Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

# AEROSPACE MATERIAL SPECIFICATION

AMS 3220D
Superseding AMS 3220C
Issued 1-23-40
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## SYNTHETIC RUBBER
General Purpose, Fluid Resistant
55 - 65





1. SCOPE:

1.1 Form: This specification covers a synthetic rubber in the form of sheet, strip, tubing, molded shapes, and extrusions.

1.2 Application: Primarily for packing and sealing joints which come in contact with aircraft fuels, hot petroleum-base lubricating oils, and ethylene gylcol. This material has fair resistance to all fluids listed. Where better resistance to a particular fluid is required, use the AMS for material compound specifically for good resistance to that fluid.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods
AMS 2810 - Identification and Packaging, Elastomeric Products

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D297 - Chemical Analysis of Rubber Products
ASTM D412 - Tension Testing of Vulcanized Rubber
ASTM D471 - Change in Properties of Elastomeric Vulcanizates Resulting from Immersion in Liquids
ASTM D573 - Accelerated Aging of Vulcanized Rubber by the Oven Method
ASTM D2240 - Indentation Hardness of Rubber and Plastics by Means of a Durometer

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

3. TECHNICAL REQUIREMENTS:

3.1 Material: Shall be a compound based on a synthetic elastomer, suitably cured to produce a product ø meeting the technical requirements of 3.2.



Printed in U.S.A.

3.2 Properties: The product shall conform to the following requirements; tests shall be performed on the product supplied and in accordance with specified ASTM methods, insofar as practicable:

3.2.1 As Received:

| | | | |
|---|---|---|---|
| 3.2.1.1 ø | Hardness, Durometer "A" or equiv. | 60 ± 5 | ASTM D2240 |
| 3.2.1.2 | Elongation, min | 200% | ASTM D412, Die B or C |
| 3.2.1.3 ø | Specific Gravity | Qualification Value ± 0.02 | ASTM D297 |

3.2.2 Petroleum Lubricating Oil Resistance: (Immediate Deteriorated Properties)

ASTM D471
Medium: ASTM Oil No. 1
Temperature: 150° C ± 3 (302° F ± 5.4)
Time: 5 hr ± 0.2

| | | |
|---|---|---|
| 3.2.2.1 | Hardness, Durometer "A" or equiv. | 50 to 70 |
| 3.2.2.2 | Elongation, min | 150% |
| 3.2.2.3 | Decomposition | None |
| 3.2.2.4 | Surface Tackiness | None |

3.2.3 Aliphatic Fuel Resistance: (Immediate Deteriorated Properties)

ASTM D471
Medium: ASTM Ref. Fuel A
Temperature: 20° - 30° C (68° - 86° F)
Time: 5 hr ± 0.2

| | | |
|---|---|---|
| 3.2.3.1 | Elongation, min | 200% |
| 3.2.3.2 | Volume Change | 0 to +30% |
| 3.2.3.3 | Decomposition | None |
| 3.2.3.4 | Surface Tackiness | None |

3.2.4 Dry Heat Resistance:

ASTM D573
Temperature: 100° C ± 1 (212° F ± 1.8)
Time: 15 hr ± 0.5

| | | |
|---|---|---|
| 3.2.4.1 | Hardness, Durometer "A" or equiv., max | 70 |
| 3.2.4.2 | Elongation, min | 150% |
| 3.2.4.3 | Bend (flat) | No cracking or checking |

3.2.5 Weathering: When specified, the product shall have weather resistance acceptable to the purchaser, determined by a procedure agreed upon by purchaser and vendor.

3.2.6 Corrosion: The product shall not have a corrosive effect on other materials when exposed to conditions normally encountered in service. Discoloration of metal shall not be considered objectionable.

3.3 Quality: The product shall be uniform in quality and condition, clean, smooth, as free from foreign material as commercially practicable, and free from imperfections detrimental to fabrication, appearance, or performance of parts.

3.4 Tolerances: Unless otherwise specified, the following tolerances shall apply:

3.4.1 Sheet and Strip:

TABLE I

| Nominal Thickness Inches | Tolerance, Inch plus and minus |
|---|---|
| Up to 0.125, incl | 0.016 |
| Over 0.125 to 0.500, incl | 0.031 |
| Over 0.500 | 0.047 |

TABLE I (SI)

| Nominal Thickness Millimetres | Tolerance, Millimetres plus and minus |
|---|---|
| Up to 3.18, incl | 0.41 |
| Over 3.18 to 12.70, incl | 0.79 |
| Over 12.70 | 1.19 |

3.4.2 Tubing:

3.4.2.1 Diameter:

TABLE II

| Nominal OD or ID (not both,) Inches | Tolerance plus and minus | Ovality, % (See 3.4.2.1.1) |
|---|---|---|
| Up to 0.500, incl | 0.020 in. | 10 |
| Over 0.500 to 1.000, incl | 0.030 in. | 15 |
| Over 1.000 | 4% | 15 |

TABLE II (SI)

| Nominal OD or ID (not both,) Millimetres | Tolerance plus and minus | Ovality, % (See 3.4.2.1.1) |
|---|---|---|
| Up to 12.70, incl | 0.51 mm | 10 |
| Over 12.70 to 25.40, incl | 0.76 mm | 15 |
| Over 25.40 | 4% | 15 |

3.4.2.1.1 Ovality applies to tubing ordered in straight lengths with wall thickness of 0.063 in. (1.60 mm) and over, and shall be computed from the difference between the minor and major axis diameter measurements, taken at the same transverse plane on the tube, expressed as a percentage of the nominal diameter.

3.4.2.2 Wall Thickness:

TABLE III

| Nominal Wall Thickness Inches | Tolerance plus and minus |
|---|---|
| Up to 0.063, excl | 0.005 in. |
| 0.063 and over | 10% |

TABLE III (SI)

| Nominal Wall Thickness Millimetres | Tolerance plus and minus |
|---|---|
| Up to 1.60. excl | 0.13 mm |
| 1.60 and over | 10% |

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.5. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to the following requirements are classified as acceptance tests and shall be performed on each lot of product:

| Requirement | Paragraph Reference |
|---|---|
| Hardness, as received | 3.2.1.1 |
| Elongation, as received | 3.2.1.2 |
| Elongation Change in Oil | 3.2.2.2 |
| Volume Change in Fuel | 3.2.3.2 |

4.2.2 Qualification Tests: Tests to determine conformance to all technical requirements of this specification are classified as qualification tests and may be the basis for approval of the compound (See 4.4.1).

4.2.2.1 For direct U.S. Military procurement, substantiating test data and, when requested, qualification test material shall be submitted to the cognizant qualification agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling: Sufficient material shall be taken from each lot to perform all required tests in triplicate. When the product supplied is an extrusion of such shape that suitable test specimens cannot be cut from the product, a separate flat strip test sample shall be supplied upon request. This strip shall be prepared from tubing 1 in. ± 0.063 (25 mm ± 1.60) in OD by 0.075 in. ± 0.008 (1.90 mm ± 0.20) in wall thickness, mechanically split and flattened into a strip while being extruded, and then cured in the same manner as production material.

4.3.1 A lot shall be all product from the same batch of compound processed in one continuous run and submitted for vendor's inspection at one time.

4.3.2 A batch shall be the quantity of compound run through a mill or mixer at one time.