

Section 8.3 of the SAE Technical Board rules provides that: "All technical reports, including standards approved and practices recommended, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no obligation to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

# AEROSPACE MATERIAL SPECIFICATIONS

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc. 485 Lexington Ave., New York 17, N.Y.

AMS 3227D

Issued 12-1-42  
Revised 2-15-65

## SYNTHETIC RUBBER Hot Oil and Coolant Resistant, Low Swell 55 - 65

1. **ACKNOWLEDGMENT:** A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.
- Ø 2. **FORM:** Sheet, strip, tubing, molded shapes, extrusions, or as ordered.
3. **APPLICATION:** Primarily for hose, packings, bushings, grommets, and seals requiring resistance to hot oils and ethylene glycol type coolants.
4. **TECHNICAL REQUIREMENTS:**
  - 4.1 **General:**
    - 4.1.1 **Condition:** Unless otherwise specified, a suitably cured product shall be supplied.
    - 4.1.2 **Weathering:** When specified, the product shall have weather resistance acceptable to the purchaser as determined by a procedure agreed upon by purchaser and vendor.
    - 4.1.3 **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.
  - 4.2 **Properties:** The product shall conform to the following requirements; tests shall be performed on the product supplied and in accordance with the issue of specified ASTM methods listed in the latest issue of AMS 2350, insofar as practicable. 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 1 in.  $\pm$  1/16 OD by 0.075 in.  $\pm$  0.008 thick wall tubing which shall be mechanically slit and flattened into a strip while being extruded and then cured in the same manner as production material.
    - 4.2.1 **As Received:**

|                                             |            |                       |
|---------------------------------------------|------------|-----------------------|
| Ø 4.2.1.1 Hardness, Durometer "A" or equiv. | 60 $\pm$ 5 | ASTM D676             |
| 4.2.1.2 Tensile Strength, psi, min          | 1500       | ASTM D412, Die B or C |
| 4.2.1.3 Elongation, %, min                  | 300        | ASTM D412, Die B or C |
    - 4.2.2 **Processing Oil Resistance:**

|                                       |  |                            |
|---------------------------------------|--|----------------------------|
| Ø (Immediate Deteriorated Properties) |  | ASTM D471                  |
|                                       |  | Medium: ASTM Oil No. 3     |
|                                       |  | Temperature: 150 C $\pm$ 3 |
|                                       |  | (302 F $\pm$ 5.4)          |
|                                       |  | Time: 70 hr                |
    - 4.2.2.1 Hardness Change, Durometer "A" or equiv. -20 to +5 |  |    - 4.2.2.2 Elongation Change, %, max -75 |  |    - 4.2.2.3 Volume Change, % 0 to +45 |  |    - 4.2.2.4 Decomposition None |  |    - 4.2.2.5 Surface Tackiness None |  |

4.2.3 Lubricating Oil Resistance:

Ø (Immediate Deteriorated Properties)

ASTM D471

Medium: ASTM Oil No. 1

Temperature:  $150\text{ C} \pm 3$ (302 F  $\pm 5.4$ )

Time: 70 hr

4.2.3.1 Hardness Change, Durometer "A" or equiv. -10 to +10

4.2.3.2 Tensile Strength Change, %, max (based on area before immersion) -50

4.2.3.3 Elongation Change, %, max -50

4.2.3.4 Volume Change, % 0 to +10

4.2.3.5 Decomposition None

4.2.3.6 Surface Tackiness None

4.2.4 Coolant (Ethylene Glycol) Resistance:

Ø (Immediate Deteriorated Properties)

ASTM D471

Medium: Ethylene

Glycol 97%

Water 3%

Temperature:  $150\text{ C} \pm 3$ (302 F  $\pm 5.4$ )

Time: 70 hr

4.2.4.1 Hardness Change, Durometer "A" or equiv. -15 to +15

4.2.4.2 Tensile Strength Change, %, max (based on area before immersion) -25

4.2.4.3 Elongation Change, %, max -60

4.2.4.4 Volume Change, % 0 to +25

4.2.4.5 Decomposition None

4.2.4.6 Surface Tackiness None

4.2.5 Dry Heat Resistance:

ASTM D573

Temperature:  $100\text{ C} \pm 1$ (212 F  $\pm 1.8$ )

Time: 70 hr

4.2.5.1 Hardness Change, Durometer "A" or equiv. 0 to +10

4.2.5.2 Tensile Strength Change, %, max -25

4.2.5.3 Elongation Change, %, max -40

4.2.5.4 Bend (flat) No cracking or checking

Ø 4.2.6 Compression Set:

ASTM D395, Method B

Temperature:  $125\text{ C} \pm 2$ (257 F  $\pm 3.6$ )

Time: 70 hr

4.2.6.1 Per cent of Original Deflection, max 50

Ø 4.2.6.2 Per cent of Original Thickness, max 13

4.2.7 Low Temperature Brittleness: Pass

ASTM D736 (See Note 1)

Temperature:  $-40\text{ C} \pm 1$ (-40 F  $\pm 1.8$ )

Time: 5 hr

Note 1. To be used only until satisfactory replacement test and values are established.

5. QUALITY: The product shall be uniform in quality and condition, clean, smooth, and free from foreign materials and from imperfections detrimental to fabrication, appearance, or performance of parts.

6. TOLERANCES: Unless otherwise specified, the following tolerances apply:

6.1 Sheet and Strip:

| Nominal Thickness<br>Inches | Tolerance, Inch<br>Plus and Minus |
|-----------------------------|-----------------------------------|
| Up to 1/8, incl             | 1/64                              |
| Over 1/8 to 1/2, incl       | 1/32                              |
| Over 1/2                    | 3/64                              |

6.2 Tubing:

| 6.2.1 | Nominal OD or ID<br>(not both), Inches | Tolerance<br>Plus and Minus | Ovality, %<br>(See Note 2) |
|-------|----------------------------------------|-----------------------------|----------------------------|
|       | Up to 1/2, incl                        | 0.020 in.                   | 10                         |
|       | Over 1/2 to 1, incl                    | 0.030 in.                   | 15                         |
|       | Over 1                                 | 4%                          | 15                         |

Note 2. Ovality applies to tubing ordered in straight lengths with wall thickness of 1/16 in. and over, and shall be computed from the difference of the minor and major axis diameter measurements, taken at the same transverse plane on the tube, expressed as a percentage of the nominal diameter.

| 6.2.2 | Nominal Wall Thickness<br>Inches | Tolerance<br>Plus and Minus |
|-------|----------------------------------|-----------------------------|
|       | Up to 1/16, excl                 | 0.005 in.                   |
|       | 1/16 and over                    | 10%                         |

7. REPORTS:

7.1 Unless otherwise specified, the vendor of the product shall furnish with each shipment three copies of a report stating that the product conforms to the requirements of this specification. This report shall include the purchase order number, material specification number, vendor's compound number, form or part number, and quantity.

7.2 Unless otherwise specified, the vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number, contractor or other direct supplier of material, supplier's compound number, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification, and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

8. IDENTIFICATION: Unless otherwise specified, all material shall be identified in accordance with the latest issue of AMS 2810.

9. PACKAGING:

9.1 Packaging shall be accomplished in such a manner as to ensure that the product, during shipment and storage, will not be permanently distorted and will be protected against damage from exposure to weather or any normal hazard.

9.2 Each package shall be permanently and legibly marked in accordance with the latest issue of AMS 2810.