

**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
RUBBER PARTS FOR USE WITH MINERAL BASE HYDRAULIC FLUID

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 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 standardisation.

NOTE 2.— This Specification, is intended to cover rubber parts required to possess resistance to fluids complying with specifications Nos. DEF 2001, D.T.D.585, and MIL-H-5606.

NOTE 3.— This specification is not included to cover fabric reinforced mouldings made from rubber proofed fabric, in which the fabric forms the major part of the moulding. It does, however, cover those mouldings in which the fabric reinforcement does not form the bulk of the moulding.

NOTE 4.— This specification covers four grades of material : Grades A and B of different hardness, and Grades 1 and 2 with different swell in oil. The grades required must, therefore, be stated on the Order.

NOTE 5.— Except where otherwise stated the methods of testing shall be as described in British Standard 903, "Methods of Testing Vulcanised Rubber".

SECTION 1
Rubber Material

1. Description

The material shall consist of uniformly compounded natural or synthetic rubber or rubberlike material which, after vulcanisation-if necessary-shall comply with the requirements specified below.

2. Provision of Test Samples

From each lot or batch of compounded material the following test samples shall be produced, having the same composition and (if vulcanised) the same degree of cure as the main bulk of material.

- (a) 1 sample 3 in. x 3 in. x $\frac{1}{4}$ in. for hardness tests.
- (b) 1 sample 12 in. x 12 in. x $\frac{1}{8}$ in. for remaining tests.

3. Tests

The following tests shall be carried out to the satisfaction of the Inspector on test pieces cut from the sample specified in Clause 2 :—

- (a) "Hardness-The hardness shall be
Grade A .. not less than 66 nor more than 77°B.S."
Grade B .. not less than 77 nor more than 97°B.S."

(b) *Tensile Properties.* —The tensile properties shall be-

	Grade A	Grade B
Minimum tensile strength (dumb-bell method*) (lb./sq. in)	1,100	1,100
Minimum elongation at break (per cent)	300	100
Maximum permanent set (per cent) (10 minutes' stretch under load of 250lb./sq.in.; 10 minutes' recovery)	7	7

(c) *Resistance to Accelerated Ageing.*—The resistance to the accelerated ageing treatment described in Appendix I shall be such that the tensile strength after ageing shall be :-
Not less than 85 per cent of that of the unaged material for Grade A, and not less than 95 per cent of that of the unaged material for Grade B.

(d) *Resistance to Hydraulic fluid* — The resistance to hydraulic fluid shall be such that, when tested by the method described in Appendix II, Grade 1 material shall not increase in volume by more than 5 per cent, or decrease by more than 2 per cent ; Grade 2 material shall increase in volume by at least 5 per cent, but not more than 15 per cent, and neither grade shall show any signs of disintegration.

*The Tensile Strength test may be carried out by the Ring Method, provided that satisfactory evidence of tensile figures determined by the two methods is furnished to the Director of Aeronautical Inspection, and his agreement to the correlation is obtained.

- (e) *Resistance to Low Temperature.* — The resistance to low temperature shall be such that, when tested by the method described in Appendix III, the test piece shall show no signs of cracking.
- (f) *Freedom from Impurities.*— (i) Chloride and sulphate content. The material 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 IV.
- (ii) pH value. The pH value of an aqueous extract of the material, prepared and tested by the method described in Appendix V, shall be not less than 6.0 or more than 8.5.

4. Retests

If failure is experienced in any one of the tests specified in Clause 3, two further samples shall be prepared as specified in Clause 2 from the same lot or batch of compounded material as that which failed, unless the lot or batch is withdrawn by the manufacturer. Each of these further test samples must comply with the requirements of Clause 3 ; otherwise the lot or batch of compounded material represented thereby will be rejected.

SECTION 2

Mouldings and Extrusions

5. Material

The mouldings or extrusions shall be made from compounded natural or synthetic rubber or rubberlike material, which has been inspected and passed as complying with Section 1 of this specification. The compounded material used may be reinforced with fabric or other fibrous material, at the option of the manufacturer and with the approval of the purchaser.

6. Freedom from Defects

The mouldings or extrusions shall be free from defects likely to affect the performance of the part, and any moulding or extrusion may be rejected at any time for faults in manufacture.

