

**Ministry of Defence
Defence Procurement Agency, ADRP2
Abbey Wood
Bristol
BS34 8JH**

OBSOLESCENCE NOTICE

All DTD specifications were declared obsolescent from 1st April 1999. All DTD 900 series approvals also lapsed at that time. The standards will no longer be updated but will be retained as obsolescent documents to provide for the servicing of existing equipment.

Further Guidance

The aim in declaring the specifications obsolescent is to recognise that the documents are not being updated and thus should be used with care by both purchaser and supplier. For example, a specification could contain valid technical information but may also contain type approval clauses that contradict procurement policy and/or use materials that do not comply with environmental legislation. The obsolescent specification can still be used as a basis for a purchase provided that the supplier and purchaser agree suitable changes to the specification within the purchase order/contract.

For the DTD 900 system, each specification has provided an MoD approved material and process. For these items, the declaration of obsolescence will constitute the termination of both the extant MoD approval and the continuing MoD assessment that had underpinned those approvals. Again, the technical content of the document remains valid and can be used by both purchaser and supplier as a basis for a contract but an acceptable (to the parties) approval/assessment procedure would be required.

Aircraft Material Specification

BRAIDED RUBBER TUBING FOR BOMB SIGHT INSTALLATIONS

NOTE 1.—This specification is one of a series issued by the Ministry of Supply either to meet a limited requirement not covered by any existing British Standard Specification, or to serve as a basis for inspection of material the properties and uses of which are not sufficiently developed to warrant submission to the British Standards Institution for standardization.

NOTE 2.—Points of difference from Specification No. D.T.D. 373 are indicated by marginal lines.

1. **Description.**—The tubing shall be a vulcanised rubber tubing having the properties specified below, and with a braided external covering.

2. **Braided Covering.**—The braided covering shall be made of 2/40's mercerised cotton yarn, having a black finish, and shall be braided in groups of four for tubing of sizes 1, 1a, 2 and 3 and in groups of six for tubing of sizes 4, 5 and 6. See also Clause 7 for details of coloured cotton yarns.

The braiding shall completely cover the tubing.

3. **Freedom from Defects.**—The finished tubing shall be of circular section, uniform throughout, free from porosity, with smooth surface free from pits, grooves and other visible defects.

4. **Dimensions.**—The dimensions of the different sizes of tubing shall be as follows :—

	Nominal External Diameter (inch)	Internal Diameter		Wall Thickness		Ovality
		Nominal Internal Diameter (inch)	The internal diameter determined after braiding shall not differ from the nominal by more than (inch)	Nominal Wall Thickness (inch)	The wall thickness at any point shall not differ from the nominal by more than (inch)	The difference between the maximum and minimum internal diameter at any point shall not exceed (inch)
Size 1 ..	$\frac{1}{4}$	$\frac{3}{8}$	± 0.015	$\frac{1}{16}$	+ 0.010 - Nil	0.020
Size 1a..	$\frac{5}{16}$	$\frac{3}{8}$	± 0.015	$\frac{1}{16}$	+ 0.010 - Nil	0.030
Size 2 ..	$\frac{3}{8}$	$\frac{1}{2}$	± 0.015	$\frac{1}{16}$	+ 0.010 - Nil	0.040
Size 3 ..	$\frac{7}{16}$	$\frac{5}{8}$	± 0.015	$\frac{1}{16}$	+ 0.010 - Nil	0.050
Size 4..	$\frac{5}{8}$	$\frac{3}{4}$	± 0.015	$\frac{1}{8}$	+ 0.010 - Nil	0.060
Size 5 ..	$\frac{3}{4}$	$\frac{1}{2}$	± 0.020	$\frac{1}{8}$	+ 0.015 - Nil	0.080
Size 6 ..	$\frac{11}{16}$	$\frac{5}{8}$	± 0.020	$\frac{3}{32}$	+ 0.015 - Nil	0.100

5. **Selection of Test Samples.**—The following samples shall be selected by the Inspector for testing in accordance with Clause 6. All tests shall be carried out on tubing without the braided covering.

