

MIL-R-83397A

2 January 1974

SUPERSEDING

MIL-R-83397

3 October 1972

MILITARY SPECIFICATION

RUBBER, POLYURETHANE, CASTABLE, HUMIDITY 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 parts made from castable, general purpose, polyurethane rubber.

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

Class 1 - 80 \pm 5 hardness

Class 2 - 90 \pm 5 hardness

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

FEDERAL

UU-P-268	Paper, Kraft, Untreated Wrapping
PPP-B-601	Boxes, Wood, Cleated-Plywood
PPP-B-636	Box, Fiberboard
PPP-T-45	Tape; Paper, Gummed (Sealing and Securing)

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to the Air Force Materials Laboratory, MXA, WPAFB, Ohio 45433, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

TSC 5330/9320

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STANDARDS

FEDERAL

FFD-SID-191 Textile Test Methods

MILITARY

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

MIL-STD-129 Marking for Shipment and Storage

MIL-STD-407 Visual Inspection Guide for Rubber Molded Items

MIL-STD-831 Test Reports, Preparation of

(Copies of specifications, standards, drawings and publications required by contractors 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)

ASTM D15	Standard Methods of Compound and Sample Preparation for Physical Testing of Rubber Products
ASTM D395	Compression Set of Vulcanized Rubber
ASTM D412	Tension Testing of Vulcanized Rubber
ASTM D573	Accelerated Aging of Vulcanized Rubber by the Oven Method
ASTM D624	Tear Resistance of Vulcanized Rubber
ASTM D1329	Evaluating Low-Temperature Characteristics of Rubber and Rubber-Like Materials by a Temperature-Retracted Procedure (TR Test)
ASTM D2240	Indentation Hardness of Rubber and Plastics by Means of a 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.)

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC. AGENT

National Motor Freight Classification

(Application for copies should be addressed to the National Motor Freight Traffic, Tariff Order Section, 1616 P Street, N.W., Washington, D.C. 20036.)

UNIFORM CLASSIFICATION COMMITTEE, AGENT

Uniform Freight Classification

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, Illinois 60606.)

3. REQUIREMENTS

3.1 Preproduction. The polyurethane rubber furnished to this specification shall be a product which has met the preproduction tests, as specified (see 4.3).

3.2 Materials. The materials shall consist of a polyurethane system containing the necessary compounding ingredients formulated and processed to meet the requirements of this specification. All materials which are not specifically described herein shall be of high quality and suitable for the purpose intended.

3.2.1 Toxic products and formulations. The cured material shall have no adverse effect on the health of personnel when used for its intended purpose. Questions pertinent to the effect shall be referred by the procuring activity to the appropriate department medical service who will act as an advisor to the procuring agency.

3.3 Dimensions and tolerances. Dimensions and tolerances shall be as specified on the drawing or in the contract or order.

3.4 Physical properties. Physical properties shall conform to the requirements specified in Table 1

3.5 Identification of product. Where the size of the product permits, the identification shall be on the product. The marking shall be applied by suitable means, using marking fluid that is not deleterious

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to the polyurethane rubber. The marking shall not be obliterated by normal handling. When identification marking of the product is impracticable, the unit package shall show the identification. The identification shall show the specification number, the manufacturer, the manufacturer's designation (compound number), hardness, and the cure date by quarter and year.

Example MIL-R-83397
The Delectable Rubber Company
Compound No. 1980
80 Hardness
Cure Date 3Q77

TABLE I. Properties

PROPERTIES	REQUIREMENTS	
	Class 1 80 Hardness	Class 2 90 Hardness
Specific gravity*	As Determined	As Determined
Tensile strength, psi, min.	4000	4500
Elongation, %, min.	400	300
Hardness, points	80 \pm 5	90 \pm 5
Tear strength, pounds/inch, min	250	400
Temperature retraction (TR-10) °F, max.	-45	-20
After aging 22 \pm 1/4 hours at 158° \pm 2°F (70° \pm 1°)		
Compression set, %, max	35	35
After aging 7 days at 212° \pm 2°F (100° \pm 1°C)		
Tensile strength change, %	\pm 20	\pm 20
Elongation change, %	\pm 20	\pm 30
Hardness change, points	\pm 5	\pm 5
After aging 120 days at 160° \pm 2°F (71° \pm 1°) and 95% Relative Humidity		
Tensile strength change, %	\pm 25	\pm 25
Elongation change, %	\pm 20	\pm 20
Hardness change, points	\pm 10	\pm 10
After aging 4 days at 180° \pm 2°F (82° \pm 1°C) over water (short term test)		
Tensile strength change, %	\pm 20	\pm 20
Ultraviolet resistance		
Tensile strength change, %	\pm 20	\pm 20
Elongation change, %	\pm 20	\pm 20

* The permissible variation in specific gravity during actual production from that value established in preproduction tests shall be ± 0.02

3.6 Vulcanized joints. Unless otherwise specified by the drawing, contract, or order, the tensile strength of permitted vulcanized joints shall be a minimum of 20 percent of the strength of the solid section. The vulcanized joint shall be of the same size as the original molded cross-section.

