

# AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

## Rubber, Fluorocarbon Elastomer, High Temperature, Fluid, and Compression Set Resistant

### NOTICE

This document has been taken directly from U.S. Military Specification MIL-R-83248C and contains only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE technical standards. The initial release of this document is intended to replace MIL-R-83248C. Any part numbers established by the original specification remain unchanged.

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Under Department of Defense policies and procedures, any qualification requirements and associated qualified products lists are mandatory for DOD contracts. Any requirement relating to qualified products lists (QPL's) has not been adopted by SAE and is not part of this SAE technical report.

#### 1. SCOPE:

##### 1.1 Scope:

This specification covers high temperature, compression set, and fluid resistant fluorocarbon elastomer sheets, strips, molded parts, and extruded shapes for aeronautical and aerospace applications.

##### 1.2 Classification:

The synthetic rubber shall be furnished in the specified types and classes (see 6.2).

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1.2.1 Types: The synthetic rubber types shall consist of the following:

- a. Type I: O-rings, compression seals, molded-in-place gaskets, and molded o-ring cord
- b. Type II: Molded parts (other than type I), sheets, strips, and extruded shapes

1.2.2 Classes: The synthetic rubber classes shall be designated as follows:

- a. Class 1: 75 ± 5 hardness
- b. Class 2: 90 ± 5 hardness

## 2. APPLICABLE DOCUMENTS:

The following publications, 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.

### 2.1 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

UU-P-268	Paper, Kraft, Wrapping
PPP-B-601	Boxes, Wood, Cleated-Plywood
PPP-B-636	Boxes, Shipping, Fiberboard
PPP-T-45	Tape, Gummed, Paper, Reinforced and Plain, for Sealing and Securing
MIL-P-4861	Packing, Preformed, Rubber, Packaging of
MIL-R-83248/1	Rubber, Fluorocarbon Elastomer, High Temperature, Fluid, and Compression Set, Resistant, O-Rings, Class 1, 75 Hardness
MIL-R-83248/2	Rubber, Fluorocarbon Elastomer, High Temperature, Fluid, and Compression Set, Resistant, O-Rings, Class 2, 90 Hardness
MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-147	Palletized Unit Loads
MIL-STD-289	Visual Inspection Guide for Rubber Sheet Material
MIL-STD-298	Visual Inspection Guide for Rubber Extruded Goods
MIL-STD-407	Visual Inspection Guide for Rubber Molded Items
MIL-STD-413	Visual Inspection Guide for Elastomeric O-Rings
MIL-STD-2073-1	DoD Material Procedures for Development and Application of Packaging Requirements

### 2.2 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AS568 Aerospace Size Standard for O-Rings

### 2.3 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-5094.

ASTM D 297	Rubber Products, Chemical Analysis of (DoD adopted)
ASTM D 395	Rubber Property - Compression Set, Tests for (DoD adopted)
ASTM D 412	Rubber Properties in Tension, Tests for (DoD adopted)
ASTM D 471	Rubber Property - Effect of Liquids, Tests for (DoD adopted)
ASTM D 573	Rubber - Deterioration in an Air Oven - Tests for (DoD adopted)
ASTM D 1329	Evaluating Rubber Property - Retraction at Low Temperature (TR TEST), Test for (DoD adopted)
ASTM D 1414	Rubber O-Rings, Testing (DoD adopted)
ASTM D 2240	Rubber Property - Durometer Hardness, Tests for (DoD adopted)
ASTM D 3951	Standard Practice for Commercial Packaging (DoD adopted)

### 3. REQUIREMENTS:

#### 3.1 Qualification:

Parts furnished under this specification shall be products which are authorized by the qualifying agency for listing on the applicable qualified products list at the time set for opening of bids.

#### 3.2 Materials:

The cured compound of fluorocarbon elastomer shall be entirely suitable for the intended purpose, and shall be of the same composition as the material used for qualification. A dihydroxy/bisphenol cure system shall be used. Amine cure systems shall not be used. Material shall be based on 100% virgin fluorocarbon elastomer. No amount of reprocessed or reground fluorocarbon scrap or non-fluoro elastomer polymer is acceptable.

#### 3.3 Physical properties:

The physical properties of the fluorocarbon elastomer rubber shall conform to the requirements specified in table I, II, III, and IV as applicable.

TABLE I. Physical properties, type I

	Class 1 (75 hardness)	Class 2 (90 hardness)
Original		
Tensile strength, psi, min	1400	1400
Elongation, %, min	125	100
Hardness, points	75±5	90±5
Specific gravity	As determined	As determined
Temperature retraction, 10% (TR-10)°F, max.	+5	+5
Air age 70 hours @ 518°F ± 5°F		
Tensile strength decrease, %, max	35	45
Elongation decrease, %, max	15	20
Hardness change, points	+10, -5	+10, -5
Weight loss, %, max.	10	10
Air age 22 hours @ 392°F ± 5°F		
Compression set, % of original deflection, max.		
0.066 to 0.110 inch, inclusive	20	35
over 0.110 inch	15	25
Air age 336 hours @ 392°F ± 5°F		
Compression set, % of original deflection, max.		
0.066 to 0.110 inch, inclusive	45	65
over 0.110 inch	40	60
Oil age 70 hours @ 392°F ± 5°F in ARM 200		
Tensile strength decrease, %, max.	35	35
Elongation decrease, %, max.	20	20
Hardness change, points	+0, -15	+0, -15
Volume change, %	+1 to +25	+1 to +25
Compression set, % of original deflection, max.		
0.066 to 0.110 inch, inclusive	30	35
over 0.110 inch	10	20
Fuel age 70 hours @ 75°F ± 5°F in ASTM Reference Fuel B (ASTM D 471)		
Tensile strength decrease, %, max.	20	20
Elongation decrease, %, max.	20	20
Hardness change, points	±5	±5
Volume change, %	+0 to +5	+0 to +5

TABLE II. Physical properties after humidity aging, type 1 (brown seals only)

The following properties shall be determined on brown O-rings that have been aged for 28 days at 77°F ± 2°F and 95 ± 3 percent relative humidity.

	Class 1 (75 hardness)	Class 2 (90 hardness)
<b>Properties</b>		
Tensile strength, psi, min	1400	1400
Elongation, %, min.	125	100
Tensile strength decrease, %, max. <u>1/</u>	15	15
Elongation decrease, %, max. <u>1/</u>	15	15
Air age 70 hours @ 518°F ± 5°F		
Tensile strength decrease, %, max. <u>2/</u>	35	45
Elongation decrease, %, max. <u>2/</u>	25	25
Air age 22 hours @ 392°F ± 5°F		
Compression set, % of original deflection, max.	15	25
Oil age 70 hours @ 392°F ± 5°F in ARM 200		
Tensile strength decrease, %, max. <u>2/</u>	35	35
Elongation decrease, %, max. <u>2/</u>	20	20
Compression set, % of original deflection, max.	10	15

1/ Shall be based on the original tensile strength and elongation found when tested to the requirements of table 1.

2/ Shall be based on the tensile strength and elongation found after aging 28 days at 77°F ± 2°F and 95 ± 3 percent relative humidity.

TABLE III. Physical properties, type II

	Class 1 (75 hardness)	Class 2 (90 hardness)
Original		
Tensile strength, psi, min	1600	1600
Elongation, %, min	125	100
Hardness, points	75±5	90±5
Specific, gravity	As determined	As determined
Temperature retraction, 10% (TR-10)°F, max.	+5	+5
Air age 70 hours @ 518°F ± 5°F		
Tensile strength decrease, %, max	35	45
Elongation decrease, %, max	15	20
Hardness change, points	+10, -5	+10, -5
Weight loss, %, max.	10	10
Air age 22 hours @ 392°F ± 5°F		
Compression set, % of original deflection, max.	15	25
Air age 336 hours @ 392°F ± 5°F		
Compression set, % of original deflection, max.	45	65
Oil age 70 hours @ 392°F ± 5°F in ARM 200		
Tensile strength decrease, %, max.	35	35
Elongation decrease, %, max.	20	20
Hardness change, points	+0, -15	+0, -15
Volume change, %	+1 to +25	+1 to +25
Compression set, % of original deflection, max.	20	25
Fuel age 70 hours @ 75°F ± 5°F in ASTM Reference Fuel B (ASTM D 471)		
Tensile strength decrease, %, max.	20	20
Elongation decrease, %, max.	20	20
Hardness change, points	±5	±5
Volume change, %	+0 to +5	+0 to +5

TABLE IV. Physical properties after humidity aging, type II (brown material only)

The following properties shall be determined on brown specimens that have been cut from 6 inches by 6 inches by 0.075 inch platen sheets and have been aged for 28 days at  $77^{\circ}\text{F} \pm 2^{\circ}\text{F}$  and  $95 \pm 3$  percent relative humidity.