- (1) One sample (4 feet long) shall be taken from any one length of tubing of each size in each batch made from a particular rubber mix and vulcanised at one time, for submission to the tests quoted in Clause 6 (1).
- (2) One sample (2 feet long) shall be taken from any one length of tubing in each batch made from a particular rubber mix and vulcanised at one time, for submission to the tests quoted in Clause 6 (2).
- (3) At the option of the Director of Aeronautical Inspection, additional samples may be taken at any time for submission to any or all of the tests quoted in Clause 6.

6. **Tests.**—(1) The sample selected as described in Clause 5 (1) shall comply with the following requirements :-

- (a) *Tension Strength.*—The tension strength, determined as described in B.S.903 using Type C dumb-bell test pieces cut from the tubing, shall be not less than 800 lb. per sq. in.
- (b) *Elongation at break.*—The elongation at break, determined as described in B.S.903 using Type C dumb-bell test pieces cut from the tubing, shall be not less than 350 per cent.

(c) *Resistance to Kinking*.—The resistance of the tubing to kinking, when determined by the method described in Appendix I, shall be not less than 10 per cent.

(d) *Resistance to Suction*.—The tubing shall not collapse at any part when tested by the method described in Appendix II.

(2) The sample selected as described in Clause 5 (2) shall comply with the following requirements :—

(a) *Resistance to Accelerated Ageing*.—The tubing shall, after submission to the ageing test described in Appendix III, have a tension strength and elongation at break within plus or minus fifteen per cent. of the original values on the unaged tubing.

(b) *Flexibility at Low Temperature*.—The tubing, when tested by the method described in Appendix IV, shall not fracture or show signs of surface cracking.

(c) *Freedom from Corrosive Impurities*.— (i) Chloride and Sulphate Content. The tubing shall contain not more than 0.1 per cent. by weight of chloride (calculated as Cl) or more than 0.2 per cent. by weight of sulphate (calculated as SO₄), when determined by the method described in Appendix V.

(ii) *Neutrality*.—The tubing when extracted and tested by the method described in Appendix VI, shall not be acid to bromo-cresol green, and, if alkaline, the alkalinity shall be not greater than that equivalent to 0.02 per cent. KOH.

7. Method of Marking.— Coloured cottons shall be included in the braiding to indicate the date of manufacture. For each size of tubing the number of coloured threads in each group shall be the same as is specified in Clause 2, and 2/40's cotton yarn shall be used throughout. The colours shall be as follows :—

Year	Colour
1950	Yellow
1951	Blue
1952	Red
1953	Green
1954	Heliotrope

After 1954 the colours shall be repeated in the same sequence as above for each succeeding group of five years.

The number of coloured cottons to be included shall be as follows :-

For tubing made between :—

January 1st and March 31st inclusive	1 group
April 1st and June 30th inclusive	2 groups
July 1st and September 30th inclusive	3 groups
October 1st and December 31st inclusive	4 groups

APPENDIX I

Method for the Determination of Resistance to Kinking

A sample of the tubing six inches long shall be taken, and steel plugs of the same diameter as the nominal internal diameter of the tubing shall be inserted in each end for a distance of $\frac{1}{2}$ inch, the distance between the plugs finally being 5 inches. The plugs shall be wired in position.

The plugs shall be screwed into the end stop and sliding plunger of the apparatus shown in Figure 1. The plunger carries a bevelled edge head moving over a scale graduated in divisions of $\frac{1}{20}$ inch, each equivalent to one per cent. of the distance between the ends of the plugs, the scale being fixed to the base of the apparatus so that the bevelled head of the plunger is at zero mark when the distance between the plugs is 5 inches. The plunger shall then be moved inwards, by turning the milled head of the screw which operates the plunger, at the rate of one division of the scale per second, and the reading on the scale taken when the tubing first develops a kink.

APPENDIX II

Method for the Determination of Resistance to Suction

A sample of the tubing, securely plugged at one end, shall be connected to a suction pump fitted with a manometer, so that not less than 12 inches of tubing are exposed to suction. The internal pressure shall then be reduced until the difference between external and internal pressures is equal to 10 inches of mercury, and this difference maintained for one minute.

