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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):

a. Type I – Type I includes gaskets of nominal 50 durometer hardness with the following classes:
   (1) Class 1 – Oil resistant (chloroprene polymer)
   (2) Class 2 – Non-oil resistant (styrene-butadiene copolymer)
   (3) Class 3 – Phosphate ester resistant (isoprene-isobutylene copolymer)
   (4) Class 5 – Fuel resistant (acrylonitrile-butadiene copolymer)

b. Type II – Type II includes gaskets of nominal 65 durometer hardness with the following classes:
   (1) Class 1 – Oil resistant (chloroprene polymer)
   (2) Class 2 – Non-oil resistant (styrene-butadiene copolymer)
   (3) Class 3 – Phosphate ester resistant (isoprene-isobutylene copolymer)
   (4) Class 5 – Fuel resistant (acrylonitrile-butadiene copolymer)

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

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 of 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 cited in the solicitation or contract.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-190 - Identification Marking of Rubber Products

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

(Copies of these documents are available online at https://quicksearch.dla.mil/.)

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

AMERICAN SOCIETY FOR QUALITY (ASQ)

ANSI/ASQ Z1.4 - Sampling Procedures and Tables for Inspection by Attributes

(Copies of this document are available online at www.asq.org.)

ASTM INTERNATIONAL

ASTM D395 - Standard Test Methods for Rubber Property - Compression Set

ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension

ASTM D471 - Standard Test Method for Rubber Property - Effect of Liquids

ASTM D573 - Standard Test Method for Rubber - Deterioration in an Air Oven

ASTM D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

ASTM D2137 - Standard Test Methods for Rubber Property - Brittleness Point of Flexible Polymers and Coated Fabrics

ASTM D2240 - Standard Test Method for Rubber Property - Durometer Hardness

ASTM F104 - Standard Classification System for Nonmetallic Gasket Materials

(Copies of these documents are available online at www.astm.org.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, 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 Materials. The material shall be vulcanized rubber that meets the requirements specified herein. Asbestos and components containing asbestos are prohibited.

3.1.1 Recycled, recovered, environmentally preferable, or biobased materials. Recycled, recovered, environmentally preferable, or biobased 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.

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

3.1.3 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).

3.2 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.

3.2.1 Sheets. Sheet rubber shall be supplied in rolls that are 36±1 inches 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 or equal to 1/16	1/100	Less than or equal to 1/16	1/128
Over 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	--	--

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

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

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

TABLE II. Physical requirements.

Initial properties:	**Type I**	**Type II**	**Test procedure**
Tensile strength, lb/in^2 (minimum)	1,000	1,000	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, type 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

3.4 Identification markings. Unless otherwise specified (see 6.2), the gasket material shall be marked as specified in this section, and shall indicate the specification number, type, class, and cure date (quarter and year). Sheet material marking shall be ½ inch high, occurring every 6 inches continuously across the sheet and recurring lengthwise every 4 inches on one side only.

3.4.1 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 3.4.6), or by contact from normal handling, shipment, and storage. Legibility of the markings shall be that 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.

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

3.4.3 Exceptions. Only the part of the identification system that applies to the individual requirements of the item specification is intended to be used. Only one set of manufacturer's letters shall 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 specification, 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 in either the applicable drawing or the item specification, as appropriate, or in both places.

TABLE III. Colors for environmental resistance.

Color	Resistant to environment	Class
Blue	Petroleum brake fluid	5
Brown	Polar fluids	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 or pink	Hydrocarbon fuel	5
White	Phosphate ester fluids	3
Yellow	Petroleum lubricating oil	5

3.4.4 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 of marking and the marking material shall be as specified (see 6.2), so that critical surfaces are not damaged.

3.4.5 Symbols and letters. Symbol and letter designations in accordance with MIL-STD-190 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 millimeters). The color shall be white or the same color used to indicate environmental resistance listed in table III. When marking is accomplished by molding, the use of a colored paint, cement, or lacquer is not required.

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

3.4.7 Dating. Unless otherwise specified (see 6.2), the date of manufacture shall indicate the quarter of the calendar year and the year. For example, 2Q-96 for the second quarter of 1996.

3.5 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 4.3.1).

4. VERIFICATION

4.1 Conformance inspection. Conformance inspection shall include the examinations of 4.3 and the tests specified in table IV. Samples to be tested shall be subjected to the group A, B, and C tests.

TABLE IV. Conformance inspection.