Properties	Class 1 (75 hardness)	Class 2 (90 hardness)
Tensile strength, psi, min	1600	1600
Elongation, %, min.	125	100
Tensile strength decrease, %, max. <u>1/</u>	15	15
Elongation decrease, %, max. <u>1/</u>	15	15
Air age 70 hours @ $518^{\circ}\text{F} \pm 5^{\circ}\text{F}$		
Tensile strength decrease, %, max. <u>2/</u>	35	45
Elongation decrease, %, max. <u>2/</u>	25	25
Air age 22 hours @ $392^{\circ}\text{F} \pm 5^{\circ}\text{F}$		
Compression set, % of original deflection, max.	15	25
Oil age 70 hours @ $392^{\circ}\text{F} \pm 5^{\circ}\text{F}$ in ARM 200		
Tensile strength decrease, %, max. <u>2/</u>	35	35
Elongation decrease, %, max. <u>2/</u>	20	20
Compression set, % of original deflection, max.	15	20

1/ Shall be based on the original tensile strength and elongation found when tested to the requirements of table III.

2/ Shall be based on the tensile strength and elongation found after aging 28 days at  $77^{\circ}\text{F} \pm 2^{\circ}\text{F}$  and  $95 \pm 3$  percent relative humidity.

#### 3.4 Dimensions and tolerances:

3.4.1 Sheets and strips: Unless otherwise specified (see 6.2) the width of the sheet material shall be  $36 \pm 1$  inch, and the tolerances on thickness shall be as shown in table V. The width of strip material, or of shapes cut from sheet, shall be as specified by the procuring activity, within a tolerance of  $\pm 5$  percent. The thickness of strip material, other than shapes cut from sheet, shall be as specified by the procuring activity within a tolerance of  $\pm 5$  percent, and the length shall be as specified by the procuring activity, within a tolerance of  $\pm 1$  percent.

Table V. Thickness tolerances for sheet

Nominal thickness (inch)	Tolerances (inch)
0.060 and less	±0.010
Over 0.060 to 0.120 inclusive	±0.016
Over 0.120 to 0.500 inclusive	±0.031
Over 0.500 to 1.000 inclusive	±0.047
Over 1.000	±0.063

3.4.2 O-ring dimensions: Dimensions and tolerances of o-rings shall be in accordance with MIL-R-83248/1 and MIL-R-83248/2, as applicable.

3.4.3 Molded parts dimensions: Unless otherwise specified (see 6.2) dimensions and tolerances of molded parts (excluding o-rings) and extruded shapes (including rubbing) shall be as specified in the contract or order.

3.5 Color:

The color of the material furnished to this specification shall be either black or brown. No other color shall be acceptable.

3.6 Identification of material:

3.6.1 Sheets and strips: Unless otherwise specified (see 6.2) sheet material (including strips cut from sheets) shall be marked to show the specification number, type, class, and the manufacturer, the manufacturer's designation (compound and lot number), and the cure date by quarter and year, for example 2Q82, thus:

MIL-R-83248, Type II, Class 2  
 Compound No.  
 Lot No.  
 Cure date  
 XYZ Co.

The identification shall be applied by suitable means using marking fluid that is not deleterious to the fluorocarbon elastomer. The color shall be white. The marking shall not be obliterated by normal handling. 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 0.375 inch high.

3.6.2 Molded parts and extruded shapes (including tubing): Where the size of the product permits, the identification shall be marked as indicated in 3.6.1. When identification marking of the product is impracticable, the unit package shall show the compound and lot 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.

### 3.7 Workmanship:

The product 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 contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance: All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

### 4.2 Classification of inspections:

The inspection requirements specified herein are classified as follows:

- a. Qualification tests (see 4.4).
- b. Quality conformance inspection (see 4.5).

#### 4.3 Inspection conditions:

Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in section 4.

4.3.1 Control fluid: The control fluid used to conduct the oil aging in this specification shall be ARM 200. New fluid shall be used for each aging test.

4.3.2 Atmospheric conditions: All fluid cooling, conditioning, and physical property determinations of rubber shall be conducted at a temperature of 75°F ± 5°F.

#### 4.4 Qualification tests:

Qualification testing shall be conducted every 3 years as a minimum. The preparing activity determines which tests should be performed for requalification.

