

**MIL-R-900E****3 NOVEMBER 1966****SUPERSEDING****MIL-R-900D****21 MAY 1956****(SEE 6.3)**

**MILITARY SPECIFICATION**

**RUBBER GASKET MATERIAL,**

**45 DUROMETER HARDNESS,**

**FOR MODERATELY LOW TEMPERATURE SERVICE**

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

**1. SCOPE**

1.1 This specification covers rubber gasket material for watertight and airtight closures, moderately low temperature applications, and other uses.

**MILITARY**

MIL-P-116 — Preservation, Methods of.

**STANDARDS****FEDERAL**

FED-STD-601 — Rubber: Sampling and Testing.

**MILITARY**

MIL-STD-105 — Sampling Procedures and Tables for Inspection by Attributes.

MIL-STD-129 — Marking for Shipment and Storage.

MIL-STD-289 — Visual Inspection Guide for Rubber Sheet Material.

MIL-STD-298 — Visual Inspection Guide for Rubber Extruded Goods.

**2. APPLICABLE DOCUMENTS**

2.1 The following documents of the issue in effect on the date of invitation for bids or requests for proposal, form a part of this specification to the extent specified herein:

**SPECIFICATIONS****FEDERAL**

PPP-B-566 — Boxes, Folding, Paperboard.

PPP-B-636 — Box, Fiberboard.

PPP-B-640 — Boxes, Fiberboard, Corrugated, Triple-Wall.

PPP-B-676 — Boxes, Set-Up, Paperboard.

FSC 5330
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**MIL-R-900E****MIL-STD-407 — Visual Inspection  
Guide for Rubber  
Molded Items.**

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

**2.2 Other publications.** The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

**OFFICIAL CLASSIFICATION COMMITTEE****Uniform Freight Classification Rules.**

(Copies may be obtained from the Official Classification Committee, 1 Park Avenue at 33rd Street, New York, N. Y. 10016.)

**3. REQUIREMENTS**

**3.1 Material.** The material shall be vulcanized rubber which meets the requirements specified herein.

**3.1.1 Plasticizer exudation.** The rubber shall not show evidence of plasticizer exudation; however, a light bloom of non-liquid material shall be considered acceptable (see 4.3).

**3.2 Form.** The rubber gasket material shall be furnished in the form specified (see

6.2). This form may be sheets, strips of rectangular cross section, shapes cut from sheets, molded shapes or extruded shapes.

**3.2.1 Sheet.** Sheet rubber shall have smooth surfaces and shall have the thickness specified (see 6.2). Unless otherwise specified (see 6.2), the tolerances in thickness given in table I shall apply. The sheet rubber shall be furnished in rolls approximately 35 to 42 inches wide. Unless otherwise specified, rolls shall weigh 100 plus or minus 10 pounds, and a roll of sheet rubber  $\frac{1}{8}$  inch or less in thickness shall consist of not more than four lengths. A roll of sheet rubber over  $\frac{1}{8}$  inch in thickness shall consist of not more than three lengths.

**3.2.2 Strip.** Strip rubber of rectangular cross section shall have smooth surfaces and shall have the cross sectional dimensions specified (see 6.2). Unless otherwise specified (see 6.2), the tolerances in thickness and width given in table I shall apply. Strip rubber shall be furnished in lengths of approximately 12, 16, 22 or 100 plus or minus  $\frac{1}{2}$  feet in length. When 100 foot lengths are supplied, a maximum of four seams per length will be acceptable providing the seams are not less than 80 percent of the tensile strength specified in 3.3.

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

TABLE I. *Tolerances in width and thickness.*

Width, inches	Tolerance (plus or minus)	Thickness, inch	Tolerance (plus or minus) inch
$\frac{1}{4}$ to $\frac{1}{2}$ , inclusive	1/32 inch	Less than 1/16	0.010
Over $\frac{1}{2}$ to 1, inclusive	3/64 inch	1/16 to $\frac{1}{8}$ , inclusive	1/64
Over 1 to 2, inclusive	1/16 inch	Over $\frac{1}{8}$ to $\frac{1}{2}$ , inclusive	1/32

**MIL-R-900E**TABLE I. *Tolerance in width and thickness—Continued*

Width, inches	Tolerance (plus or minus)	Thickness, inch	Tolerance (plus or minus) inch
Over 2	3 percent	Over ½ to 1, inclusive	3/64
		Over 1	1/16

**3.3 Physical requirements.** The rubber shall conform to the physical requirements specified in table II.

TABLE II. *Physical requirements of rubber*

	Requirement	Test procedure
Initial properties:		
Tensile strength, psi, minimum	1000	4.7.1
Ultimate elongation, percent, minimum	300	4.7.1
Hardness, durometer units	45 plus or minus 5	4.7.2
Specific gravity, maximum	1.40	4.7.3
Sealing pressure, psi, minimum	95	4.7.4
Properties after oven aging:		4.7.5
Tensile strength, percent of initial, minimum	75	4.7.5.1
Ultimate elongation, percent of initial, minimum	70	4.7.5.1
Hardness, durometer units, maximum	55	4.7.5.2
Hot compression set, percent, maximum	30	4.7.5.3
Sealing pressure, psi, minimum	70	4.7.5.4
Properties after light aging:		4.7.6
Tensile strength, percent of initial, minimum	75	4.7.6
Ultimate elongation, percent of initial, minimum	70	4.7.6
Properties after low temperature aging:		4.7.7
Hardness, durometer units, maximum	60	4.7.7.1

**MIL-R-900E**TABLE II. *Physical requirements of rubber*—Continued

	Requirement	Test procedure
Cold compression set, percent, maximum		
10 seconds after release	75	4.7.7.2
30 minutes after release	40	
Properties after liquid immersions:		
Volume change from water immersion, percent	minus 2 to plus 5	4.7.8
Water extraction, percent maximum	1.0	4.7.9
Delamination after immersion	no delamination	4.7.10

**3.4 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 supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to 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.

#### 4.2 Sampling.

**4.2.1 Lot.** For the purposes of sampling, examinations, and tests, a lot shall consist of material of the same form and dimen-

sions, produced in one plant under essentially the same conditions, not exceeding 2500 pounds, and offered for delivery at one time. In each case the number of pieces shall be the lot size.

**4.2.2 Sampling for examination.** For the examination specified in 4.3 representative samples shall be selected at random from each lot in accordance with 4.2.2.1 and 4.2.2.2.

**4.2.2.1 Sampling of material in rolls.** The lot size shall be stated in square feet and the sample also. The numbers of MIL-STD-105 at Inspection Level II shall be used. The sample shall be selected in equal amounts from 4 rolls, or from all of the rolls if there are less than 4. The acceptable quality level (AQL) shall be 6.5 defects per hundred units for major defects and 15 defects per hundred units for total defects.

**4.2.2.2 Sampling of gaskets.** Gaskets shall be sampled in accordance with table III.

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TABLE III. Sampling for examination of gaskets.

Number of gaskets in lot	Number of gaskets in sample Diameter or width of gaskets (inches)			
	Up to 6	Over 6 to 12	Over 12 to 30	Over 30
15 and under	8	5	3	2
16 to 40	13	8	5	3
41 to 100	20	13	8	5
101 to 250	32	20	13	8
251 to 630	50	32	20	13
631 to 1600	80	50	32	20

Note: The acceptance numbers are as follows:

Sample sizes	2	3	5	8	13	20	32	50	80
Acceptance number,									
Major defects	0	0	0	0	0	1	1	2	3
Minor defects	0	0	1	1	2	3	5	7	10

4.2.3 Sampling for tests. Representative material shall be selected at random from each lot that passes the requirements of 4.3 in accordance with table IV to conduct the production check test or the quality conformance tests specified in 4.4 and 4.5, as applicable.

TABLE IV. Sampling for tests—Continued

Lot size, pounds of material	Sample size <sup>1,2</sup> Number of specimens required for each test
701 to 1400	5
1401 to 2500	7

TABLE IV. Sampling for tests.

Lot size, pounds of material	Sample size <sup>1,2</sup> Number of specimens required for each test
Up to 80	1
81 to 170	2
171 to 350	3
351 to 700	4

<sup>1</sup> In sheet and strip material, each test specimen shall be cut from a different roll. If this is not possible, then from a different length in the roll.

<sup>2</sup> If the items are of such size or shape that test specimens cannot be prepared from them, substitute specimens shall be provided in the form of a piece or pieces of rubber having dimensions appropriate for the tests required. Material for these specimens shall be taken from different parts of the batch or batches used to make the items to be represented by the specimens. The substitute specimens shall be certified to have received a cure equivalent to that used in the lot of finished material offered for delivery.

4.3 Examination. Each of the samples taken in accordance with 4.2.2 shall be sub-

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jected to examination for workmanship, dimensions, tolerances and exudation of plasticizer. MIL-STD-289, MIL-STD-298, and MIL-STD-407 shall be used to determine and evaluate visual defects.

**4.3.1 Rejection.** If the number of defects in the sample exceed the applicable acceptance number, this shall be cause for rejection of the entire lot represented by the sample.

**4.4 Production check tests.** Production check tests shall be conducted on samples from (or representing) the first lot of material and from every tenth lot hereafter. All the tests specified in 4.7 shall be conducted.

**4.5 Quality conformance tests.** Quality conformance tests shall be conducted on samples from (or representing) all lots on which production check tests are not conducted. The tests specified in 4.7.1, 4.7.2, 4.7.3 and 4.7.5.3 shall be conducted.

**4.6 Action in case of nonconformance.** If any of the samples in the production check tests or quality conformance tests is found not to be in conformance with the requirements of this specification, this shall be cause for rejection of the lot represented by the sample. Furthermore, production check tests shall be performed on each succeeding lot of the contract or purchase order. This additional testing shall be discontinued, except as specified in 4.4, after four successive lots have passed the production check tests.

### 4.7 Test procedures.<sup>1</sup>

**4.7.1 Tensile strength and ultimate elongation.** Tensile strength and ultimate elongation shall be determined by methods 4111 and 4121, respectively, of FED-STD-601. Die III specimens, 0.080 plus or minus 0.010 inch thick, shall be used.

**4.7.2 Hardness.** The hardness shall be determined by method 3021 of FED-STD-601. An instantaneous reading shall be taken using a Shore A type durometer. The specimens shall be at least  $\frac{1}{4}$  inch thick but more than  $\frac{1}{2}$  inch thick. Material less than  $\frac{1}{4}$  inch thick may be plied up.

**4.7.3 Specific gravity.** The specific gravity shall be determined by method 14011 of FED-STD-601.

**4.7.4 Sealing pressure.** The sealing pressure shall be determined in accordance with method 3211 of FED-STD-601, except the aging shall be for 46 plus or minus  $\frac{1}{4}$  hours at 90° plus or minus 1.1°C. (194° plus or minus 2°F.).

**4.7.5 Oven aging.** Specimens for tensile strength, ultimate elongation, hardness, compression set and sealing pressure tests shall be aged in a dry circulating air oven for 46 plus or minus  $\frac{1}{4}$  hours at 90° plus or minus 1.1°C. (194°  $\pm$  2°F.).

**4.7.5.1 Tensile strength and ultimate elongation.** The tensile strength and ultimate elongation shall be determined after oven aging in accordance with method 7221 of FED-STD-601, except aging shall be as specified in 4.7.5.

**4.7.5.2 Hardness after oven aging.** The hardness shall be determined, as specified in 4.7.2, after oven aging the specimens in accordance with method 7221 of FED-STD-601, except aging shall be as specified in 4.7.5.

**4.7.5.3 Hot compression set.** Hot compression set shall be determined by method 3311 of FED-STD-601, with specimens clamped to 40 percent deflection and aged in accordance with 4.7.5.

<sup>1</sup> Unless otherwise indicated in the test method, tests shall not be conducted on the test specimens prior to a conditioning period of 4 hours at 27° plus or minus 5°C. (80°  $\pm$  9°F). Sample preparation may be undertaken without regard to this time interval.

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**4.7.5.4 Sealing pressure after oven aging.** Sealing pressure shall be determined as specified in 4.7.4, after oven aging in accordance with 4.7.5.

**4.7.6 Tensile strength and ultimate elongation after light aging.** Specimens shall be light-aged in accordance with method 7311 of FED-STD-601, except the specimens shall be 0.080 plus or minus 0.010 inch thick and the exposure time shall be 100 plus or minus 1/2 hours. After light-aging, the tensile strength and ultimate elongation shall be determined as specified in 4.7.1.

**4.7.7 Low temperature aging.** Specimens for hardness test and compression set test shall be aged in air or carbon dioxide for 94 plus or minus 1/2 hours at minus 37° plus or minus 1.1°C. (minus 35° plus or minus 2°F.).

**4.7.7.1 Hardness after low temperature aging.** Hardness shall be determined by method 5511 of FED-STD-601 after aging as specified in 4.7.7. The instantaneous reading shall be taken using a Shore A type durometer.

**4.7.7.2 Cold compression set.** Cold compression set shall be determined in accordance with method 5411 of FED-STD-601. The specimens shall be compressed to 40 percent deflection during aging as specified in 4.7.7.

**4.7.8 Volume change.** The change in volume shall be determined after immersion in distilled water, in accordance with method 6211 of FED-STD-601, except that the immersion time shall be 24 plus or minus 1/4 hours.

**4.7.9 Extraction in distilled water.** The percent extraction shall be determined by method 6621 of FED-STD-601, except that the specimens shall be 1 by 2 by 0.080 plus or minus 0.010 inch.

**4.7.10 Delamination.** The delamination test shall be conducted in accordance with method 6311 of FED-STD-601.

**4.8 Examination of preparation for delivery.** The packaging, packing, and marking shall be examined for compliance with section 5 of this document.

## **5. PREPARATION FOR DELIVERY**

**5.1 Packaging.** Packaging shall be level A or C as specified (see 6.2).

### **5.1.1 Level A.**

**5.1.1.1 Rubber sheets and strips.** Rubber sheets shall be unit packaged in rolls and securely tied or banded to prevent unrolling. Strips shall be individually coiled and securely tied with salvaged duck cloth. Sheets and strips shall be packaged in accordance with method III of MIL-P-116.

**5.1.1.2 Cut, molded, and extruded gaskets.** Gaskets shall be packaged in accordance with method III of MIL-P-116.

**5.1.1.3 Intermediate containers.** Unit and intermediate containers, when used, shall conform to PPP-B-566, PPP-B-636, or PPP-B-676, at the option of the supplier. Container closure, weight limitation, and sealing shall be in accordance with the applicable container specification or appendix thereto. The gross weight of paperboard boxes shall not exceed 10 pounds; fiberboard containers shall not exceed 20 pounds.

**5.1.2 Level C.** Packaging which may be the supplier's commercial practice, shall be sufficient to afford adequate protection against deterioration and physical damage during shipment from the supply source to the using activity for early use.

**5.2 Packing.** Packing shall be Level A, B, or C, as specified (see 6.2).



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**5.2.1 Level A.** Rubber sheets, strips, cut, molded and extruded gaskets, packaged as specified (see 6.2), shall be packed for shipment in containers conforming to PPP-B-636, class weather-resistant or PPP-B-640, class 2, at the option of the supplier. All corners and edge seams and manufacturer's joints of boxes shall be waterproofed with tape in accordance with the appendix to the box specification. Boxes shall be closed and banded with pressure sensitive tape in accordance with the applicable box specification or appendix thereto. The gross weight of fiberboard boxes shall not exceed the weight limitations of the applicable fiberboard box specification. Intermediate fiberboard containers (see 5.1.1.3) conforming to class weather-resistant of PPP-B-636, closed, sealed, and banded as specified herein may be used as the shipping container and need not be overpacked.

**5.2.2 Level B.** Rubber strips, cut, molded and extruded gaskets, packaged as specified (see 6.2), shall be packed in containers conforming to the requirements of class domestic of PPP-B-636, or class 1 of PPP-B-640, at the option of the supplier. Box closures shall be as specified in the applicable box specification or appendix thereto. The gross weight of the containers shall not exceed the weight limitations of the applicable box specification. Intermediate containers (see 5.1.1.3) conforming to PPP-B-636, closed, sealed, and banded as specified herein may be used as the shipping container and need not be overpacked. Rubber sheets will require no further packing.

**5.2.3 Level C.** Rubber sheets, strips, cut, molded and extruded gaskets packaged as specified, shall be packed in a manner which will insure acceptance by common carrier, at the lowest rate, and will afford protection against physical or mechanical damage during direct shipment from the supply source to the first receiving activity for immediate use. This level in general shall conform to the Uniform Freight Classification Rules and Regulations or other carrier regula-

tions as applicable to the mode of transportation and may be the supplier's commercial practice when such meets the requirements of this level.

**5.3 Marking.** In addition to any special marking required by the contract or order (see 6.2), interior packages and exterior containers shall be marked in accordance with MIL-STD-129 and shall also include cure date (month and year).

**6. NOTES**

**6.1 Intended use.** Material covered by this specification is intended for use in gaskets for watertight and airtight closures. It is not intended for use in equipment for food service or containers for potable water.

**6.2 Ordering data.** Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Form of material required (see 3.2).
- (c) Dimensions, tolerances, and shape required (see 3.2).
- (d) Level of packaging and packing required (see 5.1 and 5.2).
- (e) Special marking required (see 5.3).

**6.3 CHANGES FROM PREVIOUS ISSUE.** THE EXTENT OF CHANGES (DELETIONS, ADDITIONS, ETC.) PRECLUDE THE ANNOTATION OF THE INDIVIDUAL CHANGES FROM THE PREVIOUS ISSUE OF THIS DOCUMENT.



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**Custodians:**

**Army—MO**

**Navy—SH**

**Air Force—69**

**Review activities:**

**Army—MO, MU, MI**

**Navy—SH**

**Air Force—69**

**User activities:**

**Navy—YD, AS, MC, OS**

**Preparing activity:**

**Navy—SH**

**(Project No. 5330-0157)**

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 119-R004
<u>INSTRUCTIONS</u>		
<p>This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity (as indicated on reverse hereof).</p>		
SPECIFICATION		
ORGANIZATION (Of submitter)		CITY AND STATE
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT \$
MATERIAL PROCURED UNDER A		
<input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? A. GIVE PARAGRAPH NUMBER AND WORDING.		
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.		
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3. IS THE SPECIFICATION RESTRICTIVE? <input type="checkbox"/> YES <input type="checkbox"/> NO IF "YES", IN WHAT WAY?		
4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)		
SUBMITTED BY (Printed or typed name and activity)		DATE

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