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Defence Procurement Agency, ADRP2
Abbey Wood
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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

SILICON-NICKEL-COPPER ALLOY BARS AND FORGINGS

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.

Section I	Provisions applicable to all Material to this Specification.
Section II	Bars and Billets for Forging
Section III	Bars for Machining.
Section IV	Forgings.

The term "forging" in this specification includes drop-forgings and pressings.

SECTION I

Provisions applicable to all Material to this Specification

1. Chemical composition.

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

Nickel	not less than 2.0 nor more than 3.5 per cent.
Silicon	not less than 0.4 nor more than 0.8 per cent.

Impurities-

Aluminium	not more than 0.02 per cent.
Iron	not more than 0.10 per cent.
Total other impurities ..	not more than 0.30 per cent.
Copper	the remainder.

(b) The Manufacturer shall supply the complete analysis of each cast to the Inspector.

(c) A "cast" is defined as:-

- (i) The product of one furnace melt.
- (ii) The product of one crucible melt.
- (iii) The product of a number of crucible or furnace melts where such are aggregated and mixed prior to casting.
- (iv) Where a continuous melting process is employed, a cast shall be taken as the amount of metal tapped from the furnace without any further additions of metal having been made to the charge.
- (v) Or as otherwise defined from time to time.

2. Mechanical tests.

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

(b) The mechanical properties of the test pieces shall be :-

0.1 per cent. proof stress ..	not less than 27 tons per sq. in.
Ultimate tensile stress ..	not less than 38 tons per sq. in.
Elongation per cent.	not less than 15.

(c) *Tensile test.* - For bars, other than rectangular bars less than $\frac{9}{32}$ in. in thickness, and for test samples representing forgings, each tensile test piece shall be turned to the dimensions of one of the tensile test pieces of British Standard A.4 (latest issue).

Round, square and hexagonal bars less than $\frac{9}{32}$ in. in diameter or width across flats may be tested in the full section.

The parallel portion of any test piece may be increased in length to accommodate the extensometer employed.

The load should 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) *Hardness test.* - The hardness determinations shall be carried out according to British Standard 240 for the Brinell hardness or according to British Standard 427 for the Diamond Pyramid hardness or by any other approved method. In all Brinell tests the value P/D^2 shall be 30 and the load and ball arranged accordingly.

All hardness determinations made on bars or forgings in a parcel shall be made under the same conditions of testing.

3. Freedom from defects.

(a) The material shall be free from harmful defects.

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

SECTION II

Bars and Billets for Forging

4. Manufacture.

The bars and billets shall be supplied in the "as cast", "as rolled" or "as forged" condition. They shall not be heat treated unless otherwise specified on the order.

5. Margins of manufacture.

Margins of manufacture, when required, shall be agreed between the Manufacturer and the Purchaser and shall be specified on the order.

6. Heat treatment.

The test samples selected as specified in Clause 7 shall be heat treated by being heated uniformly at a temperature of not less than 800°C. nor more than 900°C. and quenched in water or oil at the option of the Manufacturer. They shall then be heated for the requisite period at a temperature of not less than 450°C.

The heat treatment temperatures and time of soaking employed shall be supplied by the Manufacturer to the Purchaser.

7. Selection and preparation of mechanical test samples.

(a) Bars and billets from the same cast shall be grouped in a parcel, and the Inspector shall select one test sample from the largest size of bar or billet in the parcel for testing.

(b) The test samples shall be marked as directed by the Inspector and shall then be removed from the bars or billets by nicking and breaking off or they may be sawn and, after separation from the bar, fractured. The surfaces of the fracture must show freedom from pipe or other defect.

(c) Test samples from bars or billets up to and including $1\frac{1}{8}$ in. diameter or width across flats shall be heat treated as specified in Clause 6. The tensile test piece shall be machined concentrically from the test sample.

Test samples from bars or billets over $1\frac{1}{8}$ in. diameter or width across flats shall be heat treated as specified in Clause 6. The longitudinal axis of the tensile test piece shall be $\frac{1}{16}$ in. from the surface of the test sample.

(d) A test piece shall be cut from each test sample for the forging test specified in Clause 9. The test piece shall have a length equal to its diameter or width across flats. For bars and billets up to and including 2 in. diameter or width across flats the test shall be made on the full section of the bar or billet. For bars and billets over 2 in diameter or width across flats the test may be made on the full section of the bar or billet or on a machined test piece of diameter and length not less than 2 in.

