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AEROSPACE MATERIAL SPECIFICATION

AMS 3210D
Superseding AMS 3210C

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CHLOROPRENE RUBBER
Electrical Resistant
65 - 75
CR Type

1. SCOPE:

1.1 Form: This specification covers a chloroprene (CR) rubber in the form of sheet, strip, tubing, extrusions, and molded shapes.

1.2 Application: Primarily for parts requiring resistance to electrical breakdown and the embrittling action of corona and ozone.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods
AMS 2810 - Identification and Packaging, Elastomeric Products

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D149 - Dielectric Breakdown Voltage and Dielectric Strength of Electrical Insulating Materials at Commercial Power Frequencies
ASTM D150 - A-C Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulating Materials
ASTM D297 - Rubber Products - Chemical Analysis
ASTM D395 - Rubber Property - Compression Set
ASTM D412 - Rubber Properties in Tension
ASTM D471 - Rubber Property - Effect of Liquids
ASTM D518 - Rubber Deterioration - Surface Cracking
ASTM D573 - Rubber Deterioration in an Air Oven
ASTM D624 - Rubber Property - Tear Resistance
ASTM D635 - Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
ASTM D797 - Rubber Property - Young's Modulus at Normal and Subnormal Temperatures
ASTM D1149 - Rubber Deterioration - Surface Ozone Cracking in a Chamber (Flat Specimens)
ASTM D2137 - Rubber Property - Brittleness Point of Flexible Polymers and Coated Fabrics
ASTM D2240 - Rubber Property - Durometer Hardness

3. TECHNICAL REQUIREMENTS:

3.1 Material: Shall be a compound based on a chloroprene (CR) elastomer, suitably cured to produce a product meeting the requirements of 3.2.

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

3.2.1 As Received:

3.2.1.1	Hardness, Durometer "A" or equiv.	70 ± 5	ASTM D2240
3.2.1.2	Tensile Strength, min	1000 psi (6.90 MPa)	ASTM D412, Die B or C
3.2.1.3	Elongation, min	400%	ASTM D412, Die B or C
3.2.1.4	Tear Resistance, lb per in. (kg/m), min	80% of Preproduction value	ASTM D624, Die B
3.2.1.5	Power Factor at 60 HZ, max	10%	ASTM D150

3.2.1.6	Dielectric Strength, min	300 V per mil (11,800 V/mm)	ASTM D149, Short time test, 0.080 in. (2.00 mm) thick specimen	
3.2.1.7	Specific Gravity	Preproduction value ± 0.02	ASTM D297	
3.2.2	Oil Resistance: (Immediate Deteriorated Properties)		ASTM D471 Medium: Temperature: Time:	 ASTM Oil No. 1 100°C ± 1 (212°F ± 2) 70 hr ± 0.5
3.2.2.1	Tensile Strength Change, max	-20%		
3.2.2.2	Elongation Change, max	-40%		
3.2.2.3	Volume Change	0 to +15%		
3.2.2.4	Decomposition	None		
3.2.2.5	Surface Tackiness	None		
3.2.3	Water Resistance: (Immediate Deteriorated Properties)		ASTM D471 Medium: Temperature: Time:	 Distilled Water 20° - 30° (68° - 86°F) 48 hr ± 0.5
3.2.3.1	Weight Increase, max	5%		
3.2.3.2	Dielectric Strength, min	200 V per mil (7870 V/mm)		
3.2.4	Dry Heat Resistance:		ASTM D573 Temperature: Time:	 100°C ± 1 (212°F ± 2) 70 hr ± 0.5
3.2.4.1	Hardness Change, Durometer "A" or equiv.	0 to +10		
3.2.4.2	Tensile Strength Change, max	-35%		
3.2.4.3	Elongation Change, max			
3.2.4.3.1	For parts other than extrusions	-50%		
3.2.4.3.2	For extruded parts	-60%		
3.2.4.4	Bend (flat)	No cracking or checking		

3.2.5	Compression Set:		ASTM D395, Method B Temperature: 100°C ± 1 (212°F ± 2) Time: 70 hr ± 0.5
3.2.5.1	Percent of Original Deflection, max	85	
3.2.6	Low-Temperature Resistance:		
3.2.6.1	Brittleness	Pass	ASTM D2137, Method A Temperature: -25°C ± 1 (-13°F ± 2)
3.2.6.2	Young's Modulus, max (See 8.2)	50,000 psi (345 MPa)	ASTM D797 Temperature: -35°C ± 1 (-31°F ± 2)
3.2.7	Ozone Resistance:	No cracking	4.5.1
3.2.8	Flame Resistance (See 8.3): Time to cease flaming and glowing	10 sec	4.5.2

3.2.9 Weathering: The product, unless otherwise specified, shall show no evidence of cracking when tested in accordance with ASTM D1149 for 7 days at 40°C ± 1 (104°F ± 2). Test specimens shall be prepared and mounted in accordance with ASTM D518, Method B.