APPENDIX III

Method for the Determination of Resistance to Accelerated Ageing

Type C dumb-bell test pieces, cut from the tubing, shall be aged by the Oven Method as described in B.S.903 for 168 hours.

The test pieces shall then be conditioned and the tension strength and elongation at break determined as described in B.S.903.

APPENDIX IV

Method for the Determination of Flexibility at Low Temperature

A sample of the tubing, 12 inches long, shall be cooled in a refrigerator at minus $40^{\circ}\text{C.} \pm 1^{\circ}\text{C.}$ for at least one hour, the centre 6 inch section being maintained in a straight position. A mandrel, 1 inch in diameter (when testing tubing of sizes 1, 1a, 2 and 3) and $1\frac{1}{2}$ inches in diameter (when testing tubing of sizes 4, 5 and 6), shall be placed in the refrigerator for the same time. At the end of that period the tubing shall be bent tightly round the mandrel, whilst still at a temperature of minus 40°C. , the time of bending being not more than 2 seconds, and the plane of the bent tubing being at right angles to the longitudinal axis of the mandrel. When bending the tubing care shall be taken that no part of it more than 2 inches from the ends is subjected to a temperature above minus 39°C.

The tubing shall then be examined for surface cracks.

APPENDIX V

Method for the Determination of Chloride and Sulphate Content

Five grams of the material, cut into cubes, with $\frac{1}{8}$ inch sides, or squares with $\frac{1}{8}$ inch sides if the thickness is less than $\frac{1}{8}$ inch shall be boiled for 1 hour in 100 ml. distilled water in a chemically resistant glass flask fitted with a reflux condenser. After cooling, the chloride and sulphate contents shall be determined by the usual methods, and calculated as percentages of Cl and SO_4 respectively on the original weight of material extracted.

APPENDIX VI

Method for the Determination of Neutrality

Five grams of the material, cut into cubes, with $\frac{1}{8}$ inch sides, or squares with $\frac{1}{8}$ inch sides if the thickness is less than $\frac{1}{8}$ inch shall be boiled for 1 hour in 100 ml. of carbon dioxide free distilled water in a chemically resistant glass flask fitted with a reflux condenser having a ground glass connection. After cooling in a manner which will prevent ingress of carbon dioxide, the solution shall be made up (if necessary) to 100 ml. by the addition of cold unbuffered carbon dioxide free distilled water.

50 ml. of this solution shall be taken and a few drops of phenolphthalein indicator solution added. If a red colour appears, the solution shall be titrated with N/100 hydrochloric acid to the colourless end-point. The alkalinity shall then be calculated as the percentage of KOH on the weight of material extracted.

If no red colour appears when the phenolphthalein is added, a few drops of bromo-cresol green indicator solution shall also be added. If the solution does not turn definitely blue, the material shall be regarded as too acid for acceptance.*

* Footnote to Appendix VI.— It is pointed out that a minimum pH value of about 4.8 is intended. If any doubt exists as to what constitutes a distinct blue colour, the solution under test shall be compared with bromo-cresol green indicator solution in a buffer solution of the required pH.

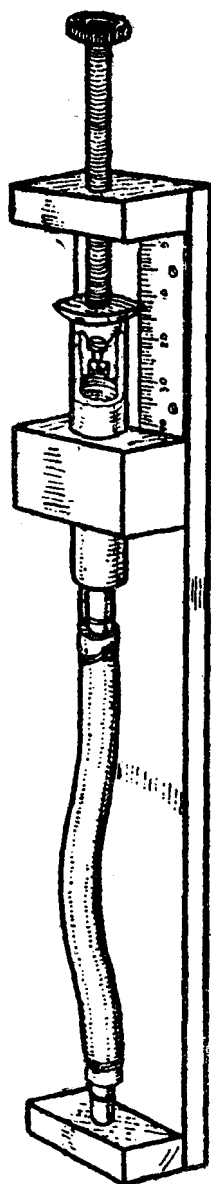


Fig. 1. Kinking Test Apparatus.

Approved for issue.

H. SUTTON,

Director of Materials Research and Development (Air).

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