for 100 hours or as described in 30.1(k). When using live steam, a pressure of 150 ± 5 lb/in² gauge is required

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- (h) Monitor for 4 hours, checking for leakage and pressure decay Use ultrasonic leak detector to assist with locating leakage if available (Decreasing pressure indicates gasket leakages)
- (i) If leakage occurs, retorque the flange bolts and record torque values required to provide a tight pressure seal Adjust to 150 lb/in² gauge as required Verify tight seal for a 4-hour period
- (j) Monitor the test assemblies for temperature and pressure three times per day, using laboratory certified equipment.
- (k) If pressure decreases significantly, check the flange assembly for leakage using pressurized nitrogen The minimum pressure requirement shall be met regardless of the source of the leakage. This pressure test (independent of temperature effects) verifies the gasket is the source of the leakage, not the fixture Check the flange bolt torque to determine if it is loose Tighten the bolts in 5-ft-lb increments until the required sealing torque is attained. Record the torque values If the flange assembly is the source of leakage, it shall be corrected or the test shall stop and be considered a failure
- (l) If gasket material leaks or fails to hold pressure after two retorques at 60 ft-lbs, (5/8-inch bolts) or 85 ft-lbs (3/4-inch bolts), the gasket shall be considered inadequate
- (m) Recharge the flange assembly with the necessary amount of water prior to starting the next thermal cycle
- (n) After testing each material, remove gasket from flange assembly
- (o) Examine and note characteristics such as for adhesion, deformation, corrosion, permanent indentation, or cracks

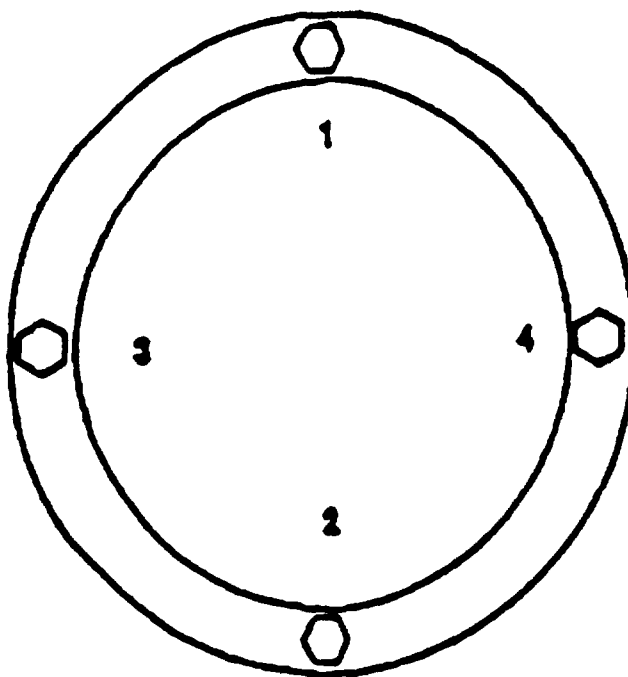


FIGURE 3 Torquing sequence for circular four-bolt flange.

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APPENDIX E

WATER EXPOSURE TEST REQUIREMENTS
WITH FLAT-FACED FLANGES

10 SCOPE

10 1 Scope This appendix describes a water exposure test for determining the performance of gasket materials covered by this specification. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

20 APPLICABLE DOCUMENTS

20 1 Government documents

20 1 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 listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6 2).

SPECIFICATIONS

MILITARY

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- MIL-S-1222 - Studs, Bolts, Hex Cap Screws, Socket Head Cap Screws and Nuts
- MIL-F-20042 - Flanges, Pipe and Bulkhead, Bronze (Silver Brazing).
- MIL-L-24478 - Lubricant, Molybdenum Disulfide in Isopropanol.

