

MIL-R-25988A (USAF)

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SUPERSEDING

MIL-R-25988 (USAF)

23 April 1962

## MILITARY SPECIFICATION

RUBBER, FLUROSILICONE ELASTOMER, OIL-AND-FUEL-RESISTANT,  
SHEETS, STRIPS, MOLDED PARTS, AND EXTRUDED SHAPES

## 1. SCOPE

1.1 Scope. This specification covers oil-and-fuel-resistant fluoro-silicone elastomer rubber sheets, strips, molded parts, and extruded shapes for aeronautical and aerospace applications.

1.2 Classification. The fluorosilicone elastomer rubber shall be of the following types, classes, and grades, as specified (see 6.2):

Type I. O-rings

Type II. Molded parts (other than O-rings), sheets, strips, and extruded shapes.

Class 1. General-purpose.

Grade 40. Nominal 40 Shore A Durometer hardness.

Grade 50. Nominal 50 Shore A Durometer hardness.

Grade 60. Nominal 60 Shore A Durometer hardness.

Grade 70. Nominal 70 Shore A Durometer hardness.

Grade 80. Nominal 80 Shore A Durometer hardness.

Class 2. High-strength general-purpose

Class 3. High modulus, increased temperature resistance.

## 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

TT-S-735

Standard Test Fluids; Hydrocarbons

FSC 5330

## MIL-R-25988A (USAF)

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

Military

MIL-P-4861	Packing, Preformed, Rubber, Packing, Packaging of
MIL-L-7808	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base

STANDARDSMilitary

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
MIL-STD-190	Identification Marking of Rubber Products
MIL-STD-407	Visual Inspection Guide for Rubber Molded Items
MIL-STD-413	Visual Inspection Guide for Rubber O-Rings

(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
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MIL-R-25988A (USAF)

ASTM D 395	Tests for Compression Set of Vulcanized Rubber
ASTM D 412	Tension Testing of Vulcanized Rubber
ASTM D 471	Test for Change in Properties of Elastomeric Vulcanizates Resulting from Immersion in Liquids
ASTM D 573	Test for Accelerated Aging of Vulcanized Rubber by the Oven Method
ASTM D 624	Tear Resistance of Vulcanized Rubber
ASTM D 1329	Evaluation Low-Temperature Characteristics of Rubber and Rubber-Like Materials by a Temperature-Retracton Procedure
ASTM D 1414	Testing of Rubber O-Rings
ASTM D 2240	Test for Indentation Hardness of Rubber and Plastics by Means of a Durometer
ARP 568	Aerospace Recommended Practice - Uniform Dash Numbering System for O-Rings

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

Consolidated Classification Committee

Uniform Freight Classification Rules

(Application for copies of the above publication should be addressed to the Consolidated Classification Committee, 202 Chicago Union Station, Chicago, Illinois 60606.)

(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.

3.1.1 Test report. A test report shall be prepared for each type, class, and grade. An updated test report shall be prepared whenever a change is made in the materials, processes, or this specification. Preproduction tests over three years old shall not be acceptable.

## MIL-R-25988A(USAF)

3.2 Materials. The cured compound of fluorosilicone elastomer rubber shall be entirely suitable for the intended purpose and shall be of the same composition and quality as the materials used for the preproduction sample.

3.3 Dimensions and tolerances.

3.3.1 Sheets and strips. The width of the sheet material shall be as specified (see 6.2), and the tolerances on thickness shall be as shown in table I. The width of strip material, or of shapes cut from sheet, shall be as specified within a tolerance of  $\pm 5$  percent. The thickness of strip material, other than shapes cut from sheet, shall be as specified within a tolerance of  $\pm 5$  percent, and the length shall be as specified within a tolerance of  $\pm 1$  percent.

Table I. Thickness tolerances for sheet

Nominal thickness (inch)	Tolerance (inch)
0.060 and less	$\pm 0.010$
Over 0.060 to 0.120, inclusive	$\pm 0.016$
Over 0.120 to 0.500; inclusive	$\pm 0.031$
Over 0.500 to 1.000, inclusive	$\pm 0.047$
Over 1.000	$\pm 0.063$

3.3.2 Molded parts (including O-rings) and extruded shapes (including tubing). Unless otherwise specified (see 6.2), dimensions and tolerances of molded parts (including O-rings) and extruded shapes (including tubing) shall be as specified on the drawing.

3.3.3 O-Rings. Unless otherwise specified dimensions and tolerances of O-rings shall be in accordance with Society of Automotive Engineers ARP 568, Class II tolerances.

3.4 Physical properties. The physical properties of the fluorosilicone elastomer rubber shall conform to the values given in table II.

MIL-R-25988A (USAF)

Table II. Physical properties

Physical property	Class 1						
	Grade 40	Grade 50	Grade 60	Grade 70	Grade 80	Class 2	Class 3
Original:							
Tensile strength, psi, min							
Type I:				800			750
Type II:	800	900	900	850	650	1150	800
Ultimate elongation, %, min							
Type I:				100			90
Type II:	225	200	175	125	60	350	100
Tensile stress at 100% elongation, psi, min (class 3 only)							
Type II				NA			700
Hardness, Type A Durometer, points	40 <sub>+5</sub>	50 <sub>+5</sub>	60 <sub>+5</sub>	70 <sub>+5</sub>	80 <sub>+5</sub>	50 <sub>+5</sub>	75 <sub>+5</sub>
Tear strength, die B, ppi, min							
Type II:	40	40	40	40	40	150	40
Temperature retraction 10% (TR-10), °F, max	-70	-70	-70	-70	-70	-70	-70
Compression set: % of original Deflection after 70 hr. at 75° +5°F, max							
Type I:							
Under 0.110 in				25			25
Over 0.110 in				20			20
Type II:	15	15	15	15	15	15	15
Air-aged 70 hr. at temperatures indicated:	392° +5°F	392° +5°F	392° +5°F	392° +5°F	392° +5°F	392° +5°F	437° +5°F
Tensile strength decrease, % max	30	25	25	20	20	30	35

MIL-R-25988A (USAF)

Table II. (Continued)

Physical property	Class 1						
	Grade 40	Grade 50	Grade 60	Grade 70	Grade 80	Class 2	Class 3
Ultimate elongation decrease, %, max	25	25	25	20	20	30	45
Hardness change, Type A Durometer, points, max	+10,-5	+10,-5	+10,-5	+10,-5	+10,-5	+10,-5	+10,-5
Weight loss, %, max	2	2	2	2	2	2	2
Air-aged 22 hr. at temperatures in- dicated:	347° ±5°F	347° ±5°F	347° ±5°F	347° ±5°F	347° ±5°F	347° ±5°F	347° ±5°F
Compression set: % of original deflection, max							
a. Standard reading: Type I: Under 0.110 in	_____	_____	_____	50	_____	_____	45
Over 0.110 in	_____	_____	_____	45	_____	_____	35
Type II:	25	35	40	40	45	40	35
Aged 70 hr. in <del>Stauffen</del> <del>Blend 7700</del> fluid at <i>75 in 3021</i> temperatures indicated:	302° ±5°F	302° ±5°F	302° ±5°F	302° ±5°F	302° ±5°F	302° ±5°F	347° ±5°F
Tensile strength decrease, %, max	45	45	45	35	30	40	30
Ultimate elongation decrease, %, max	30	30	30	20	15	30	20
Hardness change, Type A Durometer, points, max	15	15	15	15	15	15	20
Volume change, %	1 to 15	1 to 15	1 to 15	1 to 15	1 to 15	1 to 15	1 to 15

MIL-R-25988A(USAF)

Table II. (Continued)

Physical property	Class 1						Class 2	Class 3
	Grade 40	Grade 50	Grade 60	Grade 70	Grade 80	Grade 90		
Compression set: % of original deflection, max								
a. Standard reading:								
Type I:								
Under 0.110 in	—	—	—	55	—	—	—	85
Over 0.110 in	—	—	—	45	—	—	—	80
Type II:	35	35	45	45	60	45	—	80
b. 18 hr. cooling:								
Type I:								
Under 0.110 in	—	—	—	60	—	—	—	85
Over 0.110 in	—	—	—	55	—	—	—	80
Type II:	45	45	55	55	70	50	—	80
Aged 22 hr. in TT-S-735, type III, fluid at 75° ± 5°F:								
Tensile strength decrease, %, max	65	55	50	45	30	40	—	35
Ultimate elongation decrease, %, max	60	50	40	30	30	30	—	30
Hardness decrease, Type A Durometer, points, max	15	15	20	20	20	25	—	15
Volume change, %	1 to 30	1 to 25	1 to 25	1 to 25	1 to 25	1 to 25	1 to 25	1 to 25