8. Tensile test.

The mechanical properties of the tensile test pieces machined from the samples selected and prepared as specified in Clause 7 must pass the tensile test specified in Clause 2.

9. Forging test.

The forging test piece selected and prepared as specified in Clause 7 (d) must withstand, without cracking, being placed on end and compressed while hot until reduced to 20 per cent. of its original length.

10. Re-tests.

(a) *Tensile test.* - If any test piece fails to pass the tensile test specified in Clause 2 the Inspector shall select for test from the same parcel two further samples; one of these must be from the bar or billet from which the original test sample was taken, unless that bar or billet has been withdrawn by the Manufacturer. Test pieces prepared from these two further samples as specified in Clause 7 must pass the tensile test specified in Clause 2.

(b) *Forging test.* - If any test piece fails to pass the forging test specified in Clause 9 the Inspector shall select from the same parcel two further samples; one of these must be from the bar or billet from which the original test sample was taken unless that bar or billet has been withdrawn by the Manufacturer. Test pieces prepared from these two further samples as specified in Clause. 7 must pass the forging test specified in Clause 9.

11. Identification.

(a) All bars $\frac{3}{4}$ in. diameter or width across flats and under and from the same cast, passed by the Inspector, shall be tied in bundles, which shall bear a tag stamped with the mark of the Inspector and such other marking as will ensure full identification of the material.

(b) All billets and all bars over $\frac{3}{4}$ in. diameter or width across flats, passed by the Inspector, shall be stamped with the mark of the Inspector and such other marking as will ensure full identification of the material. All stamping shall be done at one extreme end of each bar or billet.

SECTION III**Bars for Machining****12. Margins of manufacture.**

The margins of manufacture shall be in accordance with those given in Tables I and II of the Appendix.

13. Straightness.

All bars shall be straight.

14. Heat treatment.

(a) All bars shall be delivered in the fully heat-treated condition and in this condition before straightening must pass the tensile test specified in Clause 2.

(b) All bars shall be heat treated by being heated uniformly at a temperature of not less than 800°C. nor more than 900°C. and quenched in water or oil at the option of the Manufacturer. They shall then be heated for the requisite period at a temperature of not less than 450°C.

15. Selection and preparation of mechanical test samples.

(a) Bars from the same cast and heat treated together shall be grouped in a parcel, and the Inspector shall select one test sample from the largest size of bar in the parcel for the tensile test specified in Clause 16.

(b) The test samples shall be marked as directed by the Inspector and shall then be removed from the bars by nicking and breaking off, or they may be sawn, and, after separation from the bar, fractured. The surfaces of the fractures must show freedom from pipe or other defect.

(c) For bars up to and including $1\frac{1}{8}$ in. diameter or width across flats, the tensile test piece shall be machined concentrically from the test sample,

For bars over $1\frac{1}{8}$ in. diameter or width across flats, the longitudinal axis of the tensile test piece shall be $\frac{3}{16}$ in. from the surface of the test sample.

(d) The test samples shall not be further heat treated or mechanically worked before being tested.

16. Tensile test.

(a) The mechanical properties of the test pieces machined from the samples selected and prepared as specified in Clause 15 must pass the tensile test specified in Clause 2.

(b) If any test piece fails to pass the tensile test specified in Clause 2, the Inspector may reject the parcel represented by that test piece or at the request of the Manufacturer adopt either of the following procedures :-

(i) Select for test from the same parcel two further samples; one of these must be from the bar from which the original test sample was taken unless that bar has been withdrawn by the Manufacturer. Test pieces prepared from these two further samples as specified in Clause 15 must pass the tensile test specified in Clause 2.

(ii) Allow the parcel to be re-heat-treated in accordance with Clause 14 (b) and re-tested in accordance with Clauses 15, 16 and 17.

17. Hardness test.

(a) Ten per cent. of all bars in each parcel shall be submitted to the hardness test. The selected bars shall be tested at one end, but the Inspector at his discretion may require the hardness test to be made at both ends of each selected bar. The Brinell hardness number, or the equivalent on the scale of the method adopted, shall be not less than 159 nor more than 207.

