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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 3200H

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Superseding AMS 3200G

Submitted for recognition as an American National Standard

BUTADIENE ACRYLONITRILE (NBR) RUBBER PETROLEUM-BASE HYDRAULIC FLUID RESISTANT 55 - 65

1. SCOPE:

1.1 Form:

This specification covers a nitrile (NBR) rubber in the form of sheet, strip, tubing, extrusions, and molded shapes.

1.2 Application:

These products have been typically used as seals and gaskets, in contact with petroleum-base hydraulic fluids but usage is not limited to such applications. Each application should be considered individually.

1.3 Safety - Hazardous Materials:

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

QUESTIONS REGARDING THIS DOCUMENT: (724) 772-7161 FAX: (724) 776-0243
TO PLACE A DOCUMENT ORDER: (724) 776-4970 FAX: (724) 776-0790
SAE WEB ADDRESS: http://www.sae.org

2.1 SAE Publications:

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

AMS 2279 Tolerances, Rubber Products
MAM 2279 Tolerances, Metric, Rubber Products
AMS 2810 Identification and Packaging, Elastomeric Products

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 395 Rubber Property - Compression Set
ASTM D 412 Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D 471 Rubber Property - Effect of Liquids
ASTM D 518 Rubber Property - Deterioration - Surface Cracking
ASTM D 573 Rubber Property - Deterioration in an Air Oven
ASTM D 792 Rubber Property - Specific Gravity
ASTM D 797 Rubber Property - Young's Modulus at Normal and Subnormal Temperatures
ASTM D 1149 Rubber Property - Deterioration - Surface Ozone Cracking in a Chamber (Flat Specimens)
ASTM D 2137 Rubber Property - Brittleness Point of Flexible Polymers and Coated Fabrics
ASTM D 2240 Rubber Property - Durometer Hardness

3. TECHNICAL REQUIREMENTS:

3.1 Material:

Shall be a compound, based on an acrylonitrile-butadiene (NBR) elastomer, suitably cured to produce a product meeting the requirements of 3.2.

3.2 Properties:

The product shall conform to the following requirements in Table 1; tests shall be performed on the product supplied and in accordance with specified ASTM methods, insofar as practicable:

TABLE 1 - Properties

	Property	Requirement	Test Method
3.2.1	Hardness, Durometer "A" or equivalent	60 ± 5	ASTM D 2240
3.2.2	Tensile Strength, min	1400 psi (9.65 MPa)	ASTM D 412, Die B or C
3.2.3	Elongation, min		ASTM D 412, Die B or C
3.2.3.1	For parts other than extrusions	250%	
3.2.3.2	For extruded parts	80% of Preproduction Value	
3.2.4	Specific Gravity	Preprocessing Value ±0.02	ASTM D 792 (Hydrostatic Method)
3.2.5	Oil Resistance		ASTM D 471 IRM 903 oil (See 8.3) 100 °C ± 1 (212 °F ± 2)
3.2.5.1	Hardness Change, Durometer "A" or equivalent	-15 to +5	70 hours ± 0.5
3.2.5.2	Tensile Strength Change, max	-30%	
3.2.5.3	Elongation Change, max	-30%	
3.2.5.4	Volume Change	0 to +25%	
3.2.5.5	Decomposition	None	
3.2.5.6	Surface Tackiness	None	
3.2.6	Dry Heat Resistance		ASTM D 573 100 °C ± 1 (212 °F ± 2)
3.2.6.1	Hardness Change, Durometer "A" or equivalent	0 to +15	70 hours ± 0.5
3.2.6.2	Tensile Strength Change, max	-10%	
3.2.6.3	Elongation Change, max	-45%	
3.2.6.4	Bend (flat)	No cracking or checking	
3.2.7	Compression Set		ASTM D 395 Method B
	Percent of Original Deflection, max	70	100 °C ± 1 (212 °F ± 2) 70 hours ± 0.5
3.2.8	Low-Temperature Resistance		
3.2.8.1	Brittleness	Pass	ASTM D 2137 Method A -35 °C ± 1 (-31 °F ± 2)

TABLE 1 - Properties (Continued)

	Property	Requirement	Test Method
3.2.8.2	Young's Modulus, max (See 8.2)	30,000 psi (207 MPa)	ASTM D 797 -40 °C ± 1 (-40 °F ± 2)

3.2.9 Weathering: The product shall show no evidence of cracking when tested in accordance with ASTM D 1149 for 168 hours ± 0.5 at 40 °C ± 1 (104 °F ± 2). Test specimens shall be prepared and mounted in accordance with ASTM D 518, Method B.

3.2.10 Corrosion: The product shall not have a corrosive effect on other materials when exposed to conditions normally encountered in service, determined by a procedure agreed upon by purchaser and supplier. Discoloration of metal shall not be considered objectionable.

3.3 Quality:

The product, as received by purchaser, shall be uniform in quality and condition, smooth, and free from foreign material as commercially practicable, and free from imperfections detrimental to usage of the product.

3.4 Sizes and Tolerances:

Shall conform to all applicable requirements of AMS 2279 or MAM 2279.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The manufacturer shall supply all samples and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Requirements, shown in Table 2, are acceptance tests and shall be performed on each lot:

TABLE 2 - Acceptance Test Requirements

Requirement	Paragraph
Hardness, as received	3.2.1
Tensile Strength, as received	3.2.2
Elongation, as received	3.2.3
Specific Gravity	3.2.4
Volume Change in oil	3.2.5.4
Compression Set	3.2.7

4.2.2 Preproduction Tests: All technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of the product by the manufacturer, when any change in ingredients and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.3 Sampling and Testing:

Shall be as follows.

4.3.1 For Acceptance Tests: Sufficient product shall be taken at random from each lot to perform all required tests. The number of determinations for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than three, except as specified in 4.3.1.4.

4.3.1.1 If specimens cannot be prepared from the product, ASTM test specimens prepared from the same batch and state of cure shall be used. When the product supplied is an extrusion of such shape that suitable test specimens cannot be cut from the product, a separate flat strip shall be prepared from the tubing 1.000 inch ± 0.063 (25.40 mm ± 0.20) in wall thickness, mechanically slit and flattened into a strip while being extruded and cured in the same manner as the production product. When the product is a molded shape from which test specimens cannot be cut, a slab 6 inches (152 mm) square by 0.075 inch ± 0.008 (1.90 mm ± 0.020) thick molded from the same batch of compound shall be supplied upon request.

4.3.1.2 A lot shall be all product from the same batch of compound processed in a continuous run and presented for manufacturer's inspection at one time.

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

4.3.1.4 A statistical sampling plan acceptable to the purchaser may be used in lieu of sampling as in 4.3.1. Sample size for visual and dimensional requirements shall be as shown in Table 3; sample unit shall be one molded part and acceptable based on zero defects.

TABLE 3 - Visual and Dimensional Inspection

Lot Size	Sample Size
2 to 8	Entire Lot
9 to 90	8
91 to 150	12
151 to 280	19
281 to 500	21
501 to 1200	27
1201 to 3200	35
3201 to 10,000	38
10,001 to 35,000	46
35,001 to 150,000	56
150,001 and Over	65

4.3.2 For Preproduction Tests: Acceptable to purchaser.

4.4 Approval:

4.4.1 Sample product shall be approved by the purchaser before product for production use is supplied, unless such approval is waived by the purchaser. Results of the tests on production product shall be essentially equivalent to those on the approved sample. Production product made by the revised procedure shall not be shipped prior to receipt of reapproval. If necessary to make any change in parameters for the process control factors, manufacturer shall submit for reapproval a statement of the proposed changes in ingredients and/or processing and when requested, sample product.

4.4.2 Manufacturer shall use ingredients, manufacturing procedures, processes, and methods of inspection on production product which are essentially the same as those used on the approved sample.

4.4.2.1 Control factors for producing products include, but are not limited to, the following:

Compound ingredients and proportions thereof within established limits
Sequence of mixing compound ingredients
Type of mixing equipment
Method and equipment for preparing preforms
Basic molding procedure (compression, transfer, injection)
Curing time and pressure; variations of ±10% are permissible
Finishing methods
Methods of inspection