7. Selection of Test Samples

One moulding or extrusion of each design made from each lot or batch of compounded material shall be selected to represent all the mouldings or extrusions of the same design made from the same lot or batch of compounded material. Should any moulding or extrusion be too large to test, a representative section of it of suitable size may be tested instead.

8. Tests

The mouldings or extrusions selected as specified in Clause 7 shall comply with the following requirements, to the satisfaction of the Inspector. Section (a) is applicable to reinforced material only :-

- (a) *Resistance to Separation.*— The resistance to separation shall be such that the moulding or extrusion shall show no visual evidence of separation between the compounded material and the reinforcement, when tested by the method described in Appendix VI.
- (b) *Resistance to Swelling.*— The resistance to swelling shall be such that, after subsection to the conditions described in Appendix VI, parts made from Grade 1 material shall not increase in volume by more than 5 per cent., or decrease by more than 2 per cent ; parts made from Grade 2 material shall increase in volume by at least 5 per cent, but not more than 15 per cent, and no parts shall show any signs of disintegration.

9. Retests

If any moulding or extrusion fails to comply with any of the tests specified in Clause 8, two further mouldings or extrusions of the same design and made from the same lot or batch of compounded material as that which failed shall be submitted to, and must comply with, the requirements specified in Clause 8 ; otherwise the mouldings or extrusions represented thereby will be rejected.

APPENDIX I

Method for the Determination of Resistance to Accelerated Ageing

A test sheet shall be aged in an oven for 150 hours at $70 \pm 1^\circ\text{C}$ as described in B.S. 903. At the conclusion of the ageing period the specimen shall be removed from the oven and suspended for 24 hours at a temperature of 15°C to 20°C , shielded from direct sunlight. The tensile strength of four dumb-bells cut from the sheet shall then be determined.

APPENDIX II

Method for the Determination of Resistance to Hydraulic Fluid

A test piece, 2 in. x 1 in. x $\frac{1}{8}$ in. shall be weighed in air to the nearest milligram (W1). It shall then be immersed in distilled water at room temperature, and again weighed to the nearest milligram (W2). The sample shall then be removed from the water, dipped quickly into ethyl alcohol, blotted dry with filter paper, and immersed in 100 ml of oil to specification DEF-2001, using a separate loosely stoppered container for each test.

The oil containing the sample shall be maintained at a temperature of $70 \pm 1^\circ\text{C}$ for a period of 150 hours in a thermostatically controlled air oven in the absence of light. At the end of that period the test piece shall be removed from the hot oil, cooled to room temperature by immersion for 30 minutes in a fresh batch of DEF-2001 oil at room temperature, washed quickly in ethyl alcohol, blotted lightly with filter paper, placed immediately in a tared weighing bottle, and weighed (W3). It shall then be removed from the weighing bottle and reweighed immediately in distilled water at room temperature (W4).

The percentage change in volume shall then be calculated from the formula—

$$\text{Percentage change in volume} = \frac{(W3 - W4) - (W1 - W2)}{(W1 - W2)}$$

APPENDIX III

Method for the Determination of Resistance to Low Temperature

A test piece, 6 in. x 1 in. shall be totally immersed for 150 hours in oil to specification DEF-2001 maintained at a temperature of $70 \pm 1^\circ\text{C}$. It shall then be cooled to room temperature by immersion in a fresh batch of DEF-2001 oil, and fixed in two grips so that it lies in one plane with 5 ins. exposed between the the grips.

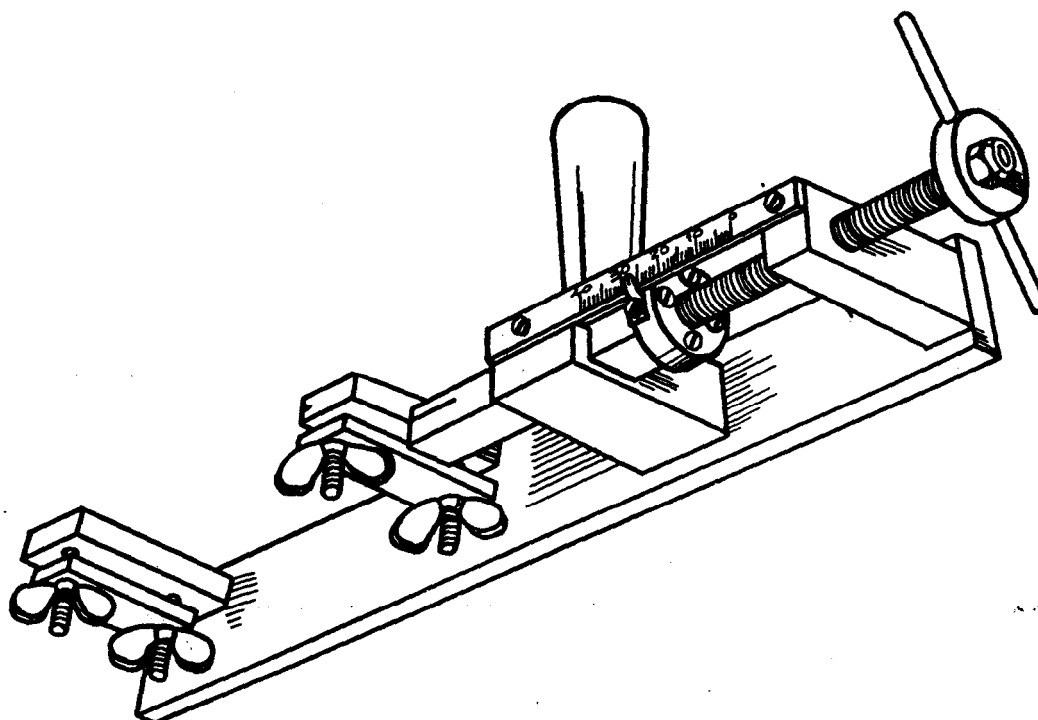


Fig. 1. APPARATUS FOR LOW TEMPERATURE TESTS

The clamped specimen shall be placed vertically in a vessel about 5 in. in diameter containing alcohol maintained continuously at a temperature of $40 \pm 1^\circ\text{C}$ by means of added solid carbon dioxide so that the sample is completely immersed. After the bath has returned to minus 40°C the sample shall be kept in the liquid at that temperature for a further 30 minutes, and the distance between the grips then reduced by 1 in. in 20 seconds by moving one grip directly towards the other and in the same plane. The test piece shall then be examined visually for signs of cracking.

A suitable apparatus is shown in Fig. 1. It consists of a back plate carrying two clamps fixed to an end stop and a sliding plunger respectively. The plunger is operated by means of a screw thread, and carries a pointer moving over a scale graduated in inches, which is fixed to the back plate so that the pointer is at zero when the undistorted sample is in position.

(It should be noted that in the case of samples which are affected by alcohol a slightly modified test procedure should be adopted.)

APPENDIX IV

Method for the Determination of Chloride and Sulphate Content

Five grams of the material, cut into pieces about 1 cubic millimetre in size, shall be boiled for two hours in 100 ml of distilled water in a chemically resistant glass flask. After cooling, the original volume shall be made up with distilled water, and the chloride and sulphate contents determined by the usual methods.

APPENDIX V

Method for the Determination of pH Value

Five grams of the material, cut into pieces about 1 cubic millimetre in size, shall be boiled for two hours in 100 ml of unbuffered, carbon dioxide free, distilled water in a chemically resistant glass flask. After cooling, the original volume shall be made up with unbuffered, carbon dioxide free, distilled water, and the pH value determined.

In case of dispute, the pH value shall be determined electrometrically, using a glass electrode.

APPENDIX VI

Method for the Determination of Resistance to Separation

Each selected moulding or extrusion shall be examined visually after having been subjected to the following conditions in the order given :-

- (i) Exposure to -40°C in air for not less than one hour.
- (ii) Exposure to 40°C in air for not less than one hour.
- (iii) Immersion in oil to specification DEF-2001 at a temperature of $70 \pm 1^\circ\text{C}$ for 150 hours.

The change in volume during the above procedure shall also be measured, by a method similar to that described in Appendix II.

Approved for issue,

N. J. L. MEGSON,

Director of Materials Research and Development (Air).

Printed in England by M. Harland & Son, Ltd.

and published by

HER MAJESTY'S STATIONERY OFFICE

Price 1s. 0d. net