### 3.5 Identification of product.

3.5.1 Sheet and strip. Unless otherwise specified (see 6.2), sheet material (including strip cut from sheet) shall be marked to show the specification number, the manufacturer, the manufacturer's designation (compound number), class, type, grade (if applicable), and the date of manufacture (by quarter and year; for example, 1Q68), thus:

MIL-R-25988A(USAF) XYZ Co.  
Compound No.  
Type I, Class I, Grade 60  
Date of Manufacture

## MIL-R-25988A(USAF)

The material shall be marked for identification in compliance with MIL-STD-190. The identification shall be applied in recurring pattern in lines from one end of the sheet to the other; shall be in intervals spaced 8 inches maximum apart on the line; shall be in rows 5+1/2 inch apart lengthwise of the sheet. The marking shall be applied by suitable means using a marking fluid that is not deleterious to the fluorosilicone elastomer rubber. The marking shall not be obliterated by normal handling and the color shall be of sufficient contrast to permit easy reading.

3.5.2 Molded parts and 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. Temporary marking of O-rings for the manufacturer's identification shall be permitted at the time of manufacture, but shall in no way affect the properties or function of the O-rings.

3.6 Workmanship. Workmanship shall conform to the best commercial practice for fluorosilicone elastomer rubber products. Parts shall be smooth and free from flash.

#### 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. Inspection records shall be kept complete and available to the procuring activity at all times.

4.1.1 Test data obtained from 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 tests. The inspection and testing of the synthetic rubber shall be classified as follows:

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

#### 4.3 Preproduction inspection.

4.3.1 Samples. Test samples for type I material shall be O-rings conforming to ARP 568-214, Class II tolerances. Hardness shall be determined on specimens of sufficient dimensions to comply with ASTM D 2240. Samples for type II material shall be obtained from 6 inches by 6 inches by 0.075 inch platen sheets.



## MIL-R-25988A (USAF)

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 batches of material.

4.4.1.1 Batch. A batch shall be the quantity of material compounded on a mill or mixer at one time.

4.4.1.2 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.

4.4.2 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 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 batch size, for the purpose of determining the sample size in accordance with MIL-STD-105, shall be expressed in units of O-rings, molded parts, or 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.

4.4.4.1 Examination for defects in appearance and workmanship.

4.4.4.1.1 Molded parts including O-rings. The sample unit shall be one molded part and the examination shall be in accordance with MIL-STD-413 for O-rings and MIL-STD-407 for other molded products. The sample size shall be in accordance with inspection level II of MIL-STD-105 and the AQL related to percent (%) defective shall be 1.5.

MIL-R-25988A(USAF)

4.4.4.1.2 Sheets, strips, and extruded shapes. The sample unit shall be 1 linear 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 5.1, shall be considered minor. The sample size shall be in accordance with inspection level II of MIL-STD-105, and the AQL related to percent (%) defective shall be 2.5.

4.4.4.2 Examination for dimensional defects.

4.4.4.2.1 Molded parts including O-rings. The sample unit shall be one molded part. When dimensions are not otherwise defined they shall be in accordance with the applicable size in ARP 568 for Class II tolerances. The sample size shall be in accordance with inspection level II of MIL-STD-105 and the AQL related to percent (%) defective shall be 1.5.

4.4.4.2.2 Sheets, strips, and extruded shapes. The sample unit shall be 1 linear yard, except if the end item is less than 1 linear 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 related to percent (%) defective 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 (O-rings, molded parts, and 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.
(Strips)	Stacked over 10 inches high. 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 (5.1.1.2.2).
Packing	Not level specified; not in accordance with contract requirements.

MIL-R-25988A(USAF)

<u>Examine</u>	<u>Defects</u>
Packing (Cont'd)	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 instructions missing.

The sample size shall be in accordance with inspection level II of MIL-STD-105 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 (see 4.4.2):

<u>Original</u>	<u>Air aged 22 hours at 347°F</u>
Tensile strength	Compression set
Elongation	
Hardness	<u>Fuel aged 22 hours at 75°F in TT-S-735 Type III</u>
	Volume change

4.4.5.1 Rejection criteria. Failure to meet the test requirements specified herein shall constitute cause for rejection of the lot.

4.5 Test conditions.

4.5.1 Control fluid. The oil aging in this specification shall be conducted using ~~Stauffer Blend 7700~~ as a control fluid. It consists of a MIL-L-7808 standard production base fluid plus 0.5 percent phenothiazine. New fluid shall be used for each aging test (see 6.4).

MIL-R-25988A (USAF)

4.5.2 Atmospheric conditions. All fluid cooling, conditioning, and physical property determinations of rubber shall be conducted in an atmosphere of  $50 \pm 15$  percent relative humidity and at 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>
Hardness	D 2240
Tensile strength and elongation	
Type I	D 1414
Type II	D 412, (use die C for oil aging)
Tensile Stress	D 412
Tear Strength	D 624, die B
Volume change	D 471
Specific gravity	D 297, hydrostatic method

4.6.2 Temperature retraction (TR-10). The temperature retraction test shall be conducted in accordance with ASTM D 1329. Three O-ring specimens as specified in 4.3.1 shall be used for type I and shall be elongated 50 percent in accordance with the rod markings. The temperature retraction test for type II shall be conducted on three 2-inch specimens. Elongation of type II materials shall be 50 percent of the ultimate elongation. The test shall be conducted at a heating rate of  $1^\circ\text{C}$  per minute.

4.6.3 Air aging. Air aging shall be conducted in accordance with ASTM D 573, except that the aging time and temperature shall be in accordance with table II. Tensile strength, elongation, and hardness changes shall be determined as specified in 4.6.1.

4.6.3.1 Weight loss. The weight loss test shall be conducted on samples air-aged in accordance with 4.6.3. Test specimens shall be conditioned for 24 hours in a desiccator before and after air aging. The specimens shall be weighed immediately after the desiccation period before and after aging. The percentage weight loss shall be calculated as follows:

$$\frac{w_1 - w_2}{w_1} \times 100$$

where  $w_1$  = weight of sample before air aging.

$w_2$  = weight of sample after air aging.

4.6.4 Oil aging. Oil aging of specimens shall be conducted in clean 39 millimeters (mm) OD by 300 mm pyrex glass test tubes fitted with 2-hole cork stoppers. Each stopper shall be fitted with 2 lengths of 8 mm pyrex glass tubing (chimneys), one 3 inches in length, the other 5 inches in length. The 3 inch chimney shall extend through and 1/2 inch above the top of the stopper. The 5 inch chimney shall extend through and 3-1/2 inches above the top of the stopper. An aluminum block heater shall be used for aging the specimens. Use of an oil bath is permissible but is not desired. For each test, 140 milliliters (ml) of oil shall be used. The test tubes shall be inserted into the aluminum block or oil bath in such manner that the fluid level in the test tubes shall be approximately 1-5/8 inches above the heating unit of the aluminum block or surface of the oil bath. This distance shall not be measured from the top of the aluminum block or covering of the oil bath. The specimens shall be suspended in the oil by soft iron or nichrome wire hangers as follows:

- a. Type I: Three specimens shall be suspended horizontally in the fluid, one each at depths of 1-1/2 inches, 3-1/2 inches, and 5-1/2 inches below the surface of the fluid. Hardness specimens shall be placed in a separate chimney stoppered tube keeping approximately the same rubber to oil ratio.
- b. Type II: Four dumbbells cut with a die "C", conforming to ASTM D 412, shall be tested. There shall be only two specimens aged in a single test tube. The specimens shall be suspended vertically in the fluid, one each at depths of 1 inch and 2 inches below the surface of the fluid. The measurement of specimen depth in the fluid shall be made between the top edge of the specimen and the fluid level. Care shall be taken to prevent contact of specimens with each other or the wall of the test tube.

4.6.4.1 The oil aging time and temperature shall be in accordance with table II. After aging and prior to the physical property determinations, the specimens shall be removed from the hot fluid and cooled 30 minutes in fresh fluid. Tensile strength, elongation, hardness, and volume change shall then be determined as specified in 4.6.1.

4.6.5 Fuel aging. Specimens shall be immersed in test fluid conforming to TT-S-735, type III, for 70 hours at room temperature. The ratio of fluid 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. One sample at a time shall be removed from the fluid, immediately blotted dry, and tested. The tensile strength, elongation, hardness, and volume change tests shall be conducted in accordance with 4.6.1.

## MIL-R-25988A(USAF)

4.6.6 Compression set. Except where otherwise specified herein, compression set shall be determined in accordance with ASTM D 395, method B. Specimens for type I materials shall be two O-rings. Two circular plied-up buttons with dimensions of 1.129  $\pm$ 0.001 inches diameter and approximately 0.5 inch thick shall be cut from sheet for type II material.

