

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

## **OBSOLESCENCE NOTICE**

All DTD specifications were declared obsolescent from 1<sup>st</sup> 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**

**STEEL TUBES FOR HIGH-PRESSURE HYDRAULIC SYSTEMS**

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

NOTE 2.— Tubes to this specification are limited to the sizes given in Table 1, and are intended for high pressure hydraulic systems and not for structural purposes.

NOTE 3.— Tubing for high pressure hydraulic systems should not be bent round a radius less than twice the outside diameter of the tube, as measured on the inside of the bend, otherwise the tube wall on the outside of the bend may be thinned to a dangerous extent.

**1. Chemical composition**

Carbon	.....	.....	.....	.....	not more than 0.26 per cent.
Silicon	.....	.....	.....	.....	not less than 0.05 and not more than 0.35 per cent.
Manganese	.....	.....	.....	.....	not more than 1.7 per cent.
Nickel (residual)	.....	.....	.....	.....	not more than 0.30 per cent.
Sulphur	.....	.....	.....	.....	not more than 0.050 per cent.
Phosphorus	.....	.....	.....	.....	not more than 0.050 per cent.

**2. Process of manufacture**

- 2.1. Acid or basic open hearth, or electric.  
 NOTE.—Rimming steel shall not be used for the manufacture of the tubes.
- 2.2. The tubes shall be free from internal scale. Freedom from shot or sand in the bores of the tubes shall be verified by passing compressed air through each tube after any shot or sand blasting operation.

**3. Inspection procedure**

- 3.1. Sections 1 and 3 of British Standard T.100, but omitting the welding test.
- 3.2. Tubes of the same cast, of the same nominal dimensions and softened together shall be regarded as one parcel. The inspector shall select one tube from each 100 feet in the parcel and a sample shall be cut from this tube for the drifting test specified in Clause 7. The ends of the samples may be smoothed to remove burrs and rough edges.
- 3.3. The inspector shall select one tube from each 400 feet in the parcel, and a sample not less than 2 feet in length shall be cut from this tube for the distortion test specified in Clause 8.1. The test samples shall not be further heat treated or cold worked before testing.

**4. Margins of manufacture**

- 4.1. The range of tubes covered by this specification is that given in Table 1.
- 4.2. Tubes shall comply with the limits specified in Table 2 of British Standard T.100. Limits for  $\frac{3}{16}$ -inch diameter tubes shall be as for  $\frac{1}{4}$ -inch diameter tubes, and limits for  $\frac{7}{16}$ -inch diameter tubes shall be as for  $\frac{1}{2}$ -inch diameter tubes.

**5. Heat treatment**

The tubes shall be delivered in the fully softened condition.

**6. Mechanical tests**

6.1. *Tensile test*

Outside diameter of tube	Tensile strength Tons per square inch not less than:—
$\frac{3}{16}$ inches	20
Over $\frac{3}{16}$ inches	28

6.2. *Flattening test*

Distance between inner sides of test piece, in direction of flattening ..... 1T or  $\frac{1}{2}$  bore (whichever is the smaller).

### 7. Drifting test

- 7.1. The test samples shall, without showing signs of cracking, withstand being drifted to an angle of  $32^\circ \pm \frac{1}{2}^\circ$  as shown in Fig. 1 until the inside diameter of the drifted end has a dimension not less than that given for the appropriate tube size, given in column (3) of Table 1.

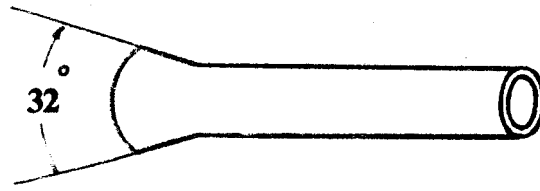


FIG. 1.

- 7.2. Drifting tests shall be made by the application of steadily applied pressure to the drift. Belling of the tubes by spinning methods is not acceptable.
- 7.3. If any test piece fails to comply with the drifting test, the inspector shall adopt one of the following procedures:—
- Select for test from the same parcel at least two other samples from each 100 feet in the parcel. One sample shall be from the tube from which the original test sample was taken, unless that tube has been withdrawn by the manufacturer.
  - Allow the parcel of tubes to be re-softened and re-tested in accordance with Clauses 6, 7 and 8.

### 8. Pressure tests

- 8.1. Each distortion test sample shall be subjected to an internal hydraulic test pressure of 4,500 lb per square inch, and the pressure shall be maintained for not less than 30 seconds. Mean outside diameters shall be determined at the same locations, not less than 1 foot from any clamp, coupling or other support, before and after the application of pressure. The maximum permanent increase in mean diameter at any location shall be:—
- |   |       |       |       |               |
|---|-------|-------|-------|---------------|
| For tubes with outside diameters less than $\frac{3}{8}$ inches | ..... | ..... | ..... | 0.0005 inches |
| For tubes $\frac{3}{8}$ inch outside diameter and over          | ..... | ..... | ..... | 0.0010 inches |
- 8.2. If any test sample fails to comply with the distortion test, the inspector shall select for test from the same parcel 25 per cent. of all tubes in that parcel, or 50 per cent. if there is less than 100 feet in the parcel. One of the further samples shall be from the tube from which the original test sample was taken unless that tube has been withdrawn by the manufacturer. All the additional samples shall comply with the test specified in Clause 8.1.
- 8.3. All the remaining tubes in the parcel, after completion of the distortion tests, shall be subjected to a hydraulic test pressure of 4,500 lb. per square inch. All tubes which show any sign of failure shall be rejected.

TABLE 1

Nominal outside diameter of tube inches	Nominal gauge S.W.G.	Minimum inside diameter of tube after drifting, inches
(1)	(2)	(3)
$\frac{3}{16}$	24 22	0.235 0.230
$\frac{1}{4}$	24 22	0.330 0.320
$\frac{5}{16}$	22	0.400
$\frac{3}{8}$	22	0.470
$\frac{7}{16}$	20	0.530
$\frac{1}{2}$	20	0.600

Approved for issue.

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Director of Materials and Structures Research and Development.

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