

**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

**12 PER CENT CHROMIUM STEEL WIRE FOR SPRINGS (corrosion resistant)
(Not suitable for engine valve springs)**

NOTE. — 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.

SECTION I Rods for wire
SECTION II Wire
SECTION III Springs

SECTION I
Rods for wire

1. Chemical composition

- 1.1. The chemical composition of the rods shall be: -
 - Carbon not less than 0.27 and not more than 0.35 per cent.
 - Silicon not more than 1.0 per cent.
 - Manganese not more than 1.0 per cent.
 - Nickel (residual). not more than 1.0 per cent.
 - Chromium not less than 12.0 and not more than 14.0 per cent.
 - Sulphur not more than 0.045 per cent.
 - Phosphorus not more than 0.045 per cent.
- 1.2. The complete analysis of every cast shall be supplied to the inspector.

2. Manufacture

- 2.1. The steel shall be made by the electric furnace process.
- 2.2. The ingots shall be machined or ground all over before rolling. They shall be cogged down and rolled without quartering.
- 2.3. An adequate discard to remove pipe, segregation or other defects shall be taken from each ingot prior to rolling to rods.

3. Freedom from defects

- 3.1. The rods from which the wire is to be produced shall be pickled and examined visually for surface defects, and any exhibiting seams or other imperfections of such nature as to prejudice the quality of the final product shall be rejected.

4. Condition

- 4.1. The rod shall be supplied in the softened condition.

5. Selection and preparation of mechanical test samples

- 5.1 The inspector shall select one test sample from the largest size of rod from each cast from which:-
 - (a) One tensile test sample shall be cut for the tensile test specified in Clause 6.2. This test sample shall be heat treated as specified in Clause 5.2. before being tested.
 - (b) One ductility test sample shall be cut for the ductility test specified in Clause 6.3. This test sample shall be heat treated as specified in Clause 5.2. before being tested.
- 5.2. The mechanical test samples selected as specified in Clause 5.1. shall be hardened by heating at a temperature not exceeding 1,000°C and cooling in air or quenching in oil, at the option of the manufacturer. They shall then be tempered at a temperature not less than 350°C to give the mechanical properties specified in Clause 6. The purchaser shall be advised of the relevant heat treatment data.

6. Mechanical properties

- 6.1. The mechanical properties obtained from test samples selected and prepared as specified in Clause 5 shall be as follows: -
- 6.2. *Tensile test*.- The ultimate tensile stress shall be not less than 95 tons per square inch.
- 6.3. *Single bend test*.-The test sample shall be bent through 90° by steadily applied pressure round a mandrel or former having a radius equal to six times the diameter of the rod. The test sample shall withstand this test without showing cracking or signs of fracture.

7. Re-tests

- 7.1. If the samples selected and prepared as specified in Clause 5 fail to comply with the tensile or bend test specified in Clause 6, the inspector shall select for test from the same cast two further test samples, one of which shall be from the rod from which the original test sample was taken, unless that rod has been withdrawn by the manufacturer. Test pieces prepared from these two test samples, as specified in Clause 5, shall comply with the tensile and bend test specified in Clause 6.

8. Identification

- 8.1. All material passed by the inspector shall be stamped with the identification mark of the inspector and such other markings as shall ensure full identification of the material.

SECTION II**Wire****9. Manufacture**

- 9.1. The wire shall be made from rods which conform to Section I of this specification.

10. Freedom from defects

- 10.1. The wire shall be free from harmful defects.
- 10.2. Any wire may be rejected for faults in manufacture, although it has been passed previously on chemical composition and mechanical tests.

11. Condition

- 11.1. The wire shall be supplied in the softened or softened and subsequently light drawn condition.

12. Selection and preparation of mechanical test samples

- 12.1. *Wire in coils*. - Coils of wire of the same nominal section, from the same cast of steel and softened together, shall be grouped in parcels. The total weight of a parcel containing more than one coil shall not exceed one cwt. When the weight of a single coil exceeds 1 cwt. it shall be regarded as a parcel.
- 12.2. *Wire in straight lengths*. - Wire of the same nominal section, from the same cast of steel and softened together shall be grouped in parcels of not more than 1 cwt.
- 12.3. The inspector shall select test samples from each parcel of coils or straight wire as follows:-
 - (a) one test sample of sufficient length to allow the preparation of test pieces for the tensile and single bend tests specified in Clauses 13.2 and 13.3. This test sample shall be heat treated as specified in Clause 12.4 before being tested.
 - (b) two ductility test samples, one from each end of one coil or from each of two individual wires, for the ductility test specified in Clause 13.4. The test samples shall not be heat treated or mechanically worked before being tested. At his discretion the inspector may select a sample to be cut other than from the end of a coil.
- 12.4. The mechanical test samples selected as specified in Clause 12.3(a) shall be hardened by heating at a temperature not exceeding 1,000°C and cooling in air or quenching in oil, at the option of the manufacturer. They shall then be tempered at a temperature not less than 350°C to give the mechanical properties specified in Clauses 13.2 and 13.3. Wires 14 s.w.g. (0.080 inch) and thinner shall not be heated at the hardening temperature for a period exceeding two minutes. The purchaser shall be advised of the appropriate heat treatment data.

13. Mechanical properties

- 13.1. The mechanical properties obtained from test samples selected and prepared as specified in Clause 12 shall be as follows :-
- 13.2. *Tensile test*. - The ultimate tensile stress shall be not less than 95 and not more than 120 tons per square inch.
- 13.3. *Single bend test*. - The test sample shall be bent through 90° by steadily applied pressure round a mandrel or former having a radius equal to six times the diameter of the wire. The test sample shall withstand this test without showing cracking or signs of fracture.

