INCH-POUND
MIL-PRF-1149D
10 June 1998
SUPERSEDING
MIL-G-1149C
9 November 1988
(See 6.7)

PERFORMANCE SPECIFICATION

GASKET MATERIALS, SYNTHETIC RUBBER, 50 AND 65 DUROMETER HARDNESS

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

1. SCOPE

1.1 Scope. This specification covers vulcanized synthetic rubber gasket materials of nominal 50 and 65 durometer hardness.

1.2 Classification. Gasket materials are furnished in the following types and classes, as specified (see 6.2).

Type I - Nominal 50 durometer hardness
- Class 1 - Oil resistant (chloroprene polymer)
- Class 2 - Non-oil resistant (styrene-butadiene copolymer)
- Class 3 - Phosphate ester resistant (isoprene-isobutylene copolymer)
- Class 5 - Fuel resistant (acrylonitrile-butadiene copolymer)

Type II - Nominal 65 durometer hardness
- Class 1 - Oil resistant (chloroprene polymer)
- Class 2 - Non-oil resistant (styrene-butadiene copolymer)
- Class 3 - Phosphate ester resistant (isoprene-isobutylene copolymer)
- Class 5 - Fuel resistant (acrylonitrile-butadiene copolymer)

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

2. APPLICABLE DOCUMENTS

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

2.2 Government documents.

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

STANDARDS

DEPARTMENT OF DEFENSE

MIL-STD-289 - Visual Inspection Guide for Rubber Sheet Material.
MIL-STD-298 - Visual Inspection Guide for Rubber Extruded Goods.
MIL-STD-407 - Visual Inspection Guide for Rubber Molded Items.

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

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of 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)

ASTM D 395 - Standard Test Methods for Rubber Property - Compression Set. (DoD adopted)
ASTM D 412 - Standard Test Methods for Rubber Properties in Tension. (DoD adopted)
ASTM D 471 - Test Method for Rubber Property - Effect of Liquids.
ASTM D 573 - Standard Test Method for Rubber - Deterioration in an Air Oven. (DoD adopted)
ASTM D 792 - Standard Test Methods for Specific Gravity (Relative Density) and Density of Plastics by Displacement. (DoD adopted)
ASTM D 2137 - Standard Test Methods for Rubber Property - Brittleness Point of Flexible Polymers and Coated Fabrics. (DoD adopted)
ASTM D 2240 - Standard Test Method for Rubber Property - Durometer Hardness. (DoD adopted)
ASTM F 104 - Standard Classification System for Non-Metallic Gasket Materials. (DoD adopted)

(Application for copies should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

RUBBER MANUFACTURERS ASSOCIATION (RMA)
Vendors Identification Guide for Molded and Extruded Goods.

(Requests for copies should be addressed to the Rubber Manufacturers Association, Inc., 1400 K Street, NW, Washington, DC 20005.)

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

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.2.

3.2 Materials. The material shall be vulcanized rubber which meets the requirements specified herein. Asbestos and components containing asbestos are prohibited.

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

3.2.2 Used or rebuilt products. The use of used or rebuilt gasket materials is prohibited.

3.2.3 Age. The age of the vulcanized rubber shall not exceed 12 months from the month in which it was cured to the date of acceptance by the purchaser under the contract or order (see 4.3.2.2).

3.3 Form. The gasket material shall be furnished in the form specified (see 6.2). The forms are sheets, strips with rectangular cross section, shapes cut from sheets, molded shapes, and extruded shapes.

3.3.1 Sheets. Sheet rubber shall be supplied in rolls that are 36 ± 1 inch wide. Length and thickness shall be as specified (see 6.2). Thickness tolerances for sheet material shall be as specified in table I.

TABLE I. Tolerances in width and thickness.

Width (inches)	Tolerance (± inch)	Thickness (inches)	Tolerance (± inch)
Less than 1/16	1/100	Less than 1/16	1/128
1/16 to 1/8, inclusive	1/64	Over 1/16 to 1/8, inclusive	1/64
Over 1/8 to 1/2, inclusive	1/32	Over 1/8 to 1/2, inclusive	1/32
Over 1/2 to 1, inclusive	3/64	Over 1/2 to 1, inclusive	3/64
Over 1 to 2, inclusive	1/16	Over 1	1/16
Over 2	3 percent of width		

3.3.2 Strips. The strip rubber cross section dimensions shall be as specified (see 6.2). Unless otherwise specified, tolerances in width and thickness shall be as specified in table I.

3.3.3 Cut, molded, and extruded shapes. Cut, molded, and extruded shapes shall have the form, dimensions, and tolerances as specified (see 6.2).

3.4 Physical requirements. The gasket material shall be as specified in table II.

TABLE II. Physical requirements.

	Type I	Type II	Test procedure
Initial properties:			
Tensile strength, lb/in^2 (minimum)	1000	1000	4.5.2
Ultimate elongation, percent (minimum)	300	250	4.5.2
Hardness, durometer units	50 ± 5	65 ± 5	4.5.3
Specific gravity, class 1 (maximum)	1.65	1.75	4.5.4
Specific gravity, classes 2,3, and 5 (maximum)	1.55	1.65	4.5.4
Properties after oven aging:			
Tensile strength, percent of initial (minimum)	80	80	4.5.6
Ultimate elongation, percent of initial (minimum)	65	65	4.5.6
Hardness, Shore A durometer (maximum)	60	75	4.5.7
Hot compression set, percent (maximum)	75	75	4.5.8
Brittleness point	no cracks	no cracks	4.5.9
Properties after immersion:			
Water extraction, percent (maximum)	0.5	0.5	4.5.10
Oil resistance (for class 1 only), percent	0 to +120	0 to +120	4.5.11
Phosphate ester resistance (for class 3 only), percent	0 to +35	0 to +35	4.5.12
Fuel resistance (for class 5 only), percent	0 to +60	0 to +60	4.5.13

3.5 Identification markings. Unless otherwise specified (see 6.2), the gasket material shall be marked as specified in this section, and shall indicate the Military specification number, type, class, and cure date (quarter and year). Sheet material marking shall be 1/2 inch high occurring every 6 inches continuously across the sheet and recurring lengthwise every 4 inches on one side only.

3.5.1 Performance and legibility. Markings of rubber products shall not rub off or be otherwise effaced by exposure to the elements, action of fluids, oils, or environment to which the material is resistant (see 3.5.6), and contact to normal handling, shipment, and storage. Legibility of the markings shall be such as required for readability and temporary identification. Permanent identification is preferred if it does not affect the function of the product. The size of the symbols or letters shall be commensurate with the size of the product being marked.

3.5.2 Deleterious effect. Marking of rubber products shall be accomplished in a manner which shall not adversely affect the acceptability and function of the finished product.

3.5.3 Exceptions. Only the part of the identification systems which applies to the individual requirements of the item specification is intended to be used. Only one set of manufacturer's letters will be specified on one item. More than one color dash may be used to indicate resistance to more than one environment. When more than one dash is used on one item, the order in which the dashes appear should be the same as the order shown in table III. On small molded products, where the cross sectional diameter is not sufficient or functional surfaces do not permit marking in accordance with this standard, equivalent marking shall be placed on the containers in which the item is packaged. Any exceptions to marking of the product itself are allowed only if specified. The exceptions shall be specified in either the applicable drawing or the item specification, as appropriate, or in both places.

3.5.4 Marking. Marking shall be accomplished by molding or extruding (either recess or in relief) or by external application of a substance such as paint, cement, or lacquer. The type marking and the marking material shall be specified in the item specification so that critical surfaces are not damaged.

3.5.5 Symbols and letters. The symbol and letter designations published in the Rubber Manufacturer's Association "Vendors Identification Guide for Molded and Extruded Goods." shall be used where applicable. The size shall be consistent with the size of the part, but shall normally be in the range of 1/16 to 1/8 inch (1.6 to 3.2 mm). The color shall be white or the same as the color used to indicate resistance to environment listed in table III. When marking is accomplished by molding, the use of a colored paint, cement, or lacquer is not required.

3.5.6 Colors for environmental resistance. The colors as specified in table III are to be applied as dashes approximately 1/16 inch (1.6mm) wide by 1/4 inch (6.4mm) long and repeated at intervals of 10 inches (254mm) where size of product permits.

TABLE III. Colors for environmental resistance.

Color	Resistant to environment	Class
Blue	Petroleum hydraulic fluid	5
Brown	Polar fluids (brake fluid)	3
Green	Weather (ozone)	1
Gray	Pneumatic air (air and nitrogen)	2
Orange (one dash)	Low temperature (down to -40˚F (-40˚C))	2, 3
Orange (two dashes)	Arctic low temperature (down to -65˚F (-53.4˚C))	2
Red	Hydrocarbon fuel	5
White	Phosphate ester fluids	3
Yellow	Petroleum lubricating oil	5

3.5.7 Dating. Unless otherwise specified, the date of manufacturer shall indicate the quarter of the calendar year and the year. For example, 2Q-96 for the second quarter of 1996.

3.6 Workmanship. Workmanship shall meet all the applicable requirements of this specification. Surfaces shall be free of surface voids, tears, rips, cuts, and all foreign matter that may affect the use of the finished product (see 4.3.2.1).

4. VERIFICATION

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

(a) First article inspection (see 4.2).
(b) Conformance inspection (see 4.3).

