MIL-R-2765D
24 September 1986
SUPERSEDING
MIL-R-2765C
9 July 1965
(See 6.5)

MILITARY 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 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

SPECIFICATIONS

FEDERAL

TT-T-548 - Toluene, Technical.
PPP-B-566 - Boxes, Folding, Paperboard.
PPP-B-576 - Boxes, Wood, Cleated, Veneer, Paper Overlaid.
PPP-B-585 - Boxes, Wood, Wirebound.
PPP-B-591 - Boxes, Shipping, Fiberboard, Wood-Cleated.
PPP-B-601 - Boxes, Wood, Cleated-Plywood.
PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner.
PPP-B-636 - Box, Shipping, Fiberboard.
PPP-B-640 - Boxes, Fiberboard, Corrugated, Triple-Wall.
PPP-B-665 - Boxes, Paperboard, Metal.
PPP-B-676 - Boxes, Edged and Components Setup.

Beneticial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 55Z3, Department of the Navy, Washington, DC 20362-5101 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

MILITARY

MIL-P-116 - Preservation, Methods of.
MIL-L-10547 - Liners, Case, and Sheet, Overwrap; Water-Vaporproof or Waterproof, Flexible.

STANDARDS

MILITARY

MIL-STD-129 - Marking for Shipment and Storage.
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 specifications and standards required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the douments which are DoD adopted shall be those listed in the issue of the DoDISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS shall be the issue of the non-government documents which is current on the date of the solicitation.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D 395 - Standard Test Methods for Rubber Property - Compression Set. (DoD adopted)
D 412 - Standard Test Methods for Rubber Properties in 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 Specific Gravity and 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)
D 3951 - Standard Practice for Commercial Packaging. (DoD adopted)

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

(Nongovernment standards and other publications are normally available from the organizations which prepare or which 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 specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified in the contract or purchase order, a sample shall be subjected to first article inspection (see 4.3 and 6.3).

3.2 Form. The synthetic rubber shall be furnished in the form of sheets, strips, cut, extruded, or molded rubber material, as specified (see 6.2.1).

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 6.2.1), 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 6.2.1).

3.3.2 Tolerances. Tolerances for cut, molded, and extruded material shall be as specified (see 6.2.1). Unless otherwise specified (see 6.2.1), 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 requirement specified in table III.

TABLE III. Physical requirements of rubber.

Initial properties	Requirement	Test method
Tensile strength, lb/in^2 minimum	1000	4.6.1
Ultimate elongation, percent, minimum	300	4.6.1
Hardness, Shore A durometer	35 to 55	4.6.2
Specific gravity, maximum	1.65	4.6.3
Delamination, after liquid immersion	No delamination	4.6.4
Properties after oven aging		
Tensile strength, percent of initial, minimum	80	4.6.5.1
Ultimate elongation, percent of initial, minimum	70	4.6.5.1
Hardness, Shore A durometer, maximum	60	4.6.5.2
Hot compression set, percent, maximum	40	4.6.5.3
Properties after oil-immersion		
Tensile strength, lb/in^2 minimum	1000	4.6.6.1
Ultimate elongation, percent, minimum	300	4.6.6.1
Volume change, percent, maximum (no shrinkage allowed)	plus 25	4.6.6.2
Low temperature properties		4.6.7
Hardness Shore A durometer, maximum	60	4.6.7.1
Cold compression set, before and after oil immersion		4.6.7.2
Percent, maximum, 10 seconds after release	75	
Percent, maximum, 30 minutes after release	35	

3.5 Identification. Unless otherwise specified (see 6.2.1), the synthetic rubber material shall be marked with rows of constantly recurring yellow symbols identifying the item as oil resistant. The symbols shall be clearly legible and may be applied by any means that is not deleterious to the rubber. The markings shall not be obliterated by normal handling or by the action of petroleum. The markings shall be in accordance with MIL-STD-190.

3.6 Workmanship. The workmanship shall be such as to meet all applicable requirements of this specification.

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 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 assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection 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 assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

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

(a) First article inspection (see 4.3).
(b) Quality conformance inspection (see 4.4).

4.3 First article inspection. First article inspection shall consist of the examinations of 4.5 and the tests specified in 4.6. A first article test and inspection report shall be prepared as specified (see 6.3).

4.3.1 Sampling for first article inspection. First article samples taken from the first production lot shall be tested as specified in 4.3.

4.4 Quality conformance inspection. Quality conformance inspection shall consist of the examinations of 4.5 and tests as specified in 4.6.1, 4.6.2, and 4.6.3.