13.4. *Wrapping test.* - The test piece shall be wrapped closely round a mandrel eight times and unwound with the exception of the last turn. For wire not greater than 12 s.w.g. (0.104 inch) the diameter of the mandrel shall be equal to the diameter of the wire, or to the minor sectional dimension of the wire if the section of the wire is other than round. For wire greater than 12 s.w.g. the diameter of the mandrel shall be equal to twice the diameter or minor sectional dimension of the wire. When the section of the wire is other than round, the major axis of the cross section of the wire shall be parallel with the longitudinal axis of the mandrel; the corners of such wire may be chamfered if necessary.

The wire shall withstand this test without showing cracking or signs of fracture.

14. Re-tests

14.1. If any test piece fails to comply with the tensile or single bend tests specified in Clauses 13.2 and 13.3, the inspector shall select for test from the same parcel two further test samples, one of which shall be from the coil or individual wire from which the original test sample was taken, unless that coil or wire has been withdrawn by the manufacturer. The test pieces prepared from both these two further test samples, as specified in Clauses 12.3 (a) and 12.4. shall comply with the tensile and single bend tests specified in Clauses 13.2 and 13.3.

14.2. If any test piece fails to comply with the wrapping test specified in Clause 13.4, the inspector shall select for test two further test samples from each of two coils, or one test sample from each of four individual wires from the same parcel; two of the re-test samples shall be from the coil or wires from which the original test samples were taken, unless that coil or those wires have been withdrawn by the manufacturer. When a parcel consists of a single coil, two further test samples shall be taken from each end of the coil. The test pieces prepared from each of the further test samples, as specified in Clause 12.3(b), shall comply with the wrapping test specified in Clause 13.4.

15. Identification

15.1. Each coil and parcel of straight wires passed by the inspector shall bear a tag stamped with the identification mark of the inspector and such other markings as shall ensure full identification of the material.

SECTION III Springs

16. Material

16.1. Springs shall be made from wire which has been inspected and passed as complying with Section II of this specification.

17. Freedom from defects

17.1. Springs shall be free from harmful defects.

18. Condition

18.1. Springs shall be supplied in the hardened and tempered condition.

18.2. All traces of oxide shall be removed to ensure satisfactory corrosion resistance.

19. Heat treatment

19.1. Springs and mechanical test samples shall be hardened by heating at a temperature not exceeding 1,000°C and cooling in air or quenching in oil, at the option of the manufacturer. They shall then be tempered at a temperature not less than 350°C. Wires 14 s.w.g. (0.080 inch) and thinner, and springs made from such wires shall not be heated at the hardening temperature for a period exceeding two minutes.

19.2. No spring shall be re-hardened more than twice.

20. Selection and preparation of mechanical test samples

20.1. *Wire in coils.* - Coils of wire of the same nominal section, from the same cast of steel and softened together, shall be grouped in parcels. The total weight of a parcel containing more than one coil shall not exceed 1 cwt. When the weight of a single coil exceeds 1 cwt. it shall be regarded as a parcel.

20.2. *Wire in straight lengths.* - Wire of the same nominal section, from the same cast of steel and softened together shall be grouped in parcels of not more than 1 cwt.

20.3. The inspector shall select from each parcel sufficient test samples to meet the following requirements :-

(a) Springs manufactured from wire thinner than 12 s.w.g.

(i) One test sample of sufficient length to permit of one tensile test being carried out on each batch of springs heat treated together, or

- (ii) When springs are heat treated singly one tensile test sample shall be heat treated with every twentieth spring from the same parcel of wire and in the same bath or muffle, provided that accurate pyrometric control of the bath or muffle is maintained to the satisfaction of the inspector. In the absence of such approved arrangements a tensile test sample shall be heat treated with each spring.
- (b) Springs manufactured from wire 12 s.w.g. and thicker.
 - (i) One test sample of sufficient length to permit of one tensile test being carried out on each batch of springs heat treated together, or
 - (ii) When springs are heat treated singly one tensile or hardness test sample shall be heat treated with every twentieth spring from the same parcel or wire and in the same bath or muffle, provided that accurate pyrometric control of the bath or muffle is maintained to the satisfaction of the inspector. In the absence of such approved arrangements a tensile or hardness test sample shall be heat treated with each spring.
 - (iii) When hardness testing is used the minimum and maximum acceptable hardness values shall be determined by reference to a conversion factor derived from hardness tests made on the first three tensile test samples of the parcel.

21. Mechanical properties

- 21.1. The mechanical properties obtained from test samples selected and prepared as specified in Clause 20 shall be as follows :-
- 21.2. *Tensile test.* - The ultimate tensile stress shall be not less than 95 and not more than 120 tons per square inch.
- 21.3. *Hardness test.* - The hardness number of each hardness test sample selected and prepared as specified in Clause 20.3(b) shall be determined by an approved method. The tensile value calculated from a conversion factor based on three tensile plus hardness tests as specified in Clause 20.3 (b) (iii) shall be within the range specified in Clause 21.2.

22. Re-tests

- 22.1. If any test piece fails to comply with the appropriate requirement of Clause 21 the inspector shall allow the springs heat treated with it to be re-heat treated in accordance with Clause 19 and re-tested in accordance with Clauses 20 and 21.

23. Identification

- 23.1. Each batch of springs passed by the inspector shall bear the identification mark of the inspector and such other markings as shall ensure full identification of the material.

Approved for issue,

N. J. L. MEGSON,

Director of Materials Research and Development (Air)