4.4.1 Tests: Initial qualification tests shall consist of all the tests specified in 3.2 when tested in accordance with 4.6.

4.4.2 Samples: Test samples for type I material shall consist of 50 size -214 o-rings conforming to MIL-R-83248/1 or MIL-R-83248/2 from one production lot. Eight 1-inch nominal diameter by 1/4-inch minimum thickness hardness buttons made from the same formulation material as the o-rings shall also be supplied. For type II materials, ten 6-inches by 6-inches by 0.075-inch platen sheets shall be supplied.

#### 4.5 Quality conformance inspection:

4.5.1 Quality conformance inspection testing: Quality conformance tests shall be required for all production lots of material. These tests may be performed by the manufacturer's laboratory or at an independent laboratory.

4.5.1.1 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.

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

4.5.1.3 Sampling: Except where otherwise indicated herein, sampling for quality conformance shall be in accordance with the specified zero defect sampling plans. One or more defects found in the sample shall be cause for the rejection of the lot.

4.5.1.4 Inspection of material and components: The supplier is responsible for ensuring 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. Inspection records shall be kept complete and available to the procuring activity at all times.

4.4.2 Sampling plan A: 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. The type I o-ring sizes that are suitable for test are shown in table VI. For all other sizes, the tests on type I materials shall be conducted on size -214 o-rings. If the type II items are unsuitable for test, the samples shall be cut from 6 inches by 6 inches by 0.075 inch platen sheets. If at all possible, compression set and specific gravity tests shall be conducted on the end item. The samples shall be subjected to the following tests that are conducted on each lot of material:

<u>Original (Table VIII)</u>	<u>Air aged 22 hours @ 392°F ± 5°F (4.6.5)</u>
Tensile strength	Compression set
Elongation	
Hardness	
Specific gravity	

TABLE VI. Suitable size test table

1/8" Spool		1/2" Spool	
CS	.070 -011 to -014	CS	.070 -022 to -050
			.103 -120 to -163
			.139 -214 to -258
1/4" Spool			
CS	.070 -015 to -021		
	.103 -113 to -119		
	.139 -211 to -213		

4.5.2.1 Rejection criteria: A lot shall be rejected upon failure of the samples to meet the test requirements specified in table I or table III when tested in accordance with table VIII or 4.6.5.

4.5.3 Sampling plans B, C, and D: Examination of the end item shall be in accordance with the classification of defects and sample sizes set forth herein. The lot size, for the purpose of determining the sample size, shall be expressed in units of o-rings, molded parts, or yards of sheets, strips, or extruded shapes, as applicable for inspection as specified in 4.5.3.1, 4.5.3.2, and 4.5.3.3. If the end item is less than 1 yard, the sample unit shall be the end item.

4.5.3.1 Sampling plan B - examination for defects in appearance and workmanship: Except where otherwise noted herein, sampling for quality conformance will be in accordance with the specified zero defect sampling plans. One or more defects found in the sample will be cause for rejection of the lot.

4.5.3.1.1 Molded parts including o-rings: The sample unit shall be one molded part and the inspection shall be in accordance with MIL-STD-413 for o-rings and MIL-STD-407 for other molded products. The accept-on-zero sample size shall be as indicated below:

Lot Size	Sample Size
2-8	entire lot
9-90	8
91-150	12
151-280	19
281-500	21
501-12,000	27
12,001-32,000	35
32,001-100,000	38
100,001-350,000	46

4.5.3.1.2 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 inspection 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 accept-on-zero sample size shall be as indicated below:

Lot Size	Sample Size
2-50	5
51-90	7
91-150	11
151-280	13
281-500	16
501-12,000	19
12,001-32,000	23
32,001-100,000	29
100,001-350,000	35

4.5.3.2 Sampling plan C - examination for dimensional defects:

4.5.3.2.1 Molded parts including o-rings. The sample unit shall be one molded part. The accept-on-zero sample size shall be as indicated below:

Lot Size	Sample Size
2-8	entire lot
9-90	8
91-150	12
151-280	19
281-500	21
501-12,000	27
12,001-32,000	35
32,001-100,000	38
100,001-350,000	46

- 4.5.3.2.2 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 in the contract or order. The accept-on-zero sample size shall be as indicated below:

Lot Size	Sample Size
2-8	entire lot
9-90	8
91-150	12
151-280	19
281-500	21
501-12,000	27
12,001-32,000	35
32,001-100,000	38
100,001-350,000	46

