SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 3200K

Issued 1942-12
Revised 2008-06

Superseding AMS 3200J

Butadiene Acrylonitrile (NBR) Rubber Petroleum-Base Hydraulic Fluid Resistant 55 - 65

RATIONALE

AMS 3200K results from a Five Year Review and update of this specification.

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 issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

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

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

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 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) 212 °F ± 2 (100 °C ± 1)
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 573 212 °F ± 2 (100 °C ± 1)
3.2.6.1	Hardness Change, Durometer "A" or equivalent	0 to +15	70 hours ± 0.5

TABLE 1 - PROPERTIES (CON'T.)

Property		Requirement	Test Method
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	212 °F ± 2 (100 °C ± 1) 70 hours ± 0.5
3.2.8	Low-Temperature Resistance		
3.2.8.1	Brittleness	Pass	ASTM D 2137 Method A -31 °F ± 2 (-35 °C ±1)

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 104 °F ± 2 (40 °C ± 1). 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 Dimensions and Tolerances

Dimensions and tolerances shall be as specified in the parts standard, drawing or purchase document. If not specified, shall conform to all applicable requirements of AMS 2279 .

3.5 Toxicological Formulations

The material shall have no adverse effects on the health of personnel when used for its intended purpose in accordance with manufacturer's instructions and with appropriate handling procedures.

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 specified requirements.

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

4.2.1.1 Lot

A quantity of one size of product processed and packaged as one production entity from a batch

4.2.1.2 Batch

The quantity of compound run through a mill or mixer at one time.

4.2.1.3 Random Sampling

The method shall be as specified in the parts standard, drawing or purchase document. If not specified, product shall be taken at random from each lot to perform all the required acceptance tests. The number of test iterations for each requirement shall be specified in the applicable test procedure.

4.2.1.4 Sample shall be from a production batch/lot

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 4.3.1.2.

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 test sample from the same production lot shall be supplied upon request. This strip shall be prepared from tubing 1.000 inch ± 0.063 (25.40 mm ± 1.60) in OD by 0.075 inch ± 0.008 (1.90 mm ± 0.20) in wall thickness, mechanically slit and flattened into a strip while being extruded, and cured in the same manner as 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 ± 0.20) thick molded from the same batch of compound shall be supplied upon request.

4.3.1.2 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

4.4.2.2 Any of the above process control factors for which parameters are considered proprietary by the manufacturer may be assigned a code designation. Each variation in such parameters shall be assigned a modified code designation.

4.5 Reports

The supplier of the product shall make readily available a report showing the results of tests to determine conformance to the acceptance requirements and stating that the product conforms to the other technical requirements. This report shall include AMS3200K, manufacturer's identification and product designation, batch/lot number and date of manufacture.