3.2.10 Corrosion: The product, unless otherwise specified, 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.

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

3.4 Tolerances: Unless otherwise specified, the following tolerances shall apply:

3.4.1 Sheet and Strip:
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TABLE I

Nominal Thickness (T) Inches	Tolerance, Inch Plus and Minus Fixed	Tolerance, Inch Plus and Minus Closure (See 3.4.1.1)
Up to 0.400, incl	0.008	0.013
Over 0.400 to 0.630, incl	0.010	0.016
Over 0.630 to 1.000, incl	0.013	0.020
Over 1.000 to 1.600, incl	0.016	0.025
Over 1.600 to 2.500, incl	0.020	0.032
Over 2.500 to 4.000, incl	0.025	0.040
Over 4.000 to 6.300, excl	0.032	0.050
6.300 and over	0.005T	--

TABLE I (SI)

Nominal Thickness (T) Millimetres	Tolerance, Millimetres Plus and Minus Fixed	Tolerance, Millimetres Plus and Minus Closure (See 3.4.1.1)
Up to 10.00, incl	0.20	0.32
Over 10.00 to 16.00, incl	0.25	0.40
Over 16.00 to 25.00, incl	0.32	0.50
Over 25.00 to 40.00, incl	0.40	0.63
Over 40.00 to 63.00, incl	0.50	0.80
Over 63.00 to 100.00, incl	0.63	1.00
Over 100.00 to 160.00, excl	0.80	1.25
160.00 and over	0.005T	--

3.4.1.1 Closure dimensions are across mold parting line.
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3.4.2 Tubing Diameter and Wall Thickness:
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TABLE II

Nominal OD or ID (D) (not both) and Wall Thickness Inches	Tolerance, Inch Plus and Minus	Ovality, % (See 3.4.2.2)
Up to 0.100, incl (See 3.4.2.1)	0.013	10
Over 0.100 to 0.160, incl	0.016	15
Over 0.160 to 0.250, incl	0.020	15
Over 0.250 to 0.400, incl	0.025	15
Over 0.400 to 0.630, incl	0.032	15
Over 0.630 to 1.000, incl	0.040	15
Over 1.000	0.0350xD	15

TABLE II (SI)

Nominal OD or ID (D) (not both) and Wall Thickness Millimetres	Tolerance, Millimetres Plus and Minus	Ovality, % (See 3.4.2.2)
Up to 2.50, incl (See 3.4.2.1)	0.32	10
Over 2.50 to 4.00, incl	0.40	15
Over 4.00 to 6.30, incl	0.50	15
Over 6.30 to 10.00, incl	0.63	15
Over 10.00 to 16.00, incl	0.80	15
Over 16.00 to 25.00, incl	1.00	15
Over 25.00	0.0350xD	15

3.4.2.1 In general, cross-sectional dimensions less than 0.040 in. (1.00 mm) are impractical to extrude. Ø

3.4.2.2 Ovality applies to tubing ordered in straight-lengths with wall thickness of 0.063 in. (1.60 mm) and over, and shall be computed from the difference between the minor and major axis diameter measurements, taken at the same transverse plane of the tube, expressed as a percentage of the nominal diameter.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.6. 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. Ø

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests and as preproduction tests and shall be performed on each lot, on the first-article shipment of a product to a purchaser, when a change in material or processing, or both, requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required. Ø

4.2.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling:

4.3.1 Ø For Acceptance Tests: Sufficient product shall be taken at random from each lot to perform all required tests. The number of tests for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than three. If test 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 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 tubing 1.000 in. ± 0.063 (25 mm ± 1.6) in OD by 0.080 in. (2.00 mm ± 0.20) in wall thickness, mechanically split and flattened into a strip while being extruded, and cured in the same manner as production material. When the product is a molded shape from which test specimens cannot be cut, a slab 6 x 6 x 0.075 in. (150 x 150 x 2 mm) molded from the same batch of compound shall be supplied upon request.

4.3.1.1 A lot shall be all product from the same batch of compound processed in a continuous run and submitted for vendor's inspection at one time. An inspection lot shall not exceed 500 lb (225 kg).

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

4.3.1.3 When a statistical sampling plan and acceptance quality level (AQL) have been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1 and the report of 4.6.1 shall state that such plan was used.

4.3.2 For Preproduction Tests: As agreed upon by purchaser and vendor.

4.4 Approval:

4.4.1 Sample material shall be approved by purchaser before material for production use is supplied, unless such approval be waived by purchaser. Results of tests on production material shall be essentially equivalent to those on the approved sample.

4.4.2 Vendor shall use ingredients, manufacturing procedures, processes, and methods of inspection on production material which are essentially the same as those used on the approved sample material. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in material or processing, or both, and, when requested, sample material. Production material made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods: