

MIL-R-83285 (USAF)
23 July 1970

MILITARY SPECIFICATION

RUBBER, ETHYLENE-PROPYLENE, GENERAL PURPOSE

1. SCOPE

1.1 Scope. This specification covers two grades of ethylene-propylene rubber having excellent resistance to ozone and hot water, but poor resistance to hydrocarbon oils or solvents.

1.2 Classification. The rubber covered by this specification shall be of the following grades, as specified (see 6.2):

| | |
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| Grade 60 | 60 nominal Durometer Shore A hardness. |
| Grade 80 | 80 nominal Durometer Shore A hardness. |

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

Federal

| | |
|-----------|--|
| UU-P-268 | Paper, Kraft, Uncreated Wrapping |
| PPP-B-585 | Box, Wood, Wirebound |
| PPP-B-591 | Box, Fiberboard, Cleated |
| PPP-B-601 | Boxes, Wood, Cleated-Plywood |
| PPP-B-621 | Box, Wood, Nailed and Lock Corner |
| PPP-B-636 | Box, Fiberboard |
| PPP-T-45 | Tape, Gummed, Paper, Reinforced and Plain, For Sealing and Securing |

Military

| | |
|------------|---|
| MIL-P-4861 | Packing, Preformed, Rubber Packing, Packaging of |
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FSC 5330

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STANDARDS

Military

| | |
|-------------|--|
| MS 33666 | Packing, Preformed-Aeronautical, Elastomeric, Range of Sizes |
| 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 |

(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 documents form 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:

American Society for Testing and Materials

| | |
|-------------|---|
| ASTM D 297 | Chemical Analysis of Rubber Products |
| ASTM D 395 | Tests for Compression Set of Vulcanized Rubber |
| ASTM D 412 | Tension Testing of Vulcanized Rubber |
| ASTM D 471 | Test for Changing Properties for Elastomeric Vulcanizates Resulting from Immersion in Liquids |
| ASTM D 573 | Test for Accelerated Aging of Vulcanized Rubber by the Oven Method |
| ASTM D 624 | Test for Tear Resistance of Vulcanized Rubber |
| ASTM D 746 | Brittleness Temperature of Plastics and Elastomers by Impact |
| ASTM D 1149 | Test for Accelerated Ozone Cracking of Vulcanized Rubber |
| ASTM D 2240 | Test for Indentation Hardness of Rubber and Plastics by Means of Durometer |

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

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. REQUIREMENTS

3.1 Preproduction sample. The synthetic rubber furnished under this specification shall be a product which has met the preproduction tests specified herein. If there are any changes in materials or manufacturing processes, new preproduction tests are required.

3.2 Materials. The materials used to formulate the rubber covered by this specification shall be ethylene-propylene polymers.

3.3 Dimensions and tolerances

3.3.1 Sheets and strips. Unless otherwise specified (see 6.2) the width of the sheet material shall be 36 ± 1 inches, the length shall be 120 inches ± 1 percent, and tolerances on thickness shall be as shown in Table I. The width of strip shall be 4 inches with a tolerance of ± 5 percent, the length shall be 75 feet ± 1 foot; the tolerance on thickness shall be as shown in Table I. The dimensions and tolerances of the shapes cut from sheets shall be as specified on the detail drawings.

Table I. Thickness tolerances of sheet and strip

| Nominal thickness (inch) | Tolerances (inch) |
|------------------------------|-------------------|
| .031 and less | $\pm .010$ |
| over .031 to .063 inclusive | $\pm .012$ |
| over .063 to .125 inclusive | $\pm .016$ |
| over .125 to .188 inclusive | $\pm .020$ |
| over .188 to .375 inclusive | $\pm .031$ |
| over .375 to .563 inclusive | $\pm .047$ |
| over .563 to .750 inclusive | $\pm .063$ |
| over .750 to 1.000 inclusive | $\pm .093$ |
| over 1.000 | $\pm 10\%$ |

3.3.2 Molded parts and extruded shapes (including tubing). Unless otherwise specified (see 6.2) dimensions and tolerances of molded parts and extruded shapes (including tubing) shall be as specified on the drawing or in the contract or order.