HANDBOOK

MILITARY

- MIL-HDBK-267 - Guide for Selection of Lubricants and Hydraulic Fluids for Use in Shipboard Equipment.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094)

30 PROCEDURE

30 1 Steps The following steps shall be performed for the water exposure test

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APPENDIX E

- (a) Clean flange face
- (b) Install the test gasket material in the 3-inch test assembly, ANSI B16.5 class 150 flat-faced flanges, group 3.4 (NICU) with 5/8-inch NICU bolts, made in accordance with MIL-S-1222. The flat-faced flanges shall have a phonographic surface finish of 250 RHR. ^{1/}
- (c) Center the gasket on the flange and install the test flange. Lubricate and hand tighten the flange bolts, using lubricant specified in MIL-HDBK-267 (such as Molykote) in accordance with MIL-L-24478 or equal. This lubricant shall not be used as a release agent for the gasket.
- (d) Using the proper bolt tightening sequence (a 4-bolt flange assembly is shown on figure 3 of appendix D as an example), torque the flange bolts to 40 ft-lbs. Maximum torque value for a lubricated 5/8-inch NICU bolt is 60 ft-lbs (equivalent to 40 ksi minimum yield of NICU).
 - Record the torque value
 - If at any time during testing, the gasket leaks by, check torque to maintain 40 ft-lbs. If a tight seal cannot be maintained at 40 ft-lbs increase the torque as necessary up to 60 ft-lbs in 5-ft-lb increments
 - Record all torque values and leakage conditions
 - If a nickel-based containing antisize compound from MIL-A-907 is used as an alternative lubricant, the minimum and maximum torques shall be 50 ft-lb and 76 ft-lb, respectively.
- (e) Fill the assembly with fresh water at ambient temperature.
- (f) Pressurize to not less than 315 lb/in² gauge. ANSI B16.5 seat test pressure for a 150-lb steel flange is 315 lb/in² gauge.
- (g) Monitor for 4 hours, checking for leakage and pressure decay. Use ultrasonic leak detector to assist with locating leakage if available. (Decreasing pressure indicates gasket leakages.)
- (h) If leakage occurs, retorque the flange bolts and record torque values required to provide a tight pressure seal. Adjust to 315 lb/in² gauge, as required. Verify tight seal for a 4-hour period.
- (i) Monitor the test assemblies for pressure three times per day, using laboratory certified equipment conforming to the following tolerances:

Pressure plus or minus 5 lb/in² gauge

^{1/} An alternative test flange is a 3-inch, 400-lb, MIL-F-20042 bronze flange with a phonographic surface finish of 250 RHR. The flange shall be used with four 3/4-inch bolts with a maximum torque of 85 ft-lbs, a minimum torque of 57 ft-lbs (these torque values are equivalent to those shown in step (d) for 5/8-inch NICU bolts), and gasket dimensions of 8.125 inch od and 4.25 inch id.

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APPENDIX F

- (j) If pressure decreases significantly, check the flange assembly for leakage using pressurized nitrogen. The minimum pressure requirement shall be met regardless of the source of the leakage. This pressure test (independent of temperature effects) verifies the gasket is the source of the leakage, not the fixture. Check the flange bolt torque to determine if it is loose. Tighten the bolts in 5-ft-lb increments until the required sealing torque is attained. Record the torque values. If the flange assembly is the source of leakage, it shall be corrected or the test shall stop and be considered a failure.
- (k) If gasket material leaks or fails to hold pressure after two retorques at 60 ft-lbs (5/8-inch bolts) or 85 ft-lbs (3/4-inch bolts), the gasket shall be considered inadequate.
- (l) After testing each material, remove gasket from flange assembly.
- (m) Examine and note characteristics such as for adhesion, deformation, corrosion, permanent indentation, or cracks.

