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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 3631B

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Superseding AMS 3631A

POLYVINYL CHLORIDE (PVC) PLASTIC EXTRUSIONS
High Temperature, Flexible

1. SCOPE:

1.1 Form:

This specification covers a polyvinyl chloride (PVC) plastic in the form of extruded tubing, cord, tape, and shapes.

1.2 Application:

These extrusions have been used typically as sleeving on wire or as bus bar insulation, particularly where transparency of the sleeve is desired, for operating temperatures up to 120 °C (248 °F), but usage is not limited to such applications.

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 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 applicable issue of referenced publications shall be the issue in effect on the date of the purchase order.

2.1 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM D 149 Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
ASTM D 471 Rubber Property-Effect of Liquids
ASTM D 570 Water Absorption of Plastics
ASTM D 573 Rubber-Deterioration in an Air Oven
ASTM D 746 Brittleness Temperature of Plastics and Elastomers by Impact
ASTM D 876 Non-Rigid Vinyl Chloride Polymer Tubing Used for Electrical Insulation
ASTM G 21 Determining Resistance of Synthetic Polymeric Materials to Fungi

2.2 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-2073-1 DOD Materiel, Procedures for Development and Application of Packaging Requirements

3. TECHNICAL REQUIREMENTS:

3.1 Material:

Shall be polyvinyl chloride (PVC) or one of its co-polymers and shall contain no mercury compounds.

3.2 Color:

Colorless and transparent. Colored transparent, translucent, or opaque material shall be furnished only when specified.

3.2.1 Material shall be considered colorless if the color identification of the wire inside the tubing is legible and shall be considered transparent if other identification marking on the wire inside the tube is legible.

3.3 Properties:

Extrusions shall conform to the requirements shown in Table 1, 3.3.10, and 3.3.11; tests shall be performed on the extrusions supplied and in accordance with specified test methods, insofar as practicable.

TABLE 1 - Properties

Paragraph	Property	Requirement	Test Method
3.3.1	Tensile Strength, minimum	1800 psi (12.4 MPa)	ASTM D 876
3.3.2	Elongation, minimum	250%	ASTM D 876
3.3.3	Water Absorption (24 hours immersion), change in weight, maximum	1.5%	ASTM D 570
3.3.4	Flammability, time to cease burning, maximum (See 8.2)	15 seconds	4.5.1
3.3.5	Dielectric Strength (short time test)		ASTM D 876 (tubing) ASTM D 149 (other forms)
	Under 0.020 inch (0.51 mm) thick, minimum	750 volts per mil (29.5 kV/mm)	
	0.020 inch (0.51 mm) thick and over, minimum	15,000 volts per mil (591 kV/mm)	
3.3.6	Fungus Resistance	Rating of 1 or less	ASTM G 21
3.3.7	Petroleum Hydraulic Oil Resistance (Immediate Deteriorated Properties)		ASTM D 471 ASTM Oil No. 3 100 °C ± 1 (212 °F ± 2) 8 hours ± 0.25
3.3.7.1	Shrinkage, Lengthwise, maximum	10%	
3.3.7.2	Bend, 180 degrees around a 0.25 inch (6.4 mm) diameter at approximately 60 degrees per second at room temperature	No cracking	4.5.2
3.3.7.3	Decomposition	None	
3.3.7.4	Surface Tackiness	None	
3.3.8	Dry Heat Resistance		ASTM D 573 130 °C ± 1 (266 °F ± 2) 2 hours ± 0.25 4.5.2
3.3.8.1	Shrinkage, Lengthwise, maximum	10%	

TABLE 1 - Properties (Continued)

Paragraph	Property	Requirement	Test Method
3.3.8.2	Surface Tackiness	None	
3.3.8.3	Loss of Transparency	Negligible	
3.3.9	Low-Temperature Brittleness At -32 °C ± 1 (-26 °F ± 2), as received	Pass	4.5.3

3.3.10 Weather Resistance: When specified, extrusions shall have weather resistance acceptable to purchaser, determined by a procedure agreed upon by purchaser and vendor.

3.3.11 Corrosion: Extrusions 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.

3.4 Quality:

Extrusions, as received by purchaser, shall be uniform in quality and condition, smooth, and free from foreign materials and from imperfections detrimental to usage of the extrusions.

3.5 Tolerances:

3.5.1 Tubing:

Shall conform to Table 2; for intermediate nominal ID, use the tolerance for the next larger size.

TABLE 2A - ID and Wall Thickness Tolerances, Inch/Pound Units

Nominal ID Inches	ID, Inches minimum	ID, Inches maximum	Nominal Wall Thickness Inch	Wall Thickness Tolerance, Inch Plus and Minus
0.022	0.020	0.027	0.012	0.002
0.027	0.025	0.032	0.012	0.002
0.034	0.032	0.039	0.016	0.003
0.042	0.040	0.049	0.016	0.003
0.053	0.051	0.061	0.016	0.003
0.066	0.064	0.072	0.016	0.003
0.085	0.081	0.089	0.016	0.003
0.095	0.091	0.101	0.016	0.003
0.106	0.102	0.112	0.016	0.003
0.118	0.114	0.124	0.020	0.003
0.133	0.129	0.141	0.020	0.003
0.148	0.144	0.158	0.020	0.003
0.166	0.162	0.178	0.020	0.003
0.186	0.182	0.198	0.020	0.003
0.208	0.204	0.224	0.020	0.003
0.234	0.229	0.249	0.020	0.003
0.263	0.258	0.278	0.020	0.003
0.294	0.289	0.311	0.020	0.003
0.330	0.325	0.347	0.020	0.003
5/16	0.312	0.334	0.025	0.003
3/8	0.375	0.399	0.025	0.003
7/16	0.438	0.462	0.025	0.003
1/2	0.500	0.524	0.025	0.003
5/8	0.625	0.655	0.030	0.003
3/4	0.750	0.786	0.035	0.005
7/8	0.875	0.911	0.035	0.005
1	1.000	1.036	0.035	0.005
1-1/4	1.250	1.290	0.040	0.005
1-1/2	1.500	1.550	0.045	0.006
1-3/4	1.750	1.812	0.055	0.008
2	2.000	2.070	0.060	0.010
2-1/4	2.250	2.330	0.065	0.010
2-1/2	2.500	2.590	0.070	0.010