4.4.1 Sampling for quality conformance.

4.4.1.1 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.

4.4.1.2 Sampling for examination. For the examination specified in 4.5, representative samples from different portions of each lot shall be selected as specified in table IV.

TABLE IV. Sampling for visual and dimensional examination.

Number of rolls of sheet or strip packing, or number of gaskets, extruded or molded item in lot	Number of rolls or items to be examined	Major defects in rolls or items		Total defects[1/] in rolls or items	
		Acceptance number	Rejection number	Acceptance number	Rejection number
1 to 15	All	0	1	1	2
16 to 40	15	0	1	1	2
41 to 65	25	0	1	1	2
66 to 110	35	1	2	2	3
111 to 300	50	1	2	3	4
301 to 800	75	2	3	4	5
801 and up	110	3	4	6	7

1/ Major plus minor defects.

4.4.1.3 Sampling for tests. Four sets of samples shall be taken at random from those selected in 4.4.1.2 in sufficient quantity to conduct the quality conformance tests as specified in 4.6 as applicable. If the items are of such size or shape that test specimens cannot be prepared from them, substitute samples shall be provided 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.

4.4.1.4 Rejection. Samples tested as specified in 4.3 and 4.4 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.

4.5 Examination. Each of the samples taken in accordance with 4.4.1.2 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.

4.5.1 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.

4.5.2 Examination of packaging. One sample unit shall be examined for packaging and marking as specified in table V.

4.5.2.1 Rejection of packaging samples. If the number of defective samples exceeds the acceptance number for major defects in rolls or items as shown in table IV, the entire lot represented by the sample shall be rejected.

TABLE V. Classification of defects for packaging, packing and marking.

Categories	Defects
Critical:	None defined.
Major:	
101	Caseliner missing when required.
102	Caseliner not sealed.
103	Fiberboard container not sealed as specified.
104	Closure of shipping container incorrect.
105	Strapping missing when required.
106	Strapping not specified type and class or incorrectly applied.
107	Fiberboard boxes not banded when required.
108	Gross weight of shipping container exceeds limit specified.
109	Marking missing, illegible, or incorrect.

4.6 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.

4.6.1 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.

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

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

4.6.4 Delamination test. The delamination test shall be conducted in accordance with ASTM D 471 except that the immersion medium shall be toluene in accordance with TT-T-548.

4.6.5 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.

4.6.5.1 Tensile strength and ultimate elongation after oven aging. Tensile strength and ultimate elongation shall be determined after oven aging in accordance with ASTM D 573.

4.6.5.2 Hardness after oven aging. Hardness shall be determined as specified in 4.6.2 after oven aging.

4.6.5.3 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 4.6.5.

4.6.6 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 medium No. 3 petroleum-base oil in accordance with ASTM D 471.

4.6.6.1 Tensile strength and ultimate elongation after oil immersion. Tensile strength and ultimate elongation shall be determined after oil immersion, in accordance with ASTM D 471. 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.

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

4.6.7 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).

4.6.7.1 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 Shore A durometer. Before use, the durometer shall be completely dry.

4.6.7.2 Cold comperssion 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 unswollen thickness.

4.6.7.2.1 Oil-immersed specimens. Each specimen shall be immersed in 250 milliliters (mL) of oil as specified in 4.6.6. 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 4.6.7.2.

4.7 Inspection of packaging. Sample packages and packs, and the inspection of the preservation-packaging, packing and marking for shipment 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, C or commercial, as specified (see 6.2.1).

5.1.1 Level A.

5.1.1.1 Sheet, strip, gaskets and molded shapes. Sheet material, strips, gaskets, or molded shapes shall be unit packed in the quantity specified (see 6.2.1) in accordance with method III of MIL-P-116 in a manner to prevent deformation or set.

5.1.1.2 Rings. Rings in the quantity specified (see 6.2.1) shall be unit packed in accordance with method IC-1 or IC-3 of MIL-P-116. When specified (see 6.2.1) unit packs of rings shall be intermediate packed in folding cartons or set-up boxes in accordance with PPP-B-566 variety 2, PPP-B-636 weather-resistant, PPP-B-665 class 2 or PPP-B-676 variety 2 or 4 with selection at the option of the contractor. Box closures shall be in accordance with the box specification or appendix thereto. Gross weight of paperboard boxes shall not exceed 10 pounds; of fiberboard boxes, 20 pounds.

5.1.2 Level C. Preservation of all material shall be as specified for level A except that intermediate packs (cartons and boxes) may be of the non-water, non-weather resistant type or grade.

