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INTERNATIONAL
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 3655B

Issued JAN 1961
Revised APR 1993
Reaffirmed JAN 1999

Submitted for recognition as an American National Standard

Superseding AMS 3655A

Tubing, Electrical Insulation
Thin Wall, Extruded Polytetrafluoroethylene (PTFE)

FOREWORD

Changes in this Reaffirm are format/editorial only.

1. SCOPE:

1.1 Form:

This specification covers extruded polytetrafluoroethylene (PTFE) in the form of flexible tubing.

1 2 Application:

This tubing has been used typically as an electrical insulating sheath in service up to 260 °C (500 °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 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 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.

QUESTIONS REGARDING THIS DOCUMENT: (724) 772-7154 FAX: (724) 776-0243
TO PLACE A DOCUMENT ORDER: (724) 776-4970 FAX: (724) 776-0790
SAE WEB ADDRESS: http://www.sae.org

2.1 ASTM Publications:

Available from ASTM, 100 Barr Harbor, West Conshohocken, PA 19428-2959.

ASTM D 876 Non-Rigid Vinyl Chloride Polymer Tubing Used for Electrical Insulation
ASTM D 1675 Testing Polytetrafluoroethylene Tubing

2.2 U.S. Government Publications:

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

MIL-STD-104 Limit for Electrical Insulation Color
MIL-STD-2073-1 DOD Materiel, Procedures for Development and Application of Packaging Requirements

3. TECHNICAL REQUIREMENTS:

3.1 Material:

Shall be flexible tubing made from extruded polytetrafluoroethylene (PTFE).

3.2 Color:

Shall be natural, ranging from colorless translucent to semi-opaque white. When ordered in colors, the colors shall be in accordance with MIL-STD-104 or as agreed upon by purchaser and vendor.

3.3 Properties:

Tubing shall conform to requirements shown in Table 1; tests shall be performed on the tubing supplied and in accordance with specified ASTM methods, insofar as practicable.

TABLE 1 - Properties

Paragraph	Property	Requirement	Test Method
3.3.1	Tensile Strength at 200% elongation	2500 to 6000 psi (17.2 to 41.4 MPa)	ASTM D 876 25 °C ± 1 (77 °F ± 2)
3.3.2	Elongation, minimum	200%	ASTM D 876 25 °C ± 1 (77 °F ± 2)
3.3.3	Dielectric Breakdown Voltage, minimum average		ASTM D 876 25 °C ± 1 (77 °F ± 2)
	Nominal Wall Thickness Inch	Nominal Wall Thickness Millimeters	
	0.009	0.23	8,000 volts
	0.012	0.30	10,000 volts
	0.016	0.41	13,000 volts
	0.020	0.51	16,000 volts
	0.025	0.64	18,000 volts
	0.030	0.76	20,000 volts
	0.035	0.89	20,000 volts
	0.040	1.02	20,000 volts
3.3.4	Specific Gravity	2.14 - 2.21	ASTM D 1675
3.3.5	Strain Relief (shrinkage), maximum	1.0%	ASTM D 1675 300 °C ± 3 (572 °F ± 5)
3.3.6	Volatile Loss, maximum	0.05%	ASTM D 1675 300 °C ± 3 (572 °F ± 5)

3.4 Quality:

Tubing, 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 tubing.

3.5 Sizes and Tolerances:

Shall be as shown in Table 2; tolerances apply at 20 to 30 °C (68 to 86 °F), measured in accordance with ASTM D 1675.