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3.3.3 O-Rings. Unless otherwise specified, dimensions and tolerances of O-rings shall be in accordance with MS 33666.

3.4 Physical properties. The physical properties of the ethylene-propylene rubber shall be as specified in table II.

Table II. Physical properties

| Property and condition | Grade | | Test method |
|--|------------|------------|-------------|
| | 60 | 80 | |
| Original physical values: | | | |
| Tensile, psi, min | 2000 | 2000 | ASTM D 412 |
| Elongation, %, min | 300 | 150 | ASTM D 412 |
| Tear, pli, min | 120 | 100 | ASTM D 644 |
| Hardness, Durometer, Shore A | 60+5 | 80+5 | ASTM D 2240 |
| Brittle Point, °F, max | -65 | -65 | ASTM D 766 |
| Specific gravity | 1/ | 1/ | ASTM D 277 |
| Ozone resistance, 1000 pphm @ 22°F, bent loop, hr. to first crack min | 168 | 168 | ASTM D 1149 |
| Compression set - method B, 70 ± 1 hr. @100°C (212°F): % of original deflection | | | |
| | 20 | 25 | ASTM D 395 |
| Dry heat resistance, 70 ± 1 hr. @125°C (257°F) | | | |
| Tensile change, %, max | -15 | -15 | ASTM D 412 |
| Elongation change, %, max | -20 | -20 | ASTM D 412 |
| Hardness change, max | +10 | +10 | ASTM D 2240 |
| Resistance to hot water, 7 days @100°C (212°F) | | | |
| Tensile change, %, max 2/ | -15 | -15 | ASTM D 412 |
| Elongation, change, %, max | -20 | -20 | ASTM D 412 |
| Hardness change, max | +5 | +5 | ASTM D 2240 |
| Volume change % | 0 to +5 | 0 to +5 | ASTM D 471 |

1/ "As Determined". This denotes that the value shall be determined during preproduction testing. The quality conformance test values shall not deviate from the original "As Determined" values by more than ± 0.02.

2/ Based on area before immersion.

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3.5 Identification of product

3.5.1 Sheets and strips. Unless otherwise specified (see 6.2), sheet material (including strips cut from sheets) shall be marked to show the specification number, the manufacturer, the manufacturer's designation (compound number), and the cure date by quarter and year; for example, 1Q70, thus:

MIL-R-
Compound Number
Cure date

XYZ Co.

The identification shall recur constantly, from one end of the sheet to the other, in rows spaced approximately 5 inches apart; shall be clear, legible, and not less than 3/8 inch high; and shall be applied by suitable means using marking fluid that is not deleterious to the thylene-propylene rubber. The marking shall not be obliterated by normal handling. The color of the marking shall be white, or a contrasting color if the product is white or very light.

3.5.2 Extruded shapes (including tubing). Where the size of the product permits, the identification shall be marked as indicated in 3.5.1. When identification marking of the product is impractical, the unit package shall show the compound number and manufacturer in addition to those markings specified in 5.

3.6 Workmanship. The rubber shall be uniform in quality and condition, clean, and free from foreign materials and from defects detrimental to fabrication, appearance, or performance of parts.

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 in the contract or order, the supplier may utilize 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.

4.2 Classification of tests. The inspection and testing of the synthetic rubber shall be classified as follows:

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a. Preproduction inspection (see 4.3).

b. Quality conformance inspection (see 4.4).

4.3 Preproduction inspection

4.3.1 Samples. Samples for this material shall be obtained from 6 inches by 6 inches by 0.075 inch sheets or strips. Hardness shall be determined on specimens of sufficient dimensions to comply with ASTM D 2240.