5.1.3 Commercial. Rubber sheet, strip, extruded and molded shapes shall be packaged in accordance with ASTM D 3951.

5.2 Packing. Packing shall be level A, B, C or commercial, as specified (see 6.2.1).

5.2.1 Level A. Material preserved as specified (see 5.1), shall be packed in containers in accordance with any one of the following specifications with selection at the option of the contractor.

Specification	Type or class
PPP-B-585	Class 3
PPP-B-601	Overseas type
PPP-B-621	Class 2

Unless otherwise specified (see 6.2.1), shipping containers shall have case-liners conforming to, closed, and sealed in accordance with MIL-L-10547. Boxes shall be closed, strapped, or banded in accordance with the applicable box specification or appendix thereto. The gross weight of boxes shall not exceed 200 pounds.

5.2.2 Level B. Material preserved as specified (see 5.1), shall be packed in containers in accordance with any one of the following specifications with selection at the option of the contractor.

Specification	Type or class
PPP-B-585	Class 2
PPP-B-591	Weather-resistant
PPP-B-601	Domestic type
PPP-B-621	Class 1
PPP-B-636	weather-resistant
PPP-B-576	Class 2
PPP-B-640	Class 2

Unless otherwise specified (see 6.2.1), shipping containers shall have caseliners conforming to, closed, and sealed in accordance with MIL-L-10547. Caseliners for weather-resistant class fiberboard boxes may be omitted provided all corners, edge seams and manufacturer's joints are sealed with minimum 1-1/2 inch-wide pressure sensitive water-resistant tape. Boxes shall be closed, strapped or banded in accordance with the applicable box specification or appendix thereto except that non-metallic banding shall apply for fiberboard boxes. The gross weight of wood or wood cleated boxes shall not exceed 200 pounds, fiberboard shall not exceed the weight limitations of the box specification.

5.2.3 Level C. Material preserved as specified (see 5.1), shall be packed in boxes as specified for level B herein except that boxes shall be of the non-water, non-weather resistant domestic type or class with selection at the option of the contractor and caseliners are not required.

5.2.4 Commercial. Material preserved as specified in 5.1 shall be packed in accordance with ASTM D 3951.

5.3 Marking. In addition to any special marking required (see 6.2.1), interior (unit and intermediate) and exterior shipping containers shall be marked in accordance with MIL-STD-129 or ASTM D 3951 as applicable to the level of protection specified and shall include date of cure, indicated by calendar quarter and year for type I items and by month and year for type II items. In addition, marking shall include the specification number.

6. NOTES

6.1 Intended use. The synthetic rubber material covered by this specification is intended for use as gaskets where resistance to oil and serviceability at temperatures above minus 20°F are required.

6.2 Ordering data.

6.2.1 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) Applicable levels of packaging and packing required (see 5.1 and 5.2).

(g) Quantity of material (rings, and so forth) per unit pack (see 5.1.1.1 and 5.1.1.2).
(h) If intermediate packaging of rings is required (see 5.1.1.2).
(i) When caseliners are not required (see 5.2.1 and 5.2.2).
(j) Special marking, when required (see 5.3).

6.3 First article. When a first article inspection is required, the items should be a first production item. The contracting officer should 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 requirements 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.

6.4 Subject term (key word) listing.

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

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

Custodians:
Army - AR
Navy - SH

Review activities:
Army - MI
DLA - IS

User activities:
Army - ME
Navy - MC

Preparing activity:
Navy - SH
(Project 5330-0628)

INSTRUCTIONS In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge *(DO NOT STAPLE)*, and mailed In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems Enter in block 6 any remarks not related to a specific paragraph of the document If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered

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

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1 DOCUMENT NUMBER	2 DOCUMENT TITLE
MIL-R-2765D	RUBBER SHEET, STRIP, EXTRUDED, AND MOLDED SHAPES, SYNTHETIC, OIL RESISTANT

3a. NAME OF SUBMITTING ORGANIZATION

b. ADDRESS *(Street, City, State, ZIP Code)*

4 TYPE OF ORGANIZATION *(Mark one)*

- ☐ VENDOR
- ☐ USER
- ☐ MANUFACTURER
- ☐ OTHER *(Specify)* _____

5 PROBLEM AREAS

a. Paragraph Number and Wording

b. Recommended Wording

c. Reason/Rationale for Recommendation

6 REMARKS

7a NAME OF SUBMITTER *(Last, First, MI)* – Optional

b WORK TELEPHONE NUMBER *(Include Area Code)* – Optional

MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional

8 DATE OF SUBMISSION *(YYMMDD)*

DD FORM 82 MAR 1426

PREVIOUS EDITION IS OBSOLETE