4.6.6.1 Oil aged. Compression set shall be determined on two sets of specimens aged 70 hours at the applicable temperature as specified in table II, immersed in Stauffer Blend 7700 fluid. The compression set plates for testing type I material shall be approximately 0.375 inch by 2 inches by 4 inches. There shall be six 1/4-inch bolt holes; one on each corner and one located in the middle of each 4-inch edge and on the center line of the corner holes. There shall also be 1/4-inch holes through the middle of each half of the plates to allow fluid to be in contact with the inside diameter of the O-rings. The compression set plates for type II material shall be in accordance with ASTM D 395. The original thickness of the specimens shall be measured and the test fixtures shall be assembled using two test specimens. The specimens shall be compressed 25 percent. The test fixture shall be placed in a 1-liter stainless beaker. The beaker shall be fitted with a suitable vented stainless steel cap. The cap shall be sealed with an O-ring conforming to type I, class 1 of this specification (size-240, ARP 568, has been used). The beaker shall be placed in a suitable oven at the applicable temperature with vent open. After the fluid has reached the test temperature (approximately 2 hours) the vent shall be closed and the beaker left in the oven for a total aging time of 70 hours. At the end of the aging time, one set of specimens shall be removed from the compression plates immediately and allowed to cool on paper towels and the final thickness determined. The other set of specimens shall be allowed to cool in the fluid for 18 hours. The specimen shall be removed from the compression set plates and allowed to rest on paper towels for 30 minutes. The excess fluid shall be blotted from the specimens and the final thickness measurement made.

## 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 Type I material. Type I material shall be packaged in accordance with the level A requirements of MIL-P-4861.

### 5.1.1.2 Type II material.

5.1.1.2.1 Sheets. A suitable paper or dusting powder shall be used between the sheets extending over the full area of contact between sheet. Unit quantity shall be a stack not to exceed 10 inches.

MIL-R-25988A(USAF)

5.1.1.2.2 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. Unless otherwise specified, each roll shall consist of 75 feet  $\pm$  1 foot of rubber strip.

5.1.1.2.3 Extruded shapes. Extruded rubber shapes shall be wrapped in any suitable wrapping.

5.1.1.2.4 Molded parts. Molded 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).

5.1.2 Level C. Fluorosilicone 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.

5.2.1.1 Type I material. Type I material shall be packed in accordance with the level A requirements of MIL-P-4861.

5.2.1.2 Type II material. Shipping containers shall contain identical synthetic rubber items of the same shape and size and shall inclose 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 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 or regulations of other common carrier, as applicable to the mode of transportation. This level may conform to the supplier's commercial practice when such meets the requirements of this level.

## MIL-R-25988A (USAF)

5.3 Marking of shipments. In addition to any special marking required by the contract 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 in accordance with 3.5.2. The nomenclature shall be as follows:

Rubber (angle, channel, special-shaped section, as applicable)  
 Type \_\_\_\_\_ Class \_\_\_\_\_ Grade \_\_\_\_\_  
 Cross section and length (inches) or part number  
 Solid (molded, extruded, as applicable)  
 Compound Number, Lot number  
 Specification MIL-R-25988A  
 Date of manufacture (quarter and year)  
 STORE IN A COOL DRY PLACE

## 6. NOTES

6.1 Intended use. The rubber covered by this specification is intended for use where resistance to jet fuel and lubricating oil is required. The elevated test temperatures (note table II) were selected as the maximum temperatures at which good reproducible laboratory data could be obtained. These temperatures do not necessarily indicate nor are they to be construed as the maximum operating temperatures at which these materials can be used.

6.2 Ordering data. Procurement documents should specify:

- a. Title, number and date of this specification.
- b. Type, class, and grade (see 1.2).
- c. Dimensions and tolerances (see 3.3).
- d. Quantity.
- e. Detail drawing and additional requirements, if any.
- f. Unit quantity of molded parts if other than specified in 5.1.1.2.4.
- g. If preproduction tests are required (see 3.1.1).
- h. Applicable levels of packaging and packing (see 5.1 and 5.2).

6.3 Preproduction test. Preproduction tests are required for each type, class, and 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



MIL-R-25988A(USAF)

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.

6.4 Source of fluid. Stauffer Blend 7700 may be obtained from the Stauffer Chemical Company, Specialty Chemicals Division, 380 Madison Avenue, New York, New York 10017.

6.5 The previous specification, MIL-R-25988, required only one class of material with a hardness of  $65 \pm 10$  points. This material is covered by Class I, Grades 60 and 70 in this specification.

CUSTODIAN:

Air Force - 11

Review Activities:

Air Force - 82, 85

PREPARING ACTIVITY:

Air Force - 11

Project No. 5330-F008