3.7 Workmanship. The product shall be manufactured by such processes to meet the requirements of this specification.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, 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 Test data obtained from the base polymer and pre-compounded materials supplier is not acceptable for fulfillment of the fabricator's additional responsibility for final cured product quality control.

4.2 Classification of inspection. The inspection and testing of the polyurethane rubber shall be classified as follows.

- a. Preproduction inspection (see 4.3).
- b. Quality conformance inspection (see 4.4).

4.3 Preproduction inspection. Preproduction inspection shall consist of all the tests specified (see 4.6).

4.3.1 Preproduction test samples. Preproduction test samples shall be nominally 0.075 inch thick sheets, prepared by a method similar to that to be used in making the product, such as, low pressure injection molded, of sufficient size to allow preparation of the test specimens.

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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 on final products for all production lots of material.

4.4.1.1 Lot A lot shall consist of all 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 quantity compounded in a 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 from the same lot of identical composition and comparable 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 specifications 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 lot size, for the purpose of determining the sample size in accordance with MIL-STD-105, shall be expressed in units of parts for examinations as specified (see 4.4.4.1, 4.4.4.2, and 4.4.4.3).

4.4.4.1 Examination for defects in appearance and workmanship.

4.4.4.1.1 Molded parts. The sample unit shall be one molded part and the examination shall be in accordance with MIL-STD-407. The sample size shall be in accordance with MIL-STD-105, inspection level II, and the AQL related to percent defective shall be 1.5.

4.4.4.2 Examination for dimensional defects.

4.4.4.2.1 Molded parts The sample unit shall be one molded part. The dimensions shall be within the tolerances specified on the drawing, contract or order. The sample size shall be in accordance with MIL-STD-105, inspection level II, and the AQL related to percent defective shall be 1.5

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4.4.4.3 Examination for defects in preparation for delivery. An examination shall be made in accordance with table II 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. The sample size shall be in accordance with MIL-STD-105, inspection level II, and the AQL related to percent defective shall be 2.5.

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

Original:	Air Aged (7 days at 212°F).	Humidity Resistance (1 Day at 180°F)
Specific Gravity	Tensile Strength	Tensile Strength
Tensile Strength	Elongation	
Elongation	Hardness	
Hardness		
Tear Strength		

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. Before resubmitting full particulars concerning previous rejection and action taken to correct defects found in the original material shall be furnished the procuring activity. Material rejected after retest shall not be submitted without specific approval of the procuring activity.

4.5 Test conditions. All test specimens shall be conditioned and tested at standard conditions (see 4.5.1) unless otherwise specified herein or in the applicable ASTM test method.

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

4.6 Test Methods.

4.6.1 Properties. Unless otherwise specified herein, 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	D412
Hardness	D2240
Tear strength	D624 (use die B)
Temperature retraction (TR-10)	D1329

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Table II. Examination for defects in preparation for delivery.

EXAMINE	DEFECT
Packaging	<p>Not the level specified. Not packaged as specified or required. Packaging material, closures not as specified. Unit items not individually wrapped when specified.</p>
Packaging	<p>Not level specified; not in accordance with contract requirements. 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.</p>
Count	Less than specified.
Weight	Gross weight exceeds specified requirements.
Marking	<p>Interior or exterior markings, as applicable, omitted, illegible, incorrect, incomplete, or not in accordance with contract requirements. Date of cure, storage instructions missing.</p>

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4.6.2 Compression set. Compression set shall be determined in accordance with Method B of ASTM D395, except that the aging time and temperature shall be in accordance with Table I. Compression set tests shall be conducted on test specimens plied up from applicable test samples or parts.

4.6.3 Heat aging. Heat aging shall be conducted in accordance with ASTM D573, except that the aging time and temperature shall be in accordance with Table I, tensile strength, elongation, and hardness changes shall be determined as specified (see 4.6.1).

4.6.4 Humidity resistance.

4.6.4.1 Long term. Five ASTM D412 die C shall be suspended in a humidity chamber which maintains 95 ± 5 percent relative humidity at $160^{\circ} \pm 2^{\circ}\text{F}$ for 120 days. After 120 days the specimens shall be removed, and cooled for 4 hours at $77^{\circ} \pm 2^{\circ}\text{F}$ and 50 ± 5 percent relative humidity prior to test.

4.6.4.2 Short term. Humidity resistance shall be conducted by suspending three ASTM D412, die C specimens in a quart jar containing approximately 150 cc. distilled water. The screw cap closed jar shall be placed in an air oven for the time and temperature specified in Table I. Distilled water shall be added as required to maintain approximately 150 cc. in the jar. After exposure, the specimens shall be cooled for 4 hours at $77^{\circ} \pm 2^{\circ}\text{F}$ and 50 ± 5 percent relative humidity prior to the tensile strength test.

4.6.5 Ultraviolet resistance. Exposure shall be in accordance with Method 5660 of FED-STD-191. Tensile specimens shall be suspended in the apparatus for 100 hours. After exposure the specimens shall be held at standard conditions (see 4.5.1) for a minimum of 2 hours prior to test.

5. PACKAGING

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 Rubber parts. Rubber parts shall be packaged in containers conforming to PPP-B-636. The unit quantity shall be 25, or as specified by the procuring activity (see 6.2)

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5.1.2 Level C. The polyurethane rubber shall be preserved and packaged in a manner which will afford 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 rubber items of the same shape and size and shall inclose the contents in a snug, tight-fitting manner. Unless otherwise specified by the procuring activity, rubber material shall be packed in wood, cleated-plywood shipping containers conforming to PPP-B-601, overseas type. As far as practical, containers shall be uniform in shape and size and contain identical quantities. Container closure and strapping shall be in accordance with the appendix to PPP-B-601. Gross weight of containers shall not exceed 200 pounds.

5.2.2 Level B. Level B shall be the same as Level A except containers shall conform to domestic type and the gross weight shall not exceed 500 pounds.

5.2.3 Level C. Packages which require overpacking for acceptance by the carrier shall be packed in exterior-type shipping containers in a manner that will insure transportation at the lowest rate to the point of delivery. Containers shall conform to the Uniform Freight Classification Rules and National Motor Freight Classification rules. This level may conform to 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 contractor or order, interior packages and exterior shipping containers shall be marked in accordance with the requirements of MIL-STD-129. When applicable, interior packages shall also be marked as specified (see 3.5.2). The nomenclature shall be as follows:

Compound number, Lot number
Specification MIL-R-83397 Hardness
Cure date (quarter and year)
STORE IN A COOL DRY PLACE

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6. NOTES

6.1 Intended use. The rubber covered by this specification is intended for use where resistance to tear and abrasion is required. This material has excellent resistance to humidity

6.2 Ordering data. Procurement documents should specify

- a. Title, number, and date of this specification.
- b. Class, hardness (see 1.2).
- c. Dimensions and tolerances (see 3.3).
- d. Quantity.
- e. Detail drawing and additional requirements, if anv.
- f. Unit quantity of molded parts if other than specified (see 5.1.1.1).
- g. If preproduction tests are required (see 3.1).
- h. Applicable levels of packaging and packing (see 5.1 and 5.2).

6.3 Preproduction test. Unless otherwise specified, the supplier is responsible for all preproduction tests required for each hardness of material furnished to this specification. A copy of the preproduction test report shall be furnished the Air Force Materials Laboratory, Attn: MXE, Wright-Patterson Air Force Base, Ohio 45433. The preproduction tests 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. Test results to previous revisions of this specification are not acceptable. Preproduction tests will not be acceptable if they are more than 3 years old.

Custodians:
 Air Force - 11
 Navy - SH
 Army - MR

Preparing activity:
 Air Force - 11

PROJECT NUMBER: 5330-0484

Reviewers:
 Air Force - 99
 Navy - AS
 DLA - IS

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OF VALIDATION

MIL-R-83397A
NOTICE 2
10 December 1992

MILITARY SPECIFICATION
RUBBER, POLYURETHANE, CASTABLE,
HUMIDITY RESISTANT

MIL-R-83397A, dated 2 January 1979, has been reviewed and determined to be valid for use in acquisition.

Custodians:
Air Force - 11
Army - MR
Navy - SH

Preparing activity:
Air Force - 11

Reviewer activities:
Air Force - 99
Navy - AS
DLA - IS

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