4.1.1 Inspection conditions. Unless otherwise specified (see 6.2), all inspections shall be performed under the conditions specified herein.

4.2 First article inspection. First article inspection shall consist of the examinations and tests specified in table IV which shall be conducted on samples from (or representing) the first lot of material ordered for delivery under a contract or order.

TABLE IV. First article inspection.

Test	Requirement	Test method
Dimensions:		
Width and length	3.3	4.3.2.1
Thickness	3.3	4.3.2.1
Tensile strength and ultimate elongation	Table II	4.5.2 and 4.5.6
Hardness	Table II	4.5.3 and 4.5.7
Specific gravity	Table II	4.5.4
Hot compression set	Table II	4.5.8
Brittleness point	Table II	4.5.9
Water extraction	Table II	4.5.10
Oil resistance	Table II	4.5.11
Phosphate ester resistance	Table II	4.5.12
Fuel resistance	Table II	4.5.13
Identification markings	3.5	4.3.2.1
Workmanship	3.6	4.3.2.1

4.3 Conformance inspection. Conformance inspection shall be as specified in table V. Samples to be tested shall be subjected to the group A, B, and C tests.

TABLE V. Conformance inspection.

Test	Requirement	Test method
Group A:		
Width and length	3.3	4.3.2.1
Thickness	3.3	4.3.2.1
Identification markings	3.5	4.3.2.1
Workmanship	3.6	4.3.2.1
Group B:		
Tensile strength and ultimate elongation	Table II	4.5.2 and 4.5.6
Hardness	Table II	4.5.3 and 4.5.7 4.5.4
Specific gravity	Table II	4.5.9
Brittleness point	Table II	
Group C:		4.5.8
Hot compression set	Table II	4.5.10
Water extraction	Table II	4.5.11
Oil resistance	Table II	4.5.12
Phosphate ester resistance	Table II	4.5.13
Fuel resistance	Table II	

4.3.1 Sampling.

4.3.1.1 Lot. For the purposes of sampling for examinations and tests, a lot shall consist of one type and class of material of the same form and dimensions produced in one plant under essentially the same conditions, not to exceed 2,500 pounds, and offered for delivery at one time. In each case the number of pieces shall be the lot size.

4.3.1.2 Sampling for examination of material. Samples shall be taken at random from each lot according to the sampling plan as specified in table VI for the examination specified in 4.3.2.

TABLE VI. Sampling for examination of material.

Number of rolls of sheet or strips or number of gaskets in lot	Number of rolls or gaskets to be examined
1 to 15	All
16 to 40	15
41 to 65	25
66 to 110	35
111 to 300	50
301 to 800	75
801 and over	110

4.3.1.3 Sampling for tests. Representative samples shall be taken at random from each lot that passes the examination of 4.3.2 in sufficient quantity to conduct the conformance tests (see table V). If the items are of such size or shape that test specimens cannot be prepared from them, a substitute sample shall be provided in the form of a piece or pieces of rubber having dimensions appropriate to the tests required.

4.3.2 Examination.

4.3.2.1 Examination of material. Each of the samples taken as specified in 4.3.1.2 shall be subject to surface examination for workmanship, dimensions, and tolerances and for all other requirements for which test methods are not specified. Thickness shall be measured in accordance with ASTM F 104. Visual defects shall be determined and evaluated in accordance with MIL-STD-289, MIL-STD-298, and MIL-STD-407. A major defect is a defect that is likely to result in failure, or to reduce materially the usability of the unit of product for its intended purpose. A minor defect is a defect that is not likely to materially reduce the usability of the unit of product for its intended purpose, or is a departure from established standards having little bearing on the effective use or operation of the unit. The material shall also be examined for the items in table VII.

TABLE VII. Defects.

Category	Item	Defect
Major		
101	Appearance and workmanship	Not uniform; not homogeneous
102	Shape	Not form specified
103	Dimensions and tolerances	Not as specified
Minor		
201	Appearance and workmanship	Contains dirt or foreign matter
202	Marking	Not legibly identified with cure date as specified; marking missing

4.3.2.2 Examination for age. Material shall be examined for conformance to the age requirement (see 3.2.2). Material over the maximum 12-month age limitation shall be rejected. When the cure date cannot be determined, this shall also be cause for rejection.

4.4 Nonconformance. If any of the samples in the first article tests or conformance tests are found not to be in conformance to the requirements of this specification, this shall be cause for rejection. In addition, if a sample fails in a first article test, subsequent lots shall be subjected to the test or tests that failed. This additional testing shall be discontinued and tests returned to the normal basis of section 4 when four successive lots have been accepted.

4.5 Tests.

4.5.1 Pre-test conditioning. Unless otherwise specified in the test method, all specimens shall be conditioned for 4 hours at 80 ± 9 degrees Fahrenheit (˚F) (27 ± 5 degrees Celsius (˚C)). Sample preparations may be done without regard to this criteria.

4.5.2 Tensile strength and ultimate elongation. Tensile strength and ultimate elongation shall be determined in accordance with ASTM D 412, using die C specimens of 0.080 ± 0.010 inch.

4.5.3 Hardness. Hardness shall be determined in accordance with ASTM D 2240 using a Shore A durometer.

4.5.4 Specific gravity. Specific gravity shall be determined in accordance with ASTM D 792.

4.5.5 Oven aging. Specimens for the oven aged tensile strength, ultimate elongation, hardness test, and hot compression set test shall be aged in accordance with ASTM D 573 for 94 ± 0.5 hours at 158 ± 2˚F (70 ± 1.1˚C). Determination of aged tensile strength, ultimate elongation, and hardness properties shall be made not less than 20 hours or greater than 48 hours after removal from the oven.

4.5.6 Tensile strength and ultimate elongation after oven aging. Tensile strength and ultimate elongation shall be determined after oven aging (see 4.5.5) using the procedure specified in 4.5.2.

4.5.7 Hardness after oven aging. Hardness shall be determined after oven aging (see 4.5.5) using the procedure specified in 4.5.3.

4.5.8 Hot compression set. Hot compression set shall be determined in accordance with ASTM D 395. The specimens shall be compressed to 40 percent deflection, then subjected to the conditions specified in 4.5.5.

4.5.9 Brittleness point. The brittleness point shall be determined by ASTM D 2137, method A. The test temperature shall be minus 20 ± 2°F (minus 29 ± 1.1°C).

4.5.10 Extraction in distilled water. The percent extraction shall be determined by ASTM D 471 using distilled water at boiling point for 1 hour ± 5 minutes.

4.5.11 Oil resistance (Class 1 only). Oil resistance shall be determined by ASTM D 471. The immersion time and temperature shall be 70 ± 0.5 hours and 212 ± 2°F (100 ± 1.1°C).

4.5.12 Phosphate ester resistance (Class 3 only). Phosphate ester resistance shall be determined by ASTM D 471. The immersion time and temperature shall be 70 ± 0.5 hours and 212 ± 2°F (100 ± 1.1°C).

4.5.13 Fuel resistance (Class 5 only). Fuel resistance shall be determined by ASTM D 471. The time and temperature of immersion shall be 70 ± 0.5 hours and 73.4 ± 3.6°F (23 ± 2°C).

5. PACKAGING

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

6. NOTES

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

6.1 Intended use. This material is intended for general gasket use but is not intended for use as a gasket in hatches, air ports, or watertight and airtight doors.

6.2 Acquisition requirements. Acquisition documents must specify the following:

(a) Title, number, and date of this specification.
(b) Type and class required (see 1.2).
(c) Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1 and 2.3).
(d) First article sample, if required (see 3.1).
(e) Form of material required (see 3.3).
(f) Length and thickness of sheet rubber required (see 3.3.1).
(g) Dimensions of strip rubber required (see 3.3.2).
(h) Dimension of other rubber forms required (see 3.3.3).

(i) Type of identification marking required, marking material, and color(s) for environmental resistance, if different from table III (see 3.5).
(j) Inspection conditions, if other than as specified (see 4.1.1).
(k) Packaging requirements (see section 5.1).

6.3 First article. When first article inspection is required, the contracting officer should provide specific guidance to offerors whether the items should be a preproduction sample, a first article sample, a first production item, a sample selected from the first ____ production items, a standard production item from the contractor's current inventory (see 3.1), and the number of items to be tested as specified in 4.2. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.4 Subject term (key word) listing.

Fuel-resistant
Non-metallic
Oil-resistant
Sealing
Vulcanized

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

Custodians:
Army - AV
Navy - SH

Preparing activity:
Navy - SH
(Project 5330-1041)

Review activities:
Army - EA, CR4, MI
Navy - AS
DLA - IS, CC

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document 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 the 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-PRF-1149D	**2. DOCUMENT DATE (YYMMDD)** 980610

GASKET MATERIALS, SYNTHETIC RUBBER, 50 AND 65 DUROMETER HARDNESS

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) (1) Commercial (2) AUTOVON *(if applicable)*	**7. DATE SUBMITTED** (YYMMDD)

8. PREPARING ACTIVITY

a. NAME	b. TELEPHONE *Include Area Code)*	
COMMANER, NAVAL SEA SYSTEMS COMMAND,	(1) Commercial (703) 602-7471	(2) AUTOVON 332-7471
SEA 03R42 2531 JEFFERSON DAVIS HWY ARLINGTON, VA 22242-5160		