MIL-G-24696B(SH)

APPENDIX F

LUBE OIL EXPOSURE TEST USING
RAISFD-FACE FLANGES

10 SCOPE

10.1 Scope This appendix describes a lube oil exposure test for determining the performance of gasket materials (using raised-face flanges) covered by this specification. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

20 APPLICABLE DOCUMENTS

20.1 Government documents

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

SPECIFICATION

MILITARY

- MIL-A-907 - Antiseize Thread Compound, High-Temperature.
- MIL-L-17331 - Lubricating Oil, Steam Turbine and Gear, Moderate Service

HANDBOOK

MILITARY

- MIL-HDBK-267 - Guide for Selection of Lubricants and Hydraulic Fluids for Use in Shipboard Equipment

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

30 PROCEDURE

30.1 Steps The following steps shall be performed for the lube oil exposure test:

- (a) Clean flange face
- (b) Install the test gasket material in the 1-inch and 3-inch test assemblies
- (c) Center the gasket on the flange and install the top half of the test flange. Lubricate and hand tighten the flange bolts, using lubricant specified in MIL-HDBK-267 such as MIL-A-907
- (d) Using proper bolt-tightening sequence (an 8-bolt flange assembly is shown on figure 4 of this appendix as an example), torque the flange bolts to the required torque values to obtain a proper seal. Maximum torque ratings for flange bolts as specified in

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APPENDIX F

standard ANSI specifications shall not be exceeded. Maximum torque value is 160 foot-pounds for a 1-inch flange with 5/8-inch bolts and 200 foot-pounds for a 3-inch flange with 3/4-inch bolts. Record the torque value.

- (e) Fill the assemblies with lube oil.
- (f) Slowly heat the flange assemblies to at least 250°F (121°C) minimum, 300°F (149°C) maximum, monitoring the flange temperature. Pressurize to 150 lb/in² gauge. The heaters are energized by temperature switches which sense the fluid temperature. Since the flange and pipe may heat up faster than the lube oil, the flange temperature shall be monitored carefully to ensure that overheating does not occur.
- (g) Monitor for 4 hours, checking for leakage and pressure decay. Use an ultrasonic leak detector to assist with locating leakage. (Decreasing pressure indicates gasket leakage.)
- (h) If leakage occurs, retorque the flange bolts and record torque values required to provide a tight pressure seal. Adjust to 150 lb/in² gauge, as required. Verify tight seal for a 4-hour period.
- (i) Monitor the test assemblies for temperature and pressure three times per day using laboratory-certified equipment conforming to the following tolerances: temperature plus or minus 10°F, pressure plus or minus 5 lb/in² gauge.
- (j) After each 100 hours, secure the heaters and allow the test assemblies to cool. Re-energize the heaters after 24 hours and continue the test at specified conditions.
- (k) If pressure decreases significantly, use pressurized nitrogen to check the flange assemblies for leakage. The minimum pressure requirement shall be met regardless of the source of the leakage. This pressure test (independent of temperature effects) verifies that the gasket, not the fixture, is the source of the leakage. Check the flange bolt torque to determine whether it is loose. Tighten the bolts in 5-foot-pound increments until the required sealing torque is attained. Record the torque values. If the flange assembly is the source of leakage, it shall be corrected or the test shall stop and be considered a failure.
- (l) If gasket material leaks or fails to hold pressure after two retorques, the gasket shall be considered inadequate.
- (m) Recharge the flange assemblies with the necessary amount of lube oil prior to starting the next thermal cycle.
- (n) After testing each material, remove gasket from flange assembly.
- (o) Examine and note characteristics such as for adhesion, deformation, corrosion, permanent indentation, or cracks.

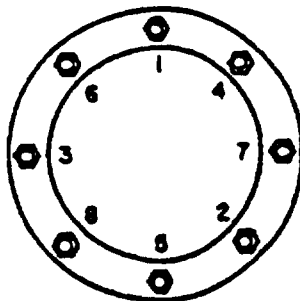


FIGURE 4 Circular eight bolt

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APPENDIX G

HYDRAULIC OIL EXPOSURE TEST USING
RAISED-FACE FLANGES

10 SCOPE

10.1 Scope This appendix describes a hydraulic oil exposure test for determining the performance of gasket materials (using raised-face flanges) covered by this specification. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

20 APPLICABLE DOCUMENTS

20.1 Government documents

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

SPECIFICATION

MILITARY

MIL-A-907 - Antiseize Thread Compound, High-Temperature.
MIL-H-17672 - Hydraulic Oil, Petroleum Inhibited

HANDBOOK

MILITARY

MIL-HDBK-267 - Guide for Selection of Lubricants and Hydraulic Fluids for Use in Shipboard Equipment.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

30. PROCEDURE

30.1 Steps. The following steps shall be performed for the hydraulic oil exposure test:

- (a) Clean flange face
- (b) Install the test gasket material in the 1-inch test assemblies.
- (c) Center the gasket on the flange and install the top half of the test flange. Lubricate and hand tighten the flange bolts, using lubricant specified in MIL-HDBK-267, such as MIL-A-907.
- (d) Using proper bolt-tightening sequence (an 8-bolt flange assembly is shown on figure 2 of appendix B as an example), torque the flange bolts to the required torque values to obtain a proper seal. Maximum torque ratings for flange bolts as specified in

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APPENDIX G

standard ANSI specifications shall not be exceeded. Maximum torque value is 160 foot-pounds for a 1-inch flange with 5/8-inch bolts. Record the torque value.

- (e) Fill the assemblies with hydraulic oil.
- (f) Slowly heat the flange assemblies to 180°F (82°C) minimum, 230°F (110°C) maximum, monitoring the flange temperature. Pressurize to 600 lb/in² gauge. The heaters are energized by temperature switches which sense the fluid temperature. Since the flange and pipe may heat up faster than the hydraulic oil, the flange temperature shall be monitored carefully to ensure that overheating does not occur.
- (g) Monitor for 4 hours, checking for leakage and pressure decay. Use an ultrasonic leak detector to assist with locating leakage. (Decreasing pressure indicates gasket leakage.)
- (h) If leakage occurs, retorque the flange bolts and record torque values required to provide a tight pressure seal. Adjust to 600 lb/in² gauge, as required. Verify tight seal for a 4-hour period.
- (i) Monitor the test assemblies for temperature and pressure three times per day using laboratory-certified equipment conforming to the following tolerances: temperature plus or minus 10°F, pressure plus or minus 5 lb/in² gauge.
- (j) After each 100 hours, secure the heaters and allow the test assemblies to cool. Re-energize the heaters after 24 hours and continue the test at specified conditions.
- (k) If pressure decreases significantly, use pressurized nitrogen to check the flange assemblies for leakage. The minimum pressure requirement shall be met regardless of the source of the leakage. This pressure test (independent of temperature effects) verifies that the gasket, not the fixture, is the source of the leakage. Check the flange bolt torque to determine whether it is loose. Tighten the bolts in 5-foot-pound increments until the required sealing torque is attained. Record the torque values. If the flange assembly is the source of leakage, it shall be corrected or the test shall stop and be considered a failure.
- (l) If gasket material leaks or fails to hold pressure after two retorques, the gasket shall be considered inadequate.
- (m) Recharge the flange assemblies with the necessary amount of hydraulic oil prior to starting the next thermal cycle.
- (n) After testing each material, remove gasket from flange assembly.
- (o) Examine and note characteristics such as for adhesion, deformation, corrosion, permanent indentation, or cracks.

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APPENDIX H

LUBE OIL EXPOSURE TEST USING
FLAT-FACED FLANGES

10 SCOPE

10.1 Scope This appendix describes a petroleum based lube oil exposure test for determining the performance of gasket materials (using flat-faced flanges) covered by this specification. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

20 APPLICABLE DOCUMENTS

20 1 Government documents

20 1 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 listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6 2).