4.3.2 Tests. Preproduction tests shall consist of all the tests specified in 4.6.

4.4 Quality conformance inspection

4.4.1 Sampling for inspection. Sampling for quality conformance inspection shall be in accordance with MIL-STD-105, except where otherwise indicated herein. Quality conformance tests are required for all production lots of material.

4.4.1.1 Lot. A lot shall consist of all the material of the same identity, cured in the same production run, from the same batch, and submitted at the same time for inspection.

4.4.1.2 Batch. A batch shall be the quantity of material run through a mill or mixer at one time.

4.4.2 Quality conformance test samples. Whenever possible, the end item, or specimens cut from the end item, shall be used as the sample. If these items are unsuitable for use as test samples, tests shall be performed on samples of identical composition and state of cure as that of the end item.

4.4.3 Inspection of materials and components. The supplier is responsible for insuring that materials and components used were manufactured, tested, and inspected in accordance with referenced subsidiary specification and standards to the extent specified, or if none, in accordance with this specification (see 4.1). In the event of conflict, this specification shall govern.

4.4.4 Inspection of the end item. Examination of the end item shall be in accordance with the classification of defects, inspection levels, and acceptance quality levels (AQL's) set forth herein. The batch size, for the purpose of determining the sample size in accordance with MIL-STD-105, shall be expressed in units of yards of sheets, strips, or extruded shapes, as applicable for examinations as specified in 4.4.4.1, 4.4.4.2, and 4.4.4.3. If the end item is less than 1 yard, the sample unit shall be the end item.

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4.4.4.1 Examination for defects in appearance and workmanship. The sample unit shall be 1 yard, except if the end item is less than 1 yard, the sample unit shall be the end item. The examination shall be in accordance with MIL-STD-289 and MIL-STD-298, as applicable. Defects in marking such as "incomplete, not legibly identified", or not as specified in 5., shall be considered minor. The sample size shall be in accordance with inspection level II of MIL-STD-105 and the AQL shall be 1.0 major and 2.5 total.

4.4.4.2 Examination for dimensional defects. The sample unit shall be 1 yard, except if the end item is less than 1 yard, the sample unit shall be the end item. The dimensions shall be within the tolerances specified in 3.3.1. Dimensions for extruded shapes shall be as specified on the drawing or in the contract or order. The sample size shall be in accordance with inspection level II of MIL-STD-105 and the AQL shall be 1.5.

4.4.4.3 Examination for defects in preparation for delivery. An examination shall be made to determine that the packaging, packing, and markings comply with section 5. The sample unit for this examination shall be one shipping container fully packed, selected just prior to the closing operation. Shipping containers fully prepared for delivery shall be examined for closure defects.

| <u>Examine</u> | <u>Defect</u> |
|-----------------------------|---|
| Packaging (extruded shapes) | Not the level specified. Not packaged as specified or required. Packaging material, closures not as specified. Unit items not individually wrapped when specified. |
| (Sheets) | Not interleaved; separator sheets do not fully cover the full area of contact between the sheets. Stacked over 10 inches high. |
| (Strips) | Not in rolls; not wound on suitable cores. Rolls not wrapped or sealed as specified. Total length per roll varies by more than the indicated tolerances. |
| Packing | Not level specified; not in accordance with contract requirements. |

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| | Container not as specified, closures not accomplished by specified or required methods or materials. |
| | Any nonconforming component, component missing, damaged or otherwise defective, affecting serviceability. |
| | Inadequate application of components, such as incomplete closure of case liners, containing flaps loose or inadequate strapping, bulged or distorted containers. |
| Count | Less than specified or indicated quantity, linear footage, or units, as applicable. |
| Weight | Gross weight exceeds specified requirements. |
| Markings | Interior or exterior markings, as applicable, omitted, illegible, incorrect, incomplete, or not in accordance with contract requirements. Date of cure, storage instruction missing. |

The sample size shall be in accordance with inspection level II of MIL-STD-105 and the AQL shall be 2.5.

4.4.5 Quality conformance tests. The following tests shall be conducted on each lot of material (see 4.4.2):

| <u>Original</u> | <u>Air age 70 hours @ 257° ±.5°F</u> |
|------------------|--------------------------------------|
| Tensile strength | Tensile strength |
| Elongation | Elongation |
| Hardness | Hardness |

4.4.5.1 Rejection criteria. A lot shall be rejected upon the failure of any sample to meet the test requirements specified herein. A lot that has been rejected may be reworked to correct the deficiencies and resubmitted for acceptance.

4.5 Test conditions. All test specimens shall be conditioned and tested at normal laboratory conditions unless otherwise specified herein or in the applicable ASTM test method. In case of dispute over test results, the tests shall be repeated using standard conditions (see 4.5.1).

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4.5.1 Standard conditions. Standard conditions shall be 50 ± 15 percent relative humidity and a temperature of $75^{\circ} \pm 5^{\circ}\text{F}$.

4.6 Test methods

4.6.1 Physical properties. Unless otherwise specified herein, physical properties shall be determined in accordance with ASTM test methods for rubber products as follows:

| <u>Property</u> | <u>ASTM method</u> |
|---------------------------------|--------------------|
| Tensile strength and elongation | D 412, die C |
| Tear | D 624, die C |
| Hardness | D 2240 |
| Brittle point | D 746 |
| Specific gravity | D 297 |
| Ozone resistance | D 1149 |
| Volume change | D 471 |
| Compression set | D 395 |

4.6.1.1 Air aging. Air aging shall be conducted in accordance with ASTM D 573, except that the rubber shall be aged for 70 ± 1 hours at $257^{\circ}\text{F} \pm 5^{\circ}\text{F}$. Tensile strength, elongation, and hardness changes shall be determined as specified in 4.6.1.

4.6.2 Water immersion. Specimens shall be immersed in distilled water for 7 days at $212^{\circ}\text{F} \pm 5^{\circ}\text{F}$. The ratio of water to rubber shall be approximately 40 ml per gram. Aging shall be conducted in a glass container. An airtight seal shall be maintained for the duration of the test. Allow specimens to cool at $75^{\circ} \pm 5^{\circ}\text{F}$ 24 hours prior to removal from the water. One specimen at a time shall be removed from the water, immediately blotted dry, and tested. The tensile strength, elongation, hardness, and volume change tests shall be conducted in accordance with 4.6.1.

4.6.3 Compression set. Except where otherwise specified herein, compression set shall be determined in accordance with ASTM D 395, method B. There shall be two specimens of circular plied-up sheets with dimensions of 1.129 ± 0.01 inches diameter and approximately 0.5 inches thick. Compression set shall be determined on specimens air aged for 70 ± 1 hours at $212^{\circ} \pm 5^{\circ}\text{F}$. The usual 30 minute waiting period before taking the final thickness measurement shall be used.

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5. PREPARATION FOR DELIVERY.

5.1 Preservation and packaging. Preservation and packaging shall be level A or C, as specified (see 6.2).

5.1.1 Level A

5.1.1.1 Sheets. Rubber sheets shall be interleaved with kraft paper conforming to UU-P-268 that will extend over the full area of contact between sheets. Unit quantity shall be a stack not to exceed 10 inches.

5.1.1.2 Strip. Rubber strips shall be wound on suitable cores that will provide rigid support and that will not distort nor change shape during handling or shipping. Each roll shall be wrapped in kraft paper conforming to UU-P-268 and sealed with tape conforming to PPP-T-45.

5.1.1.3 Extruded shapes. Extruded rubber shapes shall be individually wrapped with kraft paper conforming to UU-P-268.

5.1.1.4 Molded parts. Molded rubber parts other than O-rings shall be individually wrapped with kraft paper conforming to UU-P-268 and packaged in containers.

5.1.1.5 O-Rings. O-rings shall be packaged in accordance with the level A requirements of MIL-P-4861.

5.1.2 Level C. Ethylene-propylene elastomer material shall be packaged in a manner which affords adequate protection against deterioration and physical damage during shipment from the supply source to the first receiving activity for immediate use. This level may conform to the supplier's commercial practice when such meets the requirements of this level.