- 4.5.3.3 Sampling plan D - inspection for defects in packaging for delivery: An examination in accordance with table VII shall be made to determine that the packaging, packing, and markings comply with section 5 and are in accordance with the applicable methods specified in table VII. The sample unit for this inspection shall be one shipping container fully packed, selected just prior to the closing operation. Shipping containers fully prepared for delivery shall be inspected for closure defects. The accept-on-zero sample size shall be as indicated below:

Lot Size	Sample Size
2-50	5
51-90	7
91-150	11
151-280	13
281-500	16
501-12,000	19
12,001-32,000	23
32,001-100,000	29
100,001-350,000	35

TABLE VII. Packaging inspection

Inspect	Defect
Packing (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 (5.1.1.3.2).
Packing	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 flaps, loose or inadequate strapping, bulged or distorted containers.
Count or units, as applicable.	Less than specified or indicated quantity, linear footage.
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.

## 4.6 Inspection test methods:

4.6.1 Physical properties tests: Conformance with the rubber product properties shall be determined in accordance with the applicable test methods specified in table VIII.

TABLE VIII. Physical properties tests

Characteristics	ASTM Method
Hardness	D 2240 (type A), D 1414 (o-rings)
Tensile strength and elongation	
Type I	D 1414
Type II	D 412, (Use die C for oil aging)
Volume change	D 471
Specific gravity	D 297, hydrostatic method
Temperature retraction (TR-10)	
Type I	D 1414
Type II	D 1329

4.6.2 Air aging at 518°F test: Air aging shall be conducted in accordance with ASTM D 573, except that the rubber shall be aged for 70 hours at 518°F ± 5°F. Tensile strength, elongation, and hardness changes shall be determined as specified in 4.6.1.

4.6.2.1 Weight loss test: The weight loss test shall be conducted on samples air-aged in accordance with 4.6.2. Test specimens shall be conditioned for 24 hours in a desiccator before and after air-aging. The specimens shall be weighted immediately after the desiccation period before and after aging. The percentage weight loss shall be calculated as follows:

$$\text{weight loss} = \frac{W_1 - W_2}{W_1} \times 100$$

where  $W_1$  = weight of sample before air-aging  
 $W_2$  = weight of sample after aging

4.6.3 Oil aging test: Oil aging of specimens shall be conducted in accordance with ASTM D 471 and ASTM D 1414. Do not dip specimens in acetone, blot dry residual oil from specimens.

4.6.3.1 Oil aging time and temperature: The oil-aging time and temperature shall be 70 hours at 392°F ± 5°F. 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.

- 4.6.4 Fuel aging test: Specimens shall be immersed in test fluid conforming to ASTM Reference Fluid B (ASTM D 471), for 70 hours at  $75^{\circ}\text{F} \pm 5^{\circ}\text{F}$ . 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.
- 4.6.5 Compression set test: 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 to  $1.129 \pm 0.010$  inches diameter and approximately 0.5 inch thick shall be used for type II material.
- 4.6.5.1 Oil aged test for specimen: Compression set shall be determined on specimens aged 70 hours at  $392^{\circ}\text{F} \pm 5^{\circ}\text{F}$  immersed in fluid conforming to ARM 200. 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. Equivalent fixtures may be used. The compression set plates for type I compression seals other than o-rings and 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 steel beaker and 800 milliliters of ARM 200 fluid shall be added to the 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 1, class I of this specification (size-240, AS 568 has been used). The beaker shall be placed in a suitable oven at  $392^{\circ}\text{F} \pm 5^{\circ}\text{F}$  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, the specimens shall be removed from the compression plates immediately and allowed to cool on paper towels for 30 minutes. Excess fluid shall be blotted from the specimens with paper towels and the final thickness determined.
- 4.6.6 Humidity aged test: Aging shall be conducted in a suitable chamber maintained at  $77^{\circ}\text{F} \pm 2^{\circ}\text{F}$  and  $95 \pm 3$  percent relative humidity for 28 days. The specimens shall be tested or subsequent exposures initiated within 30 minutes after removal from the humidity chamber.

## 5. PACKAGING:

### 5.1 Preservation:

Preservation shall be level A or C, or commercial as specified (see 6.2).

#### 5.1.1 Level A:

- 5.1.1.1 Type I o-rings: Type I o-rings (require unit pack) shall be packaged in accordance with the requirements of MIL-P-4861, except clear or opaque polyethylene bags of at least 0.004 inch thickness are acceptable.