SPECIFICATIONS

MILITARY

- MIL-S-1222 - Studs, Bolts, Hex Cap Screws, Socket Head Cap Screws and Nuts
- MIL-L-17331 - Lubricating Oil, Steam Turbine and Gear, Moderate Service
- MIL-F-20042 - Flanges, Pipe and Bulkhead, Bronze (Silver Brazing).
- MIL-L-24478 - Lubricant, Molybdenum Disulfide in Isopropanol

HANDBOOK

MILITARY

- MIL-HDBK-267 - Guide for Selection of Lubricants and Hydraulic Fluids for Use in Shipboard Equipment.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

30 PROCEDURE

30 1 Steps. The following steps shall be performed for the lube oil exposure test:

MIL-G-24696B(SH)

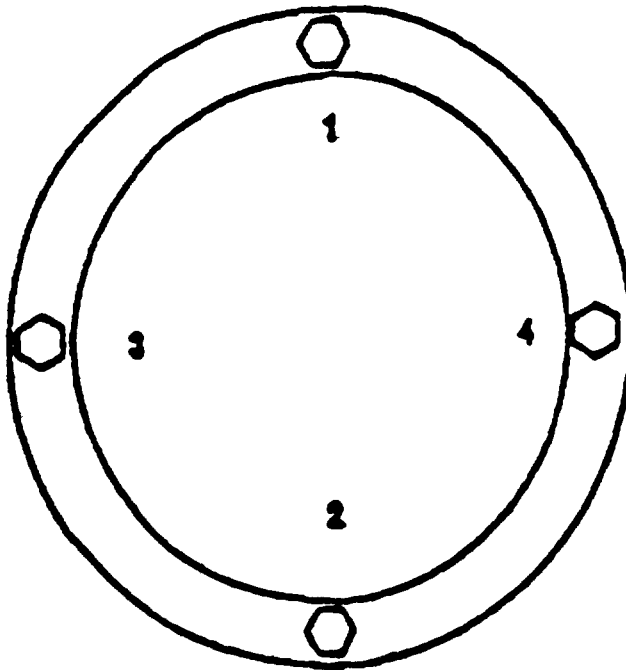
APPENDIX H

- (a) Clean flange face
- (b) Install the test gasket material in the 3-inch test assembly, ANSI B16.5 class 150 flat-faced flanges, group 3.4 (NICU) with 5/8-inch NICU bolts, made in accordance with MIL-S-1222. The flat-faced flanges shall have a phonographic surface finish of 250 RHR ^{1/}
- (c) Calculate the amount of lube oil required to fill the flange assembly when the test conditions are at least 150 lb/in² gauge. Place a measured amount of lube oil, slightly greater than required, in the flange assembly prior to closing.
- (d) Center the gasket on the flange and install the test flange. Lubricate and hand-tighten the flange bolts, using lubricant specified in MIL-HDBK-267 (such as Molykote) in accordance with MIL-L-24478 or the equivalent. This lubricant shall not be used as a release agent for the gasket.
- (e) Using the proper bolt tightening sequence (a 4-bolt flange assembly is shown on figure 5 as an example), torque the flange bolts to 53 ft-lbs. Maximum torque value for a lubricated 5/8-inch NICU bolt is 80 ft-lbs (equivalent to 40 ksi minimum yield of NICU).
 - Record the torque value.
 - If at any time during testing, the gasket leaks by, check torque to maintain 53 ft-lbs. If a tight seal cannot be maintained at 53 ft-lbs increase the torque as necessary up to 80 ft-lbs in 5-ft-lb increments.
 - Record all torque values and leakage conditions.
- (f) Slowly heat the flange assembly to at least 250°F (121°C), monitoring the flange temperature. The heaters are energized by temperature switches which sense the fluid temperature. Since the flange and pipe may heat up faster than the lube oil, the flange temperature shall be monitored carefully to ensure that overheating does not occur.
- (g) If necessary, add lube oil to the assembly in very small quantities until at least 150 lb/in² gauge is obtained.
- (h) Monitor for 4 hours, checking for leakage and pressure decay. Use an ultrasonic leak detector to assist with locating leakage. (Decreasing pressure indicates gasket leakage.)
- (i) If leakage occurs, retorque the flange bolts and record torque values required to provide a tight pressure seal. Adjust to 150 lb/in² gauge, as required. Verify tight seal for a 4-hour period.
- (j) Monitor the test assemblies for temperature and pressure three times per day using laboratory-certified equipment.