TABLE 2B - ID and Wall Thickness Tolerances, SI Units

Nominal ID Millimeters	ID Millimeters minimum	ID Millimeters maximum	Nominal Wall Thickness Millimeter	Wall Thickness Tolerance Millimeter plus and minus
0.56	0.51	0.69	0.30	0.05
0.69	0.64	0.81	0.30	0.05
0.86	0.81	0.99	0.41	0.08
1.07	1.02	1.24	0.41	0.08
1.35	1.30	1.55	0.41	0.08
1.68	1.63	1.83	0.41	0.08
2.16	2.06	2.26	0.41	0.08
2.41	2.31	2.57	0.41	0.08
2.69	2.59	2.84	0.41	0.08
3.00	2.90	3.15	0.51	0.08
3.38	3.28	3.58	0.51	0.08
3.76	3.66	4.01	0.51	0.08
4.22	4.11	4.52	0.51	0.08
4.72	4.62	5.03	0.51	0.08
5.28	5.18	5.69	0.51	0.08
5.94	5.82	6.32	0.51	0.08
6.68	6.55	7.06	0.51	0.08
7.47	7.34	7.90	0.51	0.08
8.38	8.26	8.81	0.51	0.08
7.94	7.92	8.48	0.64	0.08
9.52	9.52	10.13	0.64	0.08
11.11	11.12	11.73	0.64	0.08
12.70	12.70	13.31	0.64	0.08
15.88	15.88	16.64	0.76	0.08
19.05	19.05	19.96	0.89	0.13
22.22	22.22	23.14	0.89	0.13
25.40	25.40	26.31	0.89	0.13
31.75	31.75	32.77	1.02	0.13
38.10	38.10	39.37	1.14	0.15
44.45	44.45	46.02	1.40	0.20
50.80	50.80	52.58	1.52	0.25
57.15	57.15	59.18	1.65	0.25
63.50	63.50	65.79	1.78	0.25

3.5.2 Tape: Shall conform to Tables 3 and 4.

3.5.2.1 Width:

TABLE 3A - Tape Width Tolerances, Inch/Pound Units

Nominal Width Inches	Tolerance, Inch Plus and Minus
Up to 0.500, incl	0.016
Over 0.500 to 0.625, incl	0.020
Over 0.625 to 0.750, incl	0.025
Over 0.750 to 1.000, incl	0.032
Over 1.000 to 1.250, incl	0.040
Over 1.250 to 2.000, incl	0.064

TABLE 3B - Tape Width Tolerances, SI Units

Nominal Width Millimeters	Tolerance, Millimeters Plus and Minus
Up to 12.70, incl	0.41
Over 12.70 to 15.88, incl	0.51
Over 15.88 to 19.05, incl	0.64
Over 19.05 to 25.40, incl	0.81
Over 25.40 to 31.75, incl	1.02
Over 31.75 to 50.80, incl	1.63

3.5.2.2 Thickness:

TABLE 4A - Tape Thickness Tolerances, Inch/Pound Units

Nominal Thickness Inch	Tolerance, Inch Plus and Minus
Up to 0.019, incl	0.005
Over 0.019 to 0.031, incl	0.008
Over 0.031	0.010

TABLE 4B - Tape Thickness Tolerances, SI Units

Nominal Thickness Millimeter	Tolerance, Millimeter Plus and Minus
Up to 0.48, incl	0.13
Over 0.48 to 0.79, incl	0.20
Over 0.79	0.25

3.5.3 Cord: Shall conform to Table 5:

TABLE 5A - Cord Tolerances, Inch/Pound Units

Nominal Dimension Inch	Tolerance, Inch Plus and Minus
Up to 0.156, incl	0.005
Over 0.156 to 0.188, incl	0.008
Over 0.188	0.010

TABLE 5B - Cord Tolerances, SI Units

Nominal Dimension Millimeters	Tolerance, Millimeter Plus and Minus
Up to 3.96, incl	0.13
Over 3.96 to 4.78, incl	0.20
Over 4.78	0.25

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

(R) The vendor of extrusions shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the extrusions conform to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests for tensile strength (3.3.1), elongation (3.3.2), dielectric strength (3.3.5), loss of transparency (3.3.8.3), and tolerances (3.5) are acceptance tests and shall be performed on each lot.

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 extrusions 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.

4.2.2.1 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, contracting officer, or request for procurement.

4.3 Sampling and Testing:
(R)
Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient extrusions 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 A lot shall be all extrusions produced in a single production run from the same batches of raw materials under the same fixed conditions or all material subjected to the same unit chemical or physical processes intended to make the final product homogeneous, and presented for vendor's inspection at one time. A lot shall not exceed 500 pounds (227 kg).

4.3.1.2 When a statistical sampling plan has been agreed upon by purchaser and
(R) vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1 and the report of 4.6 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 extrusions shall be approved by purchaser before extrusions for production use are supplied, unless such approval be waived by purchaser. Results of tests on production extrusions shall be essentially equivalent to those on the approved sample.