TABLE 2A - Sizes and Tolerances, Inch/Pound Units

Size No.	ID, Inch Nominal	ID, Inch Minimum	ID, Inch Maximum	Wall Thickness Inch Nominal	Wall Thickness Tolerance Inch plus and minus
30	0.012	0.010	0.015	0.009	0.002
28	0.015	0.013	0.019	0.009	0.002
26	0.018	0.016	0.022	0.009	0.002
24	0.022	0.020	0.027	0.010	0.003
23	0.026	0.023	0.030	0.010	0.003
22	0.028	0.025	0.032	0.010	0.003
21	0.032	0.029	0.036	0.010	0.003
20	0.034	0.032	0.040	0.012	0.003
19	0.038	0.036	0.044	0.012	0.003
18	0.042	0.040	0.049	0.012	0.003
17	0.047	0.045	0.054	0.012	0.003
16	0.053	0.051	0.061	0.012	0.003
15	0.059	0.057	0.067	0.012	0.003
14	0.066	0.064	0.074	0.012	0.003
13	0.076	0.072	0.082	0.012	0.003
12	0.085	0.081	0.091	0.012	0.003
11	0.095	0.091	0.101	0.012	0.003
10	0.106	0.102	0.112	0.012	0.003
9	0.118	0.114	0.124	0.015	0.003
1/8	0.125	0.120	0.130	0.015	0.003
8	0.133	0.129	0.141	0.015	0.003
7	0.148	0.144	0.158	0.015	0.003
6	0.166	0.162	0.178	0.015	0.003
5	0.186	0.182	0.198	0.015	0.003
4	0.208	0.204	0.224	0.015	0.003
3	0.234	0.229	0.249	0.015	0.003
1/4	0.255	0.250	0.260	0.015	0.003
2	0.263	0.258	0.278	0.015	0.003
1	0.294	0.289	0.311	0.015	0.003
5/16	0.321	0.313	0.334	0.015	0.003
0	0.330	0.325	0.347	0.015	0.003
3/8	0.387	0.375	0.399	0.015	0.003
7/16	0.451	0.438	0.464	0.018	0.004
1/2	0.515	0.500	0.530	0.018	0.004
5/8	0.643	0.625	0.662	0.020	0.004
3/4	0.772	0.750	0.795	0.025	0.005

TABLE 2B - Sizes and Tolerances, SI Units

Size No.	ID Millimeters Nominal	ID Millimeters Minimum	ID Millimeters Maximum	Wall Thickness Millimeter Nominal	Wall Thickness Tolerance Millimeter plus and minus
30	0.30	0.25	0.38	0.23	0.05
28	0.38	0.33	0.48	0.23	0.05
26	0.46	0.41	0.56	0.23	0.05
24	0.56	0.51	0.68	0.25	0.08
23	0.66	0.58	0.76	0.25	0.08
22	0.71	0.64	0.81	0.25	0.08
21	0.81	0.74	0.91	0.25	0.08
20	0.86	0.81	1.02	0.30	0.08
19	0.96	0.91	1.12	0.30	0.08
18	1.07	1.02	1.24	0.30	0.08
17	1.19	1.14	1.37	0.30	0.08
16	1.35	1.30	1.55	0.30	0.08
15	1.50	1.45	1.70	0.30	0.08
14	1.68	1.62	1.88	0.30	0.08
13	1.93	1.83	2.08	0.30	0.08
12	2.16	2.06	2.31	0.30	0.08
11	2.41	2.31	2.56	0.30	0.08
10	2.69	2.59	2.84	0.30	0.08
9	3.00	2.90	3.15	0.38	0.08
1/8	3.18	3.05	3.30	0.38	0.08
8	3.38	3.28	3.58	0.38	0.08
7	3.76	3.66	4.01	0.38	0.08
6	4.22	4.11	4.52	0.38	0.08
5	4.72	4.62	5.03	0.38	0.08
4	5.28	5.18	5.69	0.38	0.08
3	5.93	5.82	6.32	0.38	0.08
1/4	6.48	6.35	6.60	0.38	0.08
2	6.68	6.55	7.06	0.38	0.08
1	7.47	7.34	7.90	0.38	0.08
5/16	8.15	7.95	8.48	0.38	0.08
0	8.38	8.26	8.81	0.38	0.08
3/8	9.83	9.52	10.13	0.38	0.13
7/16	11.46	11.12	11.78	0.46	0.10
1/2	13.08	12.70	13.46	0.46	0.10
5/8	16.33	15.88	16.81	0.51	0.10
3/4	19.61	19.05	20.19	0.64	0.13

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of tubing 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 tubing conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests for requirements shown in Table 3 are acceptance tests and shall be performed on each lot.

TABLE 3 - Acceptance Tests

Requirement	Paragraph Reference
Tensile Strength	3.3.1
Elongation	3.3.2
Dielectric Breakdown Voltage	3.3.3
Specific Gravity	3.3.4
Tolerances	3.5

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 tubing 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:

Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient tubing 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 When 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 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 tubing.

4.3.1.2 A lot shall be all tubing from the same batch of compound, processed in one continuous run, and presented for vendor's inspection at one time.

4.3.1.3 When a statistical sampling plan has 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 4.5 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 tubing shall be approved by purchaser before tubing for production use is supplied, unless such approval be waived by purchaser. Results of tests on production tubing 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 tubing which are essentially the same as those used on the approved sample. 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 ingredients and/or processing and, when requested, sample tubing. Production tubing made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Reports:

The vendor of tubing shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements and stating that the tubing conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS 3655B, vendor's material designation, and quantity.

4.6 Resampling and Retesting:

If any specimen used in the above tests fails to meet the specified requirements, disposition of the tubing may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the tubing represented. Results of all tests shall be reported.