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Butyl (IIR) Rubber Phosphate Ester Resistant 35 - 45		

RATIONALE

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1 SCOPE:

1.1 Form:

This specification covers a butyl (IIR) rubber in the form of sheet, strip, extrusions, and molded shapes.

1.2 Application:

These products have been used typically for parts, such as diaphragms, gaskets, grommets, and seals, requiring resistance to phosphate esters or low permeability to gases, but usage is not limited to such applications. This material is not normally suitable for use in contact with petroleum-base fluids due to excessive swell. 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 form 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 canceled and no superseding document has been specified, the last published issue of that document shall apply.

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 297 Rubber Products - Chemical Analysis

ASTM D 395 Rubber Property - Compression Set

ASTM D 412 Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension

ASTM D 471 Rubber Property - Effect of Liquids

ASTM D 518 Rubber Deterioration - Surface Cracking

ASTM D 573 Rubber - Deterioration in an Air Oven

ASTM D 624 Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers

ASTM D 797 Rubber Property - Young's Modulus at Normal and Subnormal Temperatures

ASTM D 1149 Rubber Deterioration - Surface Ozone Cracking in a Chamber

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 a butyl (IIR) elastomer, suitably cured to produce a product meeting the requirements of 3.2.

3.2 Properties:

The product shall conform to the requirements shown in Table 1, 3.2.6, and 3.2.7; 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 As Received:		
3.2.1.1 Hardness, Durometer "A" or equivalent	40 ± 5	ASTM D 2240
3.2.1.2 Tensile Strength, minimum	1100 psi (7.59 MPa)	ASTM D 412, Die B or C
3.2.1.3 Elongation, minimum	550%	ASTM D 412, Die B or C
3.2.1.4 Tear Resistance pounds/inch (kg/m), minimum	80% of Preproduction Value	ASTM D 624, Die B
3.2.1.5 Specific Gravity	Preproduction Value ± 0.03	ASTM D 297
3.2.2 Phosphate Ester Resistance: (Immediate Deteriorated Properties)		ASTM D 471 Medium: Tri-n-butyl phosphate Temperature: 100 °C ± 1 (212 °F ± 2) Time: 70 hours ± 0.5
3.2.2.1 Hardness Change Durometer "A" or equivalent	0 to -20	
3.2.2.2 Tensile Strength Change, maximum	-40%	
3.2.2.3 Elongation Change, maximum	-20%	
3.2.2.4 Volume Change	0 to +35%	
3.2.3 Dry Heat Resistance		ASTM D 573 Temperature: 100 °C ± 1 (212 °F ± 2) Time: 70 hours ± 0.5
3.2.3.1 Hardness Change, Durometer "A" or equivalent	0 to +15	
3.2.3.2 Tensile Strength Change, maximum	-25%	

TABLE 1 - Properties (Continued)

Property	Requirement	Test Method
3.2.3.3 Elongation Change, maximum	-50%	
3.2.4 Compression Set:		ASTM D 395, Method B Temperature: 100 °C ± 1 (212 °F ± 2) Time: 70 hours ± 0.5
3.2.4.1 Percent of Original Deflection, maximum	85	
3.2.5 Low Temperature Resistance:		
3.2.5.1 Brittleness	Pass	ASTM D 2137, Method A Temperature: -35 °C ± 1 (-31 °F ± 2) Time: 10 minutes ± 0.5
3.2.5.2 Young's Modulus maximum (See 8.2)	10 ksi (68.9 MPa)	ASTM D 797 Temperature: -40 °C ± 1 (-40 °F ± 2)

3.2.6 Weathering: The product shall show no evidence of cracking when tested in accordance with ASTM D 1149 for seven days at 41 °C ± 1 (106 °F ± 2). Test specimens shall be prepared and mounted in accordance with ASTM D 518, Method B.

3.2.7 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 vendor. 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, as free from foreign materials as commercially practicable, and free from imperfections detrimental to usage of the product.

3.4 Tolerances:

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

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The manufacturer of the product 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 specified requirements.

4.2 Classification of Tests:

- 4.2.1 Acceptance Tests: Tests for the requirements shown in Table 2 are acceptance tests and shall be performed on each lot:

TABLE 2 - Acceptance Requirements

Requirement	Paragraph
Hardness, as received	3.2.1.1
Tensile Strength, as received	3.2.1.2
Elongation, as received	3.2.1.3
Volume Change in phosphate ester	3.2.2.4
Compression Set	3.2.4

- 4.2.2 Preproduction Tests: Tests for all technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of the product to a purchaser, when a 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.
- 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 $\pm$ 0.063 (25.40 mm $\pm$ 1.60) in OD by 0.075 inch $\pm$ 0.008 (1.90 mm $\pm$ 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 $\pm$ 0.008 (1.90 mm $\pm$ 0.20) thick molded from the same batch of compound shall be supplied upon request.