^{1/} An alternative test flange is a 3-inch, 400-lb, MIL-F-20042 bronze flange with a phonographic surface finish of 250 RHR. The flange shall be used with four 3/4-inch bolts with a maximum torque of 96 ft-lbs, a minimum torque of 64 ft-lbs (these torque values are equivalent to those shown in step (e) for 5/8-inch NICU bolts), and gasket dimensions of 8.125 inch od and 4.25 inch id. The gasket area is equivalent to that of the 3-inch, 150-lb, ANSI B16.5 flange.

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APPENDIX H

- (k) After each 100 hours, secure the heaters and allow the test assemblies to cool. After at least 24 hours, re-energize the heaters and continue the test at specified conditions.
- (l) If pressure decreases significantly, use pressurized nitrogen to check the flange assemblies for leakage. The minimum pressure requirement shall be met regardless of the source of the leakage. This pressure test (independent of temperature effects) verifies that the gasket, not the fixture, is the source of the leakage. Check the flange bolt torque to determine if it is loose. Tighten the bolts in 5-foot-pound increments until the required sealing torque is attained. Record the torque values. If the flange assembly is the source of leakage, it shall be corrected or the test shall stop and be considered a failure.
- (m) If gasket material leaks or fails to hold pressure after two retorques at 80 ft-lbs (5/8-inch bolts) or 96 ft-lbs (3/4-inch bolts), the gasket shall be considered inadequate.
- (n) Recharge the flange assemblies with the necessary amount of hydraulic oil prior to starting the next thermal cycle.
- (o) After testing each material, remove gasket from flange assembly.
- (p) Examine and note characteristics such as for adhesion, deformation, corrosion, permanent indentation, or cracks.

FIGURE 5 Torquing sequence for circular four-bolt flange.

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APPENDIX I

HYDRAULIC OIL EXPOSURE TEST USING
FLAT-FACED FLANGES

10 SCOPE

10 1 Scope. This appendix describes a petroleum based hydraulic oil exposure test for determining the performance of gasket materials (using flat-faced flanges) covered by this specification. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

20 APPLICABLE DOCUMENTS

20 1 Government documents

20 1 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 listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6 2)

SPECIFICATIONS

MILITARY

- MIL-S-1222 - Studs, Bolts, Hex Cap Screws, Socket Head Cap Screws and Nuts
- MIL-H-17672 - Hydraulic Oil, Petroleum Inhibited.
- MIL-L-24478 - Lubricant, Molybdenum Disulfide in Isopropanol.

HANDBOOK

MILITARY

- MIL-HDBK-267 - Guide for Selection of Lubricants and Hydraulic Fluids for Use in Shipboard Equipment

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

30 PROCEDURE

30 1 Steps The following steps shall be performed for the hydraulic oil exposure test