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

5.2.1 Level A. Shipping containers shall contain identical synthetic rubber items of the same shape and size and shall enclose the contents in a snug, tight-fitting manner. The inside height of containers for rubber sheet shall not exceed 10 inches. Rubber strip shall be packed one roll per container. Containers for extruded rubber shapes shall have an inside maximum cross-sectional area of 36 square inches and, unless otherwise specified by the procuring activity, a maximum length of 10 feet. Unless otherwise specified by the procuring activity, rubber material, other than O-rings, shall be packed in overseas-wooden containers conforming to PPP-B-601 or PPP-B-621. Closure and strapping shall be in accordance with the applicable box

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specification or appendix thereto. Gross weight of containers shall not exceed 200 pounds. O-rings shall be packed in accordance with level A requirements of MIL-P-4861.

5.2.2 Level B. All rubber material packaged as specified in 5.1, shall be packed in domestic type shipping containers conforming to PPP-B-585, PPP-B-591, PPP-601, PPP-B-621, or PPP-B-636. Exterior shipping containers shall be of minimum cube and tare consistent with the protection required. As far as practicable, exterior shipping containers shall be of uniform shape and size and contain identical quantities. The gross weight of wood and wood-type shipping containers shall not exceed two hundred (200) pounds. The gross weight of fiberboard shipping containers shall not exceed the weight limitations of the box specifications. Closure and strapping shall be in accordance with the applicable box specification or appendix thereto. O-rings shall be packed in accordance with level B requirements of MIL-P-4861.

5.2.3 Level C. Rubber material preserved and packaged as specified in 5.1 shall be packed in a manner which affords adequate protection against damage during direct shipment from the supply source to the first receiving activity for immediate use. This level shall conform to applicable carrier rules and regulations and may be the supplier's commercial practice when such meets the requirements of this level.

5.3 Marking of shipments. In addition to any special marking required by the contract or order (see 6.2), interior packages and exterior shipping containers shall be marked in accordance with the requirements of MIL-STD-129 and as follows:

Rubber (angle, channel, special-shaped section, as applicable)
 Grade _____
 Compound Number _____
 Cross section and length (inches) or Part Number _____
 Solid (molded, extruded, as applicable) _____
 Specification: MIL-R- _____ (USAF)
 Cure date _____
 STORE IN A COOL DRY PLACE

6. NOTES

6.1 Intended use. The rubber procurable to this specification is intended for general use where resistance to ozone and hot water is required.

6.2 Ordering data. Procurement documents should specify:

- a. Title number, and date of this specification.

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- b. Grade desired (see 1.2).
- c. Dimensions and tolerances (see 3.3).
- d. Quantity.
- e. Detail drawing and additional specification, if any.
- f. Unit quantity of molded parts if other than specified in 5.
- g. If preproduction tests are required (see 6.3).
- h. Selection of applicable level of packaging and packing required (see 5.1 and 5.2).

6.3 Preproduction test. Preproduction tests are required for each grade of material furnished to this specification. A copy of the preproduction test report shall be furnished the Air Force Materials Laboratory, ATTN: MAAE, Wright-Patterson AFB, Ohio 45433. The preproduction test need not be repeated for new orders or different parts provided the materials and processes have not been changed and a certified statement to this effect is furnished to the procuring activity. The waiving of the preproduction tests will be strictly at the discretion of the procuring activity. Preproduction tests will not be acceptable if they are more than 3 years old.

Custodian:
Air Force - 11

Preparing activity:
Air Force - 11

Review activity:
Air Force - 82

Project Number: 5330-F011

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

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| 1. DOCUMENT NUMBER | 2. DOCUMENT TITLE |
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| 7a. NAME OF SUBMITTER <i>(Last, First, MI) - Optional</i> | 8. WORK TELEPHONE NUMBER <i>(Include Area Code) - Optional</i> |
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