AERONAUTICAL MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
29 West 39th Street
New York City

AMS 3215

Issued 12-1-42
Revised

SYNTHETIC RUBBER
Aromatic Fuel and Oil Resistant (65-75)

1. ACKNOWLEDGMENT: A vendor must mention this specification number in all quotations and when acknowledging purchase orders.

2. FORM: Sheet, strip, tubing, extrusions, molded shapes, or as ordered.

3. APPLICATION: The compound shall be suitable for packings, bushings, grommets and seals.

4. QUALITY: (a) It shall be uniform in quality, free from foreign materials or imperfections, tough and not easily torn by hand, It shall resist the solvent and swelling actions of lubricating oils and aviation fuels.

(b) Parts must be smooth and free from flash.

(c) If rings have a vulcanized joint, the joint section must have the same strength and size as the solid section.

5. REQUIREMENTS: (a) Physical Properties: This material shall possess the following physical properties as received:

Shore Durometer "A" Hardness	70 ±5
Tensile Strength, lb per sq in.	1500 min
Elongation, %	250 min

All tensile tests required by this and succeeding paragraphs shall conform to ASTM D412-41, except that tensile strengths after all aging tests shall be based on the original unaged cross sectional area.

(b) Fuel Aging: Tests shall be conducted in accordance with ASTM D471-40T, except that physical properties after aging shall be determined immediately after removal from the fuel. Test conditions shall be as follows:

Medium	Aromatic Blended Fuel:	65 Octane Gasoline	60%
		Toluol	20%
		Xylol	15%
		Benzol	5%
Time	24 and 168 hours		
Temperature	75° -85°F		

After either aging period the tensile strength and elongation shall have decreased not more than 50% from the values found for the material as received. The Shore Durometer "A" hardness change shall be within the limits of 0 to -20 points. The volume change shall be within the limits of 0% to +40% at the end of the 24 hour period, and at the end of 168 hours the volume change shall not deviate more than plus or minus 6% of the original volume from the percentage change at the end of 24 hours. The material shall show no shrinkage when tested in 65 octane gasoline with no added aromatics for 24 hours.

(c) Gum Extraction: Tests, using the aromatic blended fuel specified in the fuel aging test, paragraph 5 (b), shall be conducted as follows:

(1) Gum Content: A 10 gram specimen shall be diced to 1/16 inch cubes and placed in a flask. Add 250 ml. of the aromatic blended fuel and allow to stand for 48 hours at 70° - 80°F. A polished copper strip shall be placed in the flask and shall show no corrosion evidenced by discoloration at the end of 48 hours. Decant the fuel, taking care that no small particles of sample are carried over. Evaporate to dryness in an accurately tared glass dish. A live steam bath (212°F) is employed to evaporate all volatile matter from the dish. The dish shall then be removed from the bath and placed in an electric oven at 212°F for 1/2 hour. The dish is then cooled in a dessicator and weighed. The percentage of gum content shall be calculated on the basis of the original specimen of synthetic stock taken. This shall not exceed 7.5%.

(2) Fuel Insoluble Residue: The non-volatile material remaining in the glass dish after evaporation of the fuel shall be washed ten times with 50 ml. portions of the aromatic blended fuel. After each 50 ml. of fuel is added to the gum in the dish, the mixture shall be allowed to stand for not more than five minutes. The fuel washings shall be filtered through a weighed Gooch crucible. The increase in weight of the Gooch crucible plus the weight of the gum remaining in the dish shall be considered the weight of the fuel insoluble residue and shall not exceed 0.50% of the original sample weight.

(d) Oil Aging: Tests shall be conducted in accordance with ASTM D471-40T, except that physical properties after aging shall be determined immediately after removal from the oil. Test conditions shall be as follows:

Medium	SAE-ASTM Rubber Processing Oil Viscosity 150 ±10 secs. at 100°F Aniline Point 159°±3°F
Temperature	300° ±2°F
Time	70 hours

After aging, the surface shall neither be tacky nor show signs of decomposition. The Shore Durometer "A" hardness change shall be within the limits of 0 to +15 points. The tensile strength shall have decreased by not more than 60% and the elongation by not more than 75% from the values found for the material as received. The volume change shall be within the limits of -5 to +30%. This test will not be required for parts not exposed to hot oil in service.

(e) Oil Aging: Tests shall be conducted in accordance with ASTM D471-40T, except that physical properties after aging shall be determined immediately after removal from the oil. Test conditions shall be as follows:

Medium	Aircraft Engine Lubricating Oil Viscosity 100 ±5 or 120 ±5 secs. at 210°F Viscosity Index 95 min Aniline Point 250° ±10°F
Temperature	300° ±2°F
Time	70 hours

After aging, the surface shall neither be tacky nor show signs of decomposition. The Shore Durometer "A" hardness change shall be within the limits of 0 to +15 points. The tensile strength shall have decreased by not more than 40% and the elongation by not more than 50% from the values found for the material as received. The volume change shall be within the limits of +3 to +15%. This test will not be required for parts not exposed to hot oil in service.

(f) Oven Aging: Tests shall be conducted in accordance with ASTM D573-41 for 70 hours at 212° ±2°F. After aging, the surface shall be neither hard nor brittle, and specimens shall withstand bending 180° flat. The Shore Durometer "A" hardness change shall be within the limits of 0 to +10 points. The tensile strength shall have decreased by not more than 20% and the elongation by not more than 40% from the values found for the material as received.

(g) Compression Set: Tests shall be conducted in accordance with ASTM D395-40T, Method B, under the following conditions:

Time	70 hours
Temperature	212° ±2°F
Compression, To	70% of original thickness

(1) The maximum compression set shall be 75% when expressed as a percentage of the original deflection.

(2) The maximum compression set shall be 23% when expressed as a percentage of the original thickness.

(h) Cold Aging: The cold resistance of the material shall be determined by the SAE-ASTM Bent Loop Method, which is as follows:

(1) The specimen, a strip 4" X $\frac{1}{4}$" X .075", shall be aged in accordance with the Aircraft Engine Lubricating Oil aging requirements, as described in paragraph 5 (e) of this specification. It is then placed in a loop position between jaws 2" wide and $2\frac{1}{2}$" apart. Each end of the specimen shall not extend more than $\frac{1}{4}$" into each jaw clamp. After exposure to cold dry air for the specified time and temperature, the jaws are rapidly brought together until they are 1" apart.

Medium	Dry Air
Time	5 hours
Temperature	-40°F

After this test the specimen shall show no signs of cracking.

(2) A similar test of the material as received shall also be made and the specimen shall show no signs of cracking after the test.

6. SAMPLES: Sampling procedures shall conform to ASTM D15-41. When the form in which the material is furnished is unsuitable for the proper preparation of the test specimens required, the vendor shall furnish sufficient material for such specimens from production run materials which he guarantees to be of equal quality to the material supplied.

7. TOLERANCES: Unless otherwise specified on the drawing or purchase order, the following tolerances apply; all dimensions are in inches:

(a) Sheet and Strip

Nominal Thickness	Tolerance plus or minus
1/8 and less	1/64
over 1/8 to 1/2, incl.	1/32
over 1/2	3/64

(b) Tubing and Molded Hose:

Nominal Wall Thickness	Tolerance plus or minus
less than 1/16	0.005
1/16 and over	10%

(c) Extrusions and Molded Parts: Sections may be as much as plus or minus 0.005 inch outside of drawing limits provided the cross sectional area is within the limits given by the drawing dimensions.

8. REPORTS: Unless otherwise specified, the vendor shall furnish three copies of a notarized report of the results of tests to determine conformance to this specification. This report shall include the purchase order number, material specification number, vendor's compound number, percentages and specific type of synthetic or synthetics used, part number and quantity.

9. IDENTIFICATION: (a) Sheets: Unless otherwise specified, each sheet shall be marked to show the manufacturer's identification, AMS 3215, and the thickness in inches. The characters shall be not less than 3/8 inch in height and shall be applied in rows of constantly recurring symbols from one edge of the sheet to the opposite edge with rows spaced approximately 5 inches apart. The characters shall be clearly legible, and shall be applied to the material by suitable means and suitable marking fluid, and shall not be obliterated by normal handling.

(b) Extrusions: All extrusions 10 feet or more in length shall be suitably marked on each end with the specification number.

(c) Other Forms: All other forms shall be identified as agreed by the vendor and the purchaser.

10. PACKING AND MARKING: (a) Packaging shall be accomplished in such a manner as to insure that the materials being shipped will not be permanently distorted or compressed, or be exposed to undue weathering or harmful materials of any kind.