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AEROSPACE MATERIAL SPECIFICATION

SAE

AMS 3630E

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Submitted for recognition as an American National Standard

PLASTIC EXTRUSIONS, FLEXIBLE Polyvinyl Chloride

This specification has been declared "NONCURRENT" by the Aerospace Materials Division, SAE, as of July, 1992. It is recommended, therefore, that this specification not be specified for new designs.

This cover sheet should be attached to revision "D" of the subject specification.

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**AEROSPACE
MATERIAL
SPECIFICATION**

AMS 3630D
Superseding AMS 3630C

Issued 11-1-44
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PLASTIC EXTRUSIONS, FLEXIBLE
Polyvinyl Chloride

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: Primarily as sleeving on wire or as bus bar insulation, particularly where transparency of the sleeve is desired.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications 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

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 Solid Electrical Insulating Materials at Commercial Power Frequencies

ASTM D471 - Rubber Property - Effect of Liquids

ASTM D570 - Water Absorption of Plastics

ASTM D573 - Rubber - Deterioration in an Air Oven

ASTM D746 - Brittleness Temperature of Plastics and Elastomers by Impact

ASTM D876 - Testing Nonrigid Vinyl Chloride Polymer Tubing Used for Electrical Insulation

ASTM G21 - Determining Resistance of Synthetic Polymeric Materials to Fungi

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

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AMS 3630D**2.3.1 Military Standards:**

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

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, unless otherwise specified. 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 clearly legible and shall be considered transparent if other identification marking on the wire inside the tube is clearly legible.

3.3 Properties: Extrusions shall conform to the following requirements; tests shall be performed on the extrusions supplied and in accordance with specified test methods, insofar as practicable:

| | | |
|--|------------------------------------|--|
| 3.3.1 Tensile Strength, min | 1,800 psi (12.5 MPa) | ASTM D876 |
| 3.3.2 Elongation, min | 300% | ASTM D876 |
| 3.3.3 Water Absorption (24 hr immersion), change in weight, max | 1.5% | ASTM D570 |
| 3.3.4 Flammability, time to cease burning, max (See 8.2) | 15 sec | 4.5.1 |
| 3.3.5 Dielectric Strength (short time test) | | ASTM D876 (tubing) ASTM D149 (other forms) |
| Under 0.020 in. (0.50 mm) thick, min | 750 v per mil (29,525 v/mm) | |
| 0.020 in. (0.50 mm) thick and over, min | 15,000 v per mil (590,550 v/mm) | |
| 3.3.6 <u>Fungus Resistance:</u> | Rating of 1 or less | ASTM G21 |
| 3.3.7 <u>Petroleum Hydraulic Oil Resistance:</u> (Immediate Deteriorated Properties) | | ASTM D471 |
| 3.3.7.1 Shrinkage, Lengthwise, max | 10% | Medium: ASTM Oil No. 3 Temperature: 100°C + 1 (212°F + 2) Time: 8 hr + 0.25 |

AMS 3630D

- 3.3.7.2 Bend, 180 deg around 4.5.2
0.25 in. (6.25 mm) dia at
approximately 60 deg per
sec at room temperature No cracking
- 3.3.7.3 Decomposition None
- 3.3.7.4 Surface Tackiness None
- 3.3.8 Dry Heat Resistance: ASTM D573
- 3.3.8.1 Shrinkage, Lengthwise, max 10%
Temperature: $120^{\circ}\text{C} \pm 1$
($250^{\circ}\text{F} \pm 2$)
- 3.3.8.2 Bend, 180 deg around 4.5.2
0.25 in. (6.25 mm) dia at
approximately 60 deg per
sec at room temperature No cracking
- 3.3.8.3 Surface Tackiness None
- 3.3.8.4 Loss of Transparency Negligible
- 3.3.9 Low-Temperature Brittleness: 4.5.3
- 3.3.9.1 At $-40^{\circ}\text{C} \pm 1$ ($-40^{\circ}\text{F} \pm 2$), Pass
as received
- 3.3.9.2 At $-18^{\circ}\text{C} \pm 1$ ($-10^{\circ}\text{F} \pm 2$),
after oven aging in
accordance with ASTM D573
for 70 hr at $100^{\circ}\text{C} \pm 1$
($212^{\circ}\text{F} \pm 2$) Pass
- 3.3.10 Weathering: 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, clean, and free from foreign materials and from imperfections detrimental to usage of the extrusions.
- 3.5 Tolerances:

AMS 3630D

3.5.1 Tubing: Shall conform to Table I; for intermediate nominal ID, use the tolerance for the next larger size:

TABLE I

| Nominal ID Inches | ID, Inches | | Nominal Wall Thickness Inch | Wall Thickness Tolerance, Inch Plus and Minus |
|----------------------|------------|-------|-----------------------------------|---|
| | min | max | | |
| 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 | 0.3125 | 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 |

AMS 3630D

TABLE I (SI)

| Nominal ID, Millimetres | ID, Millimetres | | Nominal Wall Thickness Millimetres | Wall Thickness Tolerance, Millimetre Plus and Minus |
|----------------------------|--------------------|-------|--|---|
| | min | max | | |
| 0.55 | 0.50 | 0.68 | 0.30 | 0.05 |
| 0.68 | 0.63 | 0.51 | 0.30 | 0.05 |
| 0.85 | 0.81 | 0.99 | 0.40 | 0.07 |
| 1.05 | 1.01 | 1.24 | 0.40 | 0.07 |
| 1.32 | 1.29 | 1.54 | 0.40 | 0.07 |
| 1.65 | 1.62 | 1.82 | 0.40 | 0.07 |
| 2.12 | 2.05 | 2.26 | 0.40 | 0.07 |
| 2.38 | 2.31 | 2.56 | 0.40 | 0.07 |
| 2.65 | 2.56 | 2.84 | 0.40 | 0.07 |
| 2.95 | 2.89 | 3.15 | 0.50 | 0.07 |
| 3.32 | 3.27 | 3.58 | 0.50 | 0.07 |
| 3.70 | 3.65 | 4.01 | 0.50 | 0.07 |
| 4.15 | 4.11 | 4.52 | 0.50 | 0.07 |
| 4.65 | 4.62 | 5.02 | 0.50 | 0.07 |
| 5.20 | 5.18 | 5.69 | 0.50 | 0.07 |
| 5.85 | 5.81 | 6.32 | 0.50 | 0.07 |
| 6.58 | 6.55 | 7.06 | 0.50 | 0.07 |
| 7.35 | 7.34 | 7.89 | 0.50 | 0.07 |
| 8.25 | 8.25 | 8.81 | 0.50 | 0.07 |
| 7.94 | 7.93 | 8.48 | 0.62 | 0.07 |
| 9.52 | 9.52 | 10.13 | 0.62 | 0.07 |
| 11.11 | 11.12 | 11.73 | 0.62 | 0.07 |
| 12.70 | 12.70 | 13.31 | 0.62 | 0.07 |
| 15.88 | 15.87 | 16.63 | 0.75 | 0.07 |
| 19.05 | 19.05 | 19.96 | 0.88 | 0.12 |
| 22.72 | 22.22 | 23.13 | 0.88 | 0.12 |
| 25.40 | 25.40 | 26.31 | 0.88 | 0.12 |
| 31.75 | 31.75 | 32.76 | 1.00 | 0.12 |
| 38.10 | 38.10 | 39.37 | 1.12 | 0.15 |
| 44.45 | 44.45 | 46.02 | 1.38 | 0.20 |
| 50.80 | 50.80 | 52.57 | 1.50 | 0.25 |
| 57.15 | 57.15 | 59.18 | 1.62 | 0.25 |
| 63.50 | 63.50 | 65.78 | 1.75 | 0.25 |

AMS 3630D

3.5.2 Tape: Shall conform to Tables II and III.

3.5.2.1 Width:

TABLE II

| 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 II (SI)

| Nominal Width Millimetres | Tolerance, Millimetres Plus and Minus |
|------------------------------|--|
| Up to 12.50, incl | 0.40 |
| Over 12.50 to 15.62, incl | 0.50 |
| Over 15.62 to 18.75, incl | 0.62 |
| Over 18.75 to 25.00, incl | 0.80 |
| Over 25.00 to 31.25, incl | 1.00 |
| Over 31.25 to 50.00, incl | 1.60 |

3.5.2.2 Thickness:

TABLE III

| Nominal Thickness Millimetre | 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 III (SI)

| Nominal Thickness Millimetre | Tolerance, Millimetre Plus and Minus |
|---------------------------------|---|
| Up to 0.48, incl | 0.12 |
| Over 0.48 to 0.78, incl | 0.20 |
| Over 0.78 | 0.25 |

3.5.3 Cord: Shall conform to Table IV.

TABLE IV

| 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 IV (SI)

| Nominal Dimension Millimetres | Tolerance, Millimetre Plus and Minus |
|----------------------------------|---|
| Up to 3.90, incl | 0.12 |
| Over 3.90 to 4.70, incl | 0.20 |
| Over 4.70 | 0.25 |

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of extrusions 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 extrusions conform to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for tensile strength (3.3.1), elongation (3.3.2), dielectric strength (3.3.5), loss of transparency (3.3.8.4), and tolerances (3.5) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests and shall be performed prior to or on the initial shipment of extrusions 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.

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, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be as follows: