

**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**  
**NICKEL-COPPER-ALUMINIUM ALLOY COLD-HEADED BOLTS**  
(Not exceeding  $\frac{1}{2}$  in. diameter)

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*NOTE.-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 materials the properties and uses of which are not sufficiently developed to warrant submission to the British Standards Institution for standardisation.*

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The specific gravity of this alloy is 8.8.

Section I. General requirements.

Section II. Rod and wire for the manufacture of cold-headed bolts.

Section III. Cold-headed bolts.

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SECTION I

**General Requirements**

**1. Chemical composition**

(a) The chemical composition of the alloy shall be :-

Copper	..	..	..	..	..	..	not less than 27.0 nor more than 33.0 per cent.
Aluminium	..	..	..	..	..	..	not less than 2.0 nor more than 4.0 per cent.
Manganese	..	..	..	..	..	..	not more than 2.0 per cent.
Iron	..	..	..	..	..	..	not more than 2.0 per cent.
Total impurities (Carbon, Silicon and Magnesium)	..	..	..	..	..	..	not more than 1.0 per cent.
Nickel	..	..	..	..	..	..	the remainder.

(b) The complete analysis of every cast shall be supplied to the Inspector.

**2. Freedom from defects**

(a) The material shall be free from defects.

(b) Any material may be rejected for faults in manufacture, although it has been passed previously on chemical composition and mechanical tests.

**3. Mechanical tests**

(a) All tests shall be carried out to the satisfaction of the Inspector.

(b) The mechanical properties of the material shall be as follows :-

0.1 per cent. proof stress	..	..	..	..	..	..	not less than 45 tons per sq. inch.
Ultimate tensile stress	..	..	..	..	..	..	not less than 55 tons per sq. inch.
Elongation	..	..	..	..	..	..	not less than 20 per cent.
Izod	..	..	..	..	..	..	not less than 25 ft. lb.
Nicked fracture	..	..	..	..	..	..	See paragraph (e) below.

(c) *Tensile Test.*-The tensile test piece shall be machined from the selected samples to the dimensions of the largest possible size of British Standard tensile test piece shown in British Standard A.4 (latest issue). Alternatively, at the option of the Manufacturer, the tensile test may be made on the full cross section of unmachined test samples.

The load shall be applied axially.

Should a tensile test piece break outside the middle half of its gauge length the test may be discarded and another test made.

(d) *Izod Test.*-(i) The Izod test pieces shall be machined from the selected samples to the dimensions of one of the British Standard notched bar test pieces of British Standard A.4 (latest issue) and tested in a 120 ft. lb. Izod machine.

(ii) When the dimensions of a test sample are such that none of the British Standard notched bar test pieces can be made from it, the nicked fracture test (*see paragraph (e)*) shall be substituted for the Izod test.

(e) *Nicked Fracture Test.*-A test piece, nicked or sawn so that the area of the portion to be fractured is not less than one half of the original sectional area, must be free from defects when broken by a minimum number of blows.

## SECTION II

**Rod and Wire for the Manufacture of Cold-Headed Bolts****4. Margins of manufacture**

The margins of manufacture shall be agreed between the Manufacturer and Purchaser and shall be stated in the order.

**5. Heat treatment**

(a) The rods and wires shall be softened by heating at a temperature not less than 850°C. They shall then be cooled in water or air at the option of the Manufacturer. The water may contain 2 to 3 per cent. of alcohol.

After softening, the rods and wires shall be cold drawn to a degree sufficient to ensure that test samples, selected in accordance with clause 6 and heat treated in accordance with clause 5 (b), will pass the mechanical tests specified in clause 3.

(b) The test samples selected as specified in clause 6 (a) and (b) shall be heat treated at a temperature of 580°C. ± 20°C. for 4 to 6 hours and slowly cooled.

**6. Selection of test samples**

(a) Rods and wires of the same diameter and softened together shall be regarded as one parcel.

(b) The Inspector shall select one sample from each parcel. This sample after heat treatment in accordance with clause 5 (b) must pass the mechanical tests specified in clause 3.

(c) A sample from each end of each rod or wire shall be taken for the twisting or upsetting tests specified in clause 7 (a) and (b) respectively. At the option of the Manufacturer, these test samples may be softened as specified in clause 5 (a) before being tested.

**7. Twisting and upsetting tests**

(a) *Twisting Test.*-(Rods or wires 0.30 inch diameter and under). A twisting test shall be carried out on samples, selected as specified in clause 6 (c), from each rod or wire 0.30 in. diameter and under.

The twisting is to be applied continuously in one direction on a suitably loaded sample. The numbers of twists and the length of rod or wire between the fixed and twisting chucks are dependent on the diameter of the rod or wire and shall be as follows :-

Nominal diameter of Wire or Rod-Inch	Distance between Chucks-Inches	Number of Twists
Up to and including 0.15 .. .. .	6	20
Over 0.15 up to and including 0.20 .. .. .	8	10
Over 0.20 up to and including 0.30 .. .. .	10	10

After applying the specified number of twists the sample shall be untwisted the same number of twists as originally applied. Specimens shall withstand this test without showing signs of cracking or splitting.

(b) *Upsetting Test.*-(Rods over 0.30 in.) For rods over 0.30 in. diameter an upsetting test shall be substituted for the twisting test. A sample length of twice the rod diameter shall be compressed at room temperature to a length equal to the original rod diameter. The specimen shall withstand this test without showing any sign of splitting or cracking at the edges.

**8. Re-tests**

(a) If any test piece fails to pass the mechanical tests specified in clause 3, the Inspector may reject the parcel represented or, at the request of the Manufacturer, select two other test samples from the parcel. One of these samples must be from the same wire or rod from which the original sample was taken unless that rod or wire has been withdrawn by the Manufacturer. Test pieces prepared from these further test samples as specified in clause 6 must pass the tests specified in clause 3.

(b) If a test sample fails to pass the twisting test or the upsetting test, the rod or wire represented shall be rejected.

**9. Identification**

(a) Every coil of wire passed by the Inspector shall bear a tag stamped with the mark of the Inspector and such other marking as will ensure full identification of the material.

(b) Rods of the same diameter passed by the Inspector may be bundled, and each bundle shall bear a tag stamped with the mark of the Inspector and such other marking as will ensure full identification of the material.

## SECTION III

**Cold-Headed Bolts**

(Not exceeding  $\frac{1}{2}$  in. diameter)

*Note 1.*-The order must state the Part Number of the Parts required corresponding to the Part Numbers given in British Standard A.25 (latest issue).

*Note 2.*-Bolts to this specification will be supplied in the black condition. The oxide film enhances the corrosion resistance of the material.

**10. Manufacture**

(a) The bolts shall be manufactured by an approved process from material complying with Section II of this specification.

(b) The bolt heads shall be hexagonal, and must be concentric and true with the centre line of the shank.

(c) The radius under the heads of the bolts shall run smoothly into the faces of the head and shank without any step or discontinuity.

(d) The threads may be cut or rolled at the option of the Bolt Manufacturer ; the threaded portions shall be concentric with the shank.

### 11. Dimensions

All bolts shall be in accordance with the dimensions and limits given in the latest issue of British Standard A.25. The length of the threaded portion shall be in accordance with the dimensions and limits given in that standard, and shall be such that a standard nut (British Standard A.27 (latest issue)) shall be capable of being screwed up by hand so that its leading face is at the distance "L" from the underside of the bolt head.

### 12. Screw threads

(a) *B.A. Bolts.*-The screw threads on B.A. bolts shall have the thread form and pitches specified in Tables 2 and 4 of B.S.93 : 1951.

(b) *B.S.F. Bolts.*-The screw threads on B.S.F. bolts shall be in accordance with B.S.84 : 1940, and shall conform to the medium fit limits and tolerances specified in Table 11 of that specification.

### 13. Heat treatment

Bolts after heading, and test samples selected as specified in clause 14, shall be heat treated at a temperature of  $580^{\circ} \pm 20^{\circ}$  C. for from 4 to 6 hours and slowly cooled.

### 14. Selections of test samples

(a) Bolts of the same diameter, heat treated together, shall be considered as a batch. At least one sample from a rod or wire from which the bolts have been made shall be heat treated with the bolts, and must pass mechanical tests specified in clause 3. Alternatively, actual bolts may be used for the mechanical tests.

(b) If any test piece fails to pass the mechanical tests specified in clause 3, the Inspector may reject the bolts represented or, at the request of the Manufacturer, adopt either of the following procedures :-

(i) Select for test from the same batch two other samples as specified in paragraph (a) above. Test pieces prepared from these further samples must pass the tests specified in clause 3.

(ii) Allow the batch to be re-heat-treated in accordance with clause 13 and re-tested in accordance with clauses 14 and 3.

### 15. Hardness test

(a) The hardness test shall be carried out by an approved method, and all hardness determination shall be made under identical conditions of testing.

(b) Hardness tests shall be carried out on selected heat-treated bolts and on the sample selected in accordance with clause 14 (a). The number of bolts hardness tested shall be to the satisfaction of the Inspector. The hardness determination must be made on the shank of the bolt, and the values obtained must be not less than  $92\frac{1}{2}$  per cent. of that obtained on the test sample.

### 16. Identification

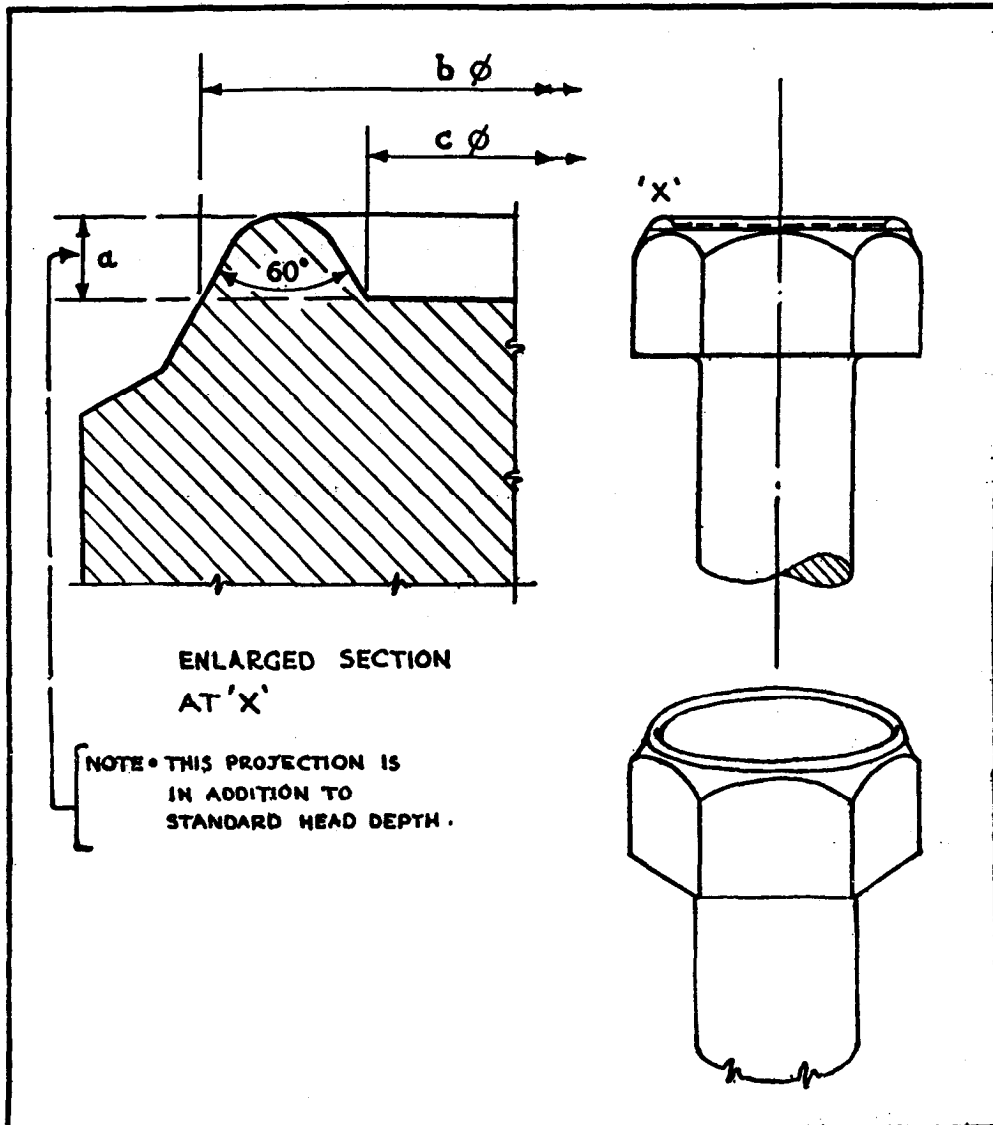
(a) The heads of all bolts shall be marked with a groove of the shape and dimension given in British Standard A.25 ; alternatively, a raised ring may be incorporated in the bolt head and shall be of the form and dimensions given in the Appendix.

(b) All bolts  $\frac{1}{4}$  in. nominal size and over shall have the appropriate part number and the letter "K" applied on the upper face of the head.

(c) All bolts under  $\frac{1}{4}$  in. nominal size shall have the letter "K" applied on the upper face of the head, and the bolts shall be made into parcels which shall be labelled with the appropriate part number and the letter "K".

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APPENDIX



ENLARGED SECTION  
AT 'X'

NOTE • THIS PROJECTION IS  
IN ADDITION TO  
STANDARD HEAD DEPTH.

TABLE OF DIMENSIONS FOR IDENTIFICATION RINGS

BOLT	a	b	c
4 BA	.012"	.249"	.201"
2 BA	.015"	.325"	.265"
1/4"	.020"	.446"	.366"
5/16"	.025"	.530"	.430"
3/8"	.030"	.609"	.489"
7/16"	.035"	.721"	.581"
1/2"	.045"	.843"	.663"
9/16"	.055"	.955"	.735"
5/8"	.065"	1.056"	.796"

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