Test	Requirement	Test Method
Group A:		
Width and length	3.2.1-3.2.3	4.3.1
Thickness	3.2.1-3.2.3	4.3.1
Identification markings	3.4	4.3.1
Workmanship	3.5	4.3.1
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
Specific gravity	Table II	4.5.4
Brittleness point	Table II	4.5.9
Group C:		
Hot compression set	Table II	4.5.8
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

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

4.2 Sampling.

4.2.1 Lot. For the purpose of sampling, a lot shall consist of all packing of the same type and thickness produced under essentially the same conditions.

4.2.2 Sampling for examination and test. A random sample in accordance with ANSI/ASQ Z1.4 at inspection level II shall be selected from each lot to conduct the conformance tests (see table IV). The Acceptance Quality Limit (AQL) shall be as specified (see 6.2). Each sample piece that passes the examination of 4.3.2 shall be 12 by 12 inches, or 3 feet long by ordered width. 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. Unless otherwise specified (see 6.2), a piece of fabric 12 by 24 inches, taken from the lot of fabric used in the manufacture of the packing delivered, shall be furnished with each delivery.

4.3 Examination.

4.3.1 Examination of material. Each of the samples taken as specified in 4.2.2 shall be subject to surface examination for workmanship, dimensions, tolerances, and all other requirements for which test methods are not specified. Thickness shall be measured in accordance with ASTM F104. 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 be examined for the defects specified in table V.

TABLE V. Classification of defects.

Classification	Requirement	Defect
Major:		
101	Appearance and workmanship	Not uniform; not homogenous
102	Shape	Not form specified
103	Dimensions	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. Examination for age. Material shall be examined for conformance to the age requirement (see 3.1.3). 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 from the conformance tests are found not to be in conformance with the requirements of this specification, this shall be cause for rejection.

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 °F (27±5 °C). Sample preparations may be done without regard to these criteria.

4.5.2 Tensile strength and ultimate elongation. Tensile strength and ultimate elongation shall be determined in accordance with ASTM D412 using die C specimens of 0.080±0.010 inch.

4.5.3 Hardness. Hardness shall be determined in accordance with ASTM D2240, using a type A durometer.

4.5.4 Specific gravity. Specific gravity shall be determined in accordance with ASTM D792.

4.5.5 Oven aging. Specimens for the oven-aged tensile strength, ultimate elongation, hardness, and hot compression set tests shall be aged in accordance with ASTM D573 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 D395. 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 in accordance with ASTM D2137, method A. The test temperature shall be -20±2 °F (-29±1.1 °C).

4.5.10 Extraction in distilled water. The percent extraction shall be determined in accordance with ASTM D471 using distilled water at boiling point for 60±5 minutes.

4.5.11 Oil resistance (class 1 only). The change in volume shall be determined in accordance with ASTM D471. 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). The change in volume shall be determined in accordance with ASTM D471. 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). The change in volume shall be determined in accordance with ASTM D471. The immersion time and temperature 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 packaging of material is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature 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. This product must survive in a maritime environment in excess of commercial standards and operate at higher levels of reliability to meet the Navy's mission. Current stock of gasket materials may be used until depleted; future requisitions for gasket materials should refer to the current version of this specification.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of the specification.

b. Type and class required (see 1.2).

c. Form of material required (see 3.2).

d. Length and thickness of sheet rubber required (see 3.2.1).

e. Dimensions of strip rubber required (see 3.2.2).

f. Width and thickness tolerances of strip rubber if other than specified in table I (see 3.2.2).

g. Dimension of other rubber forms required (see 3.2.3).

h. Type of identification marking required, marking material, and color(s) for environmental resistance, if other than specified (see 3.4).

i. The type of marking and the marking material so that critical surfaces are not damaged (see 3.4.4).

j. Format of marking the date of manufacture if other than specified (see 3.4.7).

k. Inspection conditions if other than specified (see 4.1.1).

l. AQL in accordance with ANSI/ASQ Z1.4 (see 4.2.2); an AQL of 4.0 is recommended.

m. If the requirement for a piece of fabric taken from the lot of fabric used in the manufacture of the packing delivered is other than specified (see 4.2.2).

n. Packaging requirements (see 5.1).

6.3 Subject term (key word) listing.

Fuel resistant

Non-metallic

Oil resistant

Sealing

Vulcanized

6.4 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.

CONCLUDING MATERIAL

Custodians:
Army – AV
Navy – SH

Preparing activity:
Navy – SH
(Project 5330-2019-022)

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

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