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APPENDIX I

- (a) Clean flange face
- (b) Install the test gasket material in the 3-inch test assembly, ANSI B16 5 class 600 flat-faced flanges, group 3 4 (NICU), with 3/4-inch NICU bolts, made in accordance with MIL-S-1222. The flat-faced flanges shall have a phonographic surface finish of 250 RHR.
- (c) Calculate the amount of hydraulic oil required to fill the flange assembly when the test conditions are at least 600 lb/in² gauge. Place a measured amount of hydraulic oil, slightly greater than required, in the flange assembly prior to closing.
- (d) Center the gasket on the flange and install the test flange. Lubricate and hand-tighten the flange bolts, using lubricant specified in MIL-HDBK-267 (such as Molykote) in accordance with MIL-L-24478 or the equivalent. This lubricant shall not be used as a release agent for the gasket.
- (e) Using the proper bolt tightening sequence (a 8-bolt flange assembly is shown on figure 3 of appendix D as an example), torque the flange bolts to 64 ft-lbs. Maximum torque value for a lubricated 3/4-inch NICU bolt is 96 ft-lbs (equivalent to 40 ksi minimum yield of NICU)
 - Record the torque value
 - If at any time during testing, the gasket leaks by, check torque to maintain 64 ft-lbs. If a tight seal cannot be maintained at 64 ft-lbs increase the torque as necessary up to 96 ft-lbs in 5-ft-lb increments
 - Record all torque values and leakage conditions
- (f) Slowly heat the flange assembly to at least 180°F (82°C), monitoring the flange temperature. The heaters are energized by temperature switches which sense the fluid temperature. Since the flange and pipe may heat up faster than the hydraulic oil, the flange temperature shall be monitored carefully to ensure that overheating does not occur.
- (g) If necessary, add hydraulic oil to the assembly in very small quantities until at least 600 lb/in² gauge is obtained.
- (h) Monitor for 4 hours, checking for leakage and pressure decay. Use an ultrasonic leak detector to assist with locating leakage. (Decreasing pressure indicates gasket leakage.)
- (i) If leakage occurs, retorque the flange bolts and record torque values required to provide a tight pressure seal. Adjust to 600 lb/in² gauge, as required. Verify tight seal for a 4-hour period.
- (j) Monitor the test assemblies for temperature and pressure three times per day using laboratory-certified equipment.
- (k) After each 100 hours, secure the heaters and allow the test assemblies to cool. Re-energize the heaters after 24 hours and continue the test at specified conditions.

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APPENDIX I

- (l) If pressure decreases significantly, use pressurized nitrogen to check the flange assemblies for leakage. The minimum pressure requirement shall be met regardless of the source of the leakage. This pressure test (independent of temperature effects) verifies that the gasket, not the fixture, is the source of the leakage. Check the flange bolt torque to determine whether it is loose. Tighten the bolts in 5-foot-pound increments until the required sealing torque is attained. Record the torque values. If the flange assembly is the source of leakage, it shall be corrected or the test shall stop and be considered a failure.
- (m) If gasket material leaks or fails to hold pressure after two retorques at 96 ft-lbs (3/4-inch bolts), the gasket shall be considered inadequate.
- (n) Recharge the flange assemblies with the necessary amount of hydraulic oil prior to starting the next thermal cycle.
- (o) After testing each material, remove gasket from flange assembly.
- (p) Examine and note characteristics such as for adhesion, deformation, corrosion, permanent indentation, or cracks.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

- 1 The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the comment number and revision letter should be given.
- 2 The submitter of this form must complete blocks 4, 5, 6, and 7.
- 3 The preparing activity must provide a reply within 30 days from receipt of this form.

NOTE This form may not be used to request copies of documents, nor to request waivers, or clarification of 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.

I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER
MIL-G-24696B(SH)

2. DOCUMENT DATE (YYMMDD)
950525

3. DOCUMENT TITLE

GASKET, SHEET, NON-ASBESTOS

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

A. NAME (Last, First, Middle Initial)

B. ORGANIZATION

C. ADDRESS (Include Zip Code)

D. TELEPHONE (Include Area Code)

7. DATE SUBMITTED (YYMMDD)

(1) Commercial

(2) DSN

(if applicable)

8. PREPARING ACTIVITY

A. NAME Technical Point of Contact (TPOC)

MR. RICHARD DEMPSEY, NAVSEA 03M3

ADDRESS ALL CORRESPONDENCE AS FOLLOWS:

B. TELEPHONE (Include Area Code)

(1) Commercial:

DSN:

TPOC: 703-602-0146

8-332-0146

C. ADDRESS (Include Zip Code)

COMMANDER, NAVAL SEA SYSTEMS COMMAND

NA: SEA 03R42

2531 JEFFERSON DAVIS HIGHWAY

ARLINGTON, VA 22242-5160

IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:

Defense Quality and Standardization Office
5203 Leesburg Pike, Suite 1403
Falls Church, VA 22041-3466
Telephone 703-756-2340 DSN 289-2340