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PERFORMANCE SPECIFICATION

RUBBER SHEET, STRIP, EXTRUDED, AND MOLDED SHAPES, SYNTHETIC, OIL RESISTANT

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

1. SCOPE

1.1 Scope. This specification covers an oil-resistant type of synthetic rubber material for gaskets.

2. APPLICABLE DOCUMENTS

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

2.2 Government documents.

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

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

AMSC N/A FSC 5330

DEPARTMENT OF DEFENSE STANDARDS

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 http://assist.daps.dla.mil/quicksearch or www.dodssp.daps.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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

BUREAU OF MEDICINE AND SURGERY (BUMED)

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

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

NAVAL SEA SYSTEMS COMMAND (NAVSEA)

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

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

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

ASTM INTERNATIONAL

D 395 - Standard Test Methods for Rubber Property - Compression Set. (DoD adopted)
D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension. (DoD adopted)
D 471 - Standard Test Method for Rubber Property - Effect of Liquids. (DoD adopted)
D 573 - Standard Test Method for Rubber - Deterioration in an Air Oven. (DoD adopted)
D 792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement. (DoD adopted)
D 1229 - Standard Test Method for Rubber Property - Compression Set at Low Temperatures. (DoD adopted)
D 2240 - Standard Test Methods for Rubber Property - Durometer Hardness. (DoD adopted)

(Copies of these documents are available from www.astm.org or ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959.)

RUBBER MANUFACTURERS ASSOCIATION

Vendors Identification Guide for Molded and Extruded Goods.

(Copies of this document are available from www.rma.org or the Rubber Manufacturers Association, Inc., 1400 K Street, NW, Suite 900, 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 Form. The synthetic rubber shall be furnished in the form of sheets, strips, cut, extruded, or molded rubber material, as specified (see 6.2).

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.

3.3 Dimensions and tolerances. Dimensions and tolerances of material shall be as follows:

3.3.1 Dimensions.

3.3.1.1 Sheet and strip material. Unless otherwise specified (see 6.2), dimensions of sheet and strip material shall be as follows:

a. Sheet rubber shall be furnished in rolls between 35 to 42 inches wide and rolls shall weigh between 90 and 110 pounds.

b. Strip rubber shall be furnished in lengths of 11 or 22 feet within a tolerance of plus or minus 10 percent.

3.3.1.2 Cut, molded and extruded material. The dimensions of cut, molded and extruded material shall be as specified (see 6.2).

3.3.2 Tolerances. Tolerances for cut, molded, and extruded material shall be as specified (see 6.2). Unless otherwise specified (see 6.2), tolerances for sheet and strip material shall be as specified in Tables I and II.

TABLE I. Tolerance in width for sheet and strip material.

Width	Tolerance (plus or minus)
1/4 to 1/2 inch	1/32 inch
Over 1/2 to 1 inch	3/64 inch
Over 1 to 2 inches	1/16 inch
Over 2 inches	3 percent

TABLE II. Tolerance in thickness for sheet and strip material.

Thickness - inch	Tolerance - inch (plus or minus)
Less than 1/16	0.010
1/16 to 1/8	1/64
Over 1/8 to 1/2	1/32
Over 1/2 to 1	3/64
Over 1	1/16

3.4 Physical requirements. The synthetic rubber material shall conform to the requirements specified in Table III.

TABLE III. Physical requirements of rubber.

Initial properties	Requirement
Tensile strength, 1b/in^2 minimum	1000
Ultimate elongation, percent, minimum	300
Hardness, Type A durometer	35 to 55
Specific gravity, maximum	1.65
Delamination, after liquid immersion	No delamination
Properties after oven aging	
Tensile strength, percent of initial, minimum	80
Ultimate elongation, percent of initial, minimum	70
Hardness, Type A durometer, maximum	60
Hot compression set, percent, maximum	40
Properties after oil-immersion	
Tensile strength, 1b/in^2 minimum	1000
Ultimate elongation, percent, minimum	300
Volume change, percent, maximum (no shrinkage allowed)	plus 25
Low temperature properties	
Hardness Type A durometer, maximum	60
Cold compression set, before and after oil immersion	
Percent, maximum, 10 seconds after release	75
Percent, maximum, 30 minutes after release	35

3.5 Identification. Unless otherwise specified (see 6.2), the synthetic rubber material shall be marked with rows of constantly recurring yellow symbols identifying the product as oil resistant. Markings shall be as specified in paragraphs 3.5.1 through 3.5.7. Material supplied under this specification shall be identified as specified in paragraphs 3.5.1 through 3.5.7. Material shall be marked with a yellow color. Marking shall be done with a permanent marking material.

3.5.1 Performance and legibility. Markings of rubber products shall be such as to 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 such 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 3.5. 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 is 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 (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 1.6 to 3.2 mm (1/16 to 1/8 inch). The color shall be yellow. When marking is accomplished by molding, the use of a colored paint, cement, or lacquer is not required.

3.5.6 Colors and shape for environmental resistance. The colors indicated in 3.5 are to be applied as dashes approximately 1.6mm (1/16 inch) wide by 6.4mm (1/4 inch) long and repeated at intervals of 254mm (10 inches) where size of product permits.

3.5.7 Dating. Unless otherwise specified, the date of manufacture shall indicate the quarter of the calendar year and the year. For example, 2Q-97 indicates the date of manufacture was the second quarter of 1997.

3.6 Workmanship. The workmanship shall be such as to meet all applicable requirements of this specification and the rubber shall be free of surface voids, tears, rips, cuts and free from all foreign matter that may affect the use of the finished products.

3.7 Off-gassing. The gasket material shall meet the requirements in the Nuclear Powered Submarine Atmosphere Control Manual, S9510-AB-ATM-010 Rev 2 of 30 July 1992, for a usage category of Limited (see 4.6 and 6.4).

3.8 Toxicity. The gasket material shall have no adverse effect on the health of personnel when used for its intended purpose. The gasket material shall be assessed by the Navy Environmental Health Center (NAVENVIRHLTHCEN) using the administrative Health Hazard Assessment (HHA). A flowchart for this process

can be found as enclosure (1) of BUMEDINST 6270.8. The HHA is a review of the gasket material based on information submitted by the manufacturer, to assess health hazards associated with the handling, application, use and removal of the product. The gasket material shall not cause any environmental problems during waste disposal (see 4.7 and 6.5).

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).

4.2 First article inspection. First article inspection shall consist of the examinations of 4.4 and the tests specified in 4.5, 4.6 and 4.7.

4.2.1 Sampling for first article inspection. Sufficient first article samples shall be taken from the first production lot and tested as specified in 4.2.

4.3 Conformance inspection. Conformance inspection shall consist of the examinations of 4.4 and tests as specified in 4.5.1, 4.5.2, and 4.5.3.

4.3.1 Sampling for quality conformance.

4.3.1.1 Lot. For purposes of sampling, examination and tests, a lot shall consist of not more than 2500 pounds of material of the same form and dimensions, produced in one plant under essentially the same conditions 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. For the examination specified in 4.4, representative samples from different portions of each lot shall be selected as specified in Table IV.

TABLE IV. Sampling for visual and dimensional examination.

Lot size	Sample size	Accept	Reject [1 2 3]
1 to 15	all	0	1
16 to 25	15	0	1
26 to 90	25	0	1
91 to 150	35	0	1
151 to 280	40	0	1
281 to 500	50	0	1
501 to 1200	65	0	1
1201 and over	80	0	1

1 All defective items shall be replaced with acceptable items prior to lot acceptance.
2 Inspect sample size until reject criteria is reached. If reject criteria is reached, the entire lot shall be rejected.
3 Reject lots may be screened and resubmitted for inspection and test.

4.3.1.3 Sampling for tests. Four sets of samples shall be taken at random from those selected in 4.3.1.2 in sufficient quantity to conduct the quality conformance tests as specified in 4.5 as applicable. If the items are of such size or shape that test specimens cannot be prepared from them, substitute samples shall be provided as molded specimens or in the form of pieces of rubber having dimensions appropriate to the tests required. The

substitute samples shall be certified to be of the same material and equivalent cure as that used in the lot of finished material offered for delivery.

4.3.1.4 Rejection. Samples tested as specified in 4.2 and 4.3 which fail to meet the requirements specified herein shall be cause for rejection. If the failure occurred during first article testing additional samples shall be taken from each subsequent lot and shall withstand the test wherein the failure occurred. The additional testing shall be discontinued after four successive lots have passed the test or tests.

4.4 Examination. Each of the samples taken in accordance with 4.3.1.2 shall be subjected to surface examination for identification markings, workmanship, dimensions, and tolerances. Visual defects shall be determined and evaluated in accordance with MIL-STD-289, MIL-STD-298, and MIL-STD-407.

4.4.1 Rejection. If the number of defects exceeds the applicable acceptance number shown in Table IV, this shall be cause for rejection of the entire lot.

4.5 Testing methods. Unless otherwise indicated in the test method, specimens shall be conditioned for at least 4 hours at room temperature 27 ± 5 degrees Celsius (°C) (80 ± 9 degrees Fahrenheit (°F)) before testing. Sample preparation may be undertaken without regard to this time interval.

4.5.1 Tensile strength and ultimate elongation. Tensile strength and ultimate elongation shall be determined in accordance with ASTM D 412 Die C. Specimens, 0.070 to 0.090-inch thickness, shall be used for determinations of all tensile and elongation properties.

4.5.2 Hardness. The hardness shall be determined in accordance with ASTM D 2240. The instantaneous reading shall be taken using a durometer, Type A.

4.5.3 Specific gravity. The specific gravity shall be determined in accordance with ASTM D 792.

4.5.4 Delamination test. The delamination test shall be conducted in accordance with ASTM D 471 except that the immersion medium shall be tetrahydrofuran.

4.5.5 Oven aging. Specimens for the tensile strength and ultimate elongation test, hardness test, and hot compression set test shall be aged in accordance with ASTM D 573 for 46 ± 1/4 hours at 90 ± 1.1°C (194 ± 2°F). Determination of aged tensile and hardness properties shall be made not less than 20 hours or more than 48 hours after removal from the oven.

4.5.5.1 Tensile strength and ultimate elongation after oven aging. Tensile strength and ultimate elongation shall be determined after oven aging in accordance with ASTM D 412.

4.5.5.2 Hardness after oven aging. Hardness shall be determined as specified in 4.5.2 after oven aging.

4.5.5.3 Hot compression set. Hot compression set shall be determined in accordance with ASTM D 395, method B. The specimens shall be compressed to 40 percent deflection and subjected to the conditions as specified in 4.5.5.

4.5.6 Oil immersion. Specimens for tensile strength and ultimate elongation test, volume change, and the cold compression set test shall be conditioned for 94 ± 1/4 hours at 70 ± 1.1°C (158 ± 2°F) in reference oil IRM 903 in accordance with ASTM D 471.

4.5.6.1 Tensile strength and ultimate elongation after oil immersion. Tensile strength and ultimate elongation shall be determined after oil immersion, in accordance with ASTM D 412. After removing the specimens from the oil, they shall rest at room temperature no less than 30 minutes or longer than 60 minutes before testing. The tensile strength shall be based on the swollen cross-sectional area.

4.5.6.2 Volume change. The change in volume shall be determined after oil immersion, in accordance with ASTM D 471.

4.5.7 Low temperature tests. Specimens for hardness after low temperature aging and the cold compression set tests shall be conditioned in air or carbon dioxide for 94 ± 1/4 hours at minus 29 ± 1.1°C (minus 20 ± 2°F).

4.5.7.1 Hardness after low temperature aging. The hardness after low temperature aging shall be determined in accordance with ASTM D 2240. The instantaneous reading shall be taken using a durometer, Type A. Before use, the durometer shall be completely dry.

4.5.7.2 Cold compression set. Cold compression set shall be determined, before and after oil immersion, in accordance with ASTM D 1229. The specimens shall be compressed to 40 percent deflection during conditioning. In the case of oil immersed specimens, the deflection shall be based upon the un-swollen thickness.

4.5.7.2.1 Oil-immersed specimens. Each specimen shall be immersed in 250 milliliters (mL) of oil as specified in 4.5.6. After the oil immersion, the specimens shall be removed from the oil, carefully blotted, and allowed to rest at room temperature for 30 minutes, before testing as specified in 4.5.7.2.

4.6 Off-gassing. The gasket material shall be tested in accordance with the Nuclear Powered Submarine Atmosphere Control Manual, NAVSEA Technical Manual S9510-AB-ATM-010/(U), by a Government approved testing facility. The results shall be submitted to the Government for evaluation and approval for use (see 3.7 and 6.4).

4.7 Toxicity. To determine conformance with the requirements of 3.8, gasket material shall be evaluated using the HHA process. Sufficient data to permit a HHA of the product shall be provided by the manufacturer/distributor to the NAVENVIRHLTHCEN. To obtain current technical information requirements specified by the NAVENVIRHLTHCEN, see 6.5.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system 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. The synthetic rubber material covered by this specification is intended for use as gaskets where resistance to oil is required. The lower temperature serviceability limit for this material is minus 20°F.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number and date of this specification.
b. When first article inspection is required (see 3.1).
c. Form of material required (see 3.2).
d. Dimensions and tolerances required (see 3.3).
e. Marking required on rubber item (see 3.5).
f. Is off-gas testing required? (see 3.7).
g. Packaging requirements (see 5.1).
h. Is Material Safety Data Sheet required? (see 6.3).
i. Is NEHC toxicity evaluation required? (see 6.5).

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

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

6.5 Toxicity evaluation. The NAVENVIRHLTHCEN requires sufficient information to permit a HHA of the product. Any questions concerning toxicity and requests for HHA should be addressed to the Commanding Officer, Navy Environmental Health Center, ATTN: Hazardous Materials Department, Industrial Hygiene Directorate, 620 John Paul Jones Circle, Suite 1100, Portsmouth, VA 20378-2103. Upon receipt of the HHA, a copy should be provided to Commander, Naval Sea Systems Command, ATTN: SEA 05M3, 1333 Isaac Hull Ave., SE, Stop 5133, Washington Navy Yard, DC 20376.

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

6.7 Part or identifying number (PIN).

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M        2765          1.25
|        |             |
|        |              Size
|        |
|        | Specification number
|
| Denotes item defined by inch-pound units
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6.8 Subject term (key word) listing.

Extruded material
Molded shapes
Sheet and strip material
Sheet rubber
Synthetic rubber

6.9 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 - AR
Navy - SH
Air Force - 99

Preparing activity:
Navy - SH
(Project 5330-1282)

Review activities:
Army - MI, EA, CR4
DLA - IS
Air Force - 82

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at www.dodssp.daps.mil.