(b) *Re-tests.* - If any bar fails to pass the hardness test specified in paragraph (a) above it may be rejected and all bars in the same parcel as that which failed shall be hardness tested in a similar manner.

Alternatively; bars which do not give the specified hardness value may be re-heat-treated in accordance with Clause 14 (b) and re-tested in accordance with Clauses 15, 16 and 17.

18. Identification.

(a) All bars $\frac{3}{4}$ in. diameter or width across flats and under and from the same cast, passed by the Inspector, shall be tied in bundles, which shall bear a tag stamped with the mark of the Inspector and such other marking as will ensure full identification of the material.

(b) All bars over $\frac{3}{4}$ in. diameter or width across flats, passed by the Inspector, shall be stamped with the mark of the Inspector and such other marking as will ensure full identification of the material. All stamping shall be done at one extreme end of each bar.

SECTION IV**Forgings**

Note. - Attention is called to the difficulty of specifying tensile test values which will accurately represent the tensile properties of forgings. The test samples only indicate the quality of the material and it must not be assumed that the properties of the forgings, and the test samples are similar.

19. Material.

The forgings shall be made from bars or billets which have been inspected and passed as complying with Section II of this specification, except that when the Manufacturer of the forgings is also the Manufacturer of the bars or billets from which the forgings are made, the tests on the bars or billets as specified in Section II may be waived at the option of the Manufacturer.

20. Heat-treatment.

(a) Unless otherwise specified on the order the forgings shall be delivered in the heat-treated condition.

(b) The test samples selected and prepared as specified in Clause 21 and the forgings shall be heat treated together. They shall be heated uniformly at a temperature of not less than 800°C. nor more than 900°C. and quenched in water or oil at the option of the Manufacturer. They shall then be heated for the requisite period at a temperature of not less than 450°C.

21. Selection and preparation of mechanical test samples.

(a) One test sample shall be provided for each batch of forgings heat treated together, from the bars or billets from which the forgings represented have been made.

The test samples, before being heat treated with the forgings may be forged in plain tools to a cross-section approximately equal to two-thirds the original cross-section of the bar or billet, or at the option of the Manufacturer they may be heat treated without being forged.

The test samples shall be marked as directed by the Inspector.

(b) When the heat treatment is carried out after delivery, the test samples shall be heated simultaneously with and similarly to the forgings they represent. The heat-treatment shall be as specified in Clause 20 (b).

(c) For test samples up to and including $1\frac{1}{8}$ in. diameter or width across flats the tensile test piece shall be machined concentrically from the sample.

For test samples over $1\frac{1}{8}$ in. diameter or width across flats, the longitudinal axis of the tensile test piece shall be $\frac{1}{8}$ inch from the surface of the sample.

(d) The test samples after being heat treated as specified in Clause 20 (b) shall not be 'further heat treated or mechanically worked before being tested.

22. Tensile test.

(a) The mechanical properties of the test pieces machined from the samples selected and prepared as specified in Clause 21 must pass the tensile test specified in Clause 2.

(b) If any test piece fails to pass the tensile test specified in Clause 2 the Inspector may reject the parcel represented by that test piece or at the request of the Manufacturer adopt either of the following procedures :-

- (i) Select for test two further samples which have been heat treated with the parcel of forgings from which the original sample was taken. Test pieces prepared from these two further samples as specified in Clause 21 must pass the tensile test specified in Clause 2.

- (ii) Allow the parcel to be re-heat-treated in accordance with Clause 20 (b) and re-tested in accordance with Clauses 21, 22 and 23.

23. Hardness test.

(a) All forgings in each parcel shall be submitted to the hardness test. The Brinell hardness number, or the equivalent on the scale of the method adopted, shall not be less than 159 nor more than 207.

(b) If any forging fails to pass the hardness test specified in paragraph (a) above it may be rejected, or at the request of the Manufacturer be re-heat-treated in accordance with Clause 20 (b) and re-tested in accordance with Clauses 21, 22 and 23.

24. Identification.

(a) Each forging, passed by the Inspector, shall be stamped with the mark of the Inspector, and such other marking as will ensure full identification of the material. All such stamping shall be done wherever it is least liable to be detrimental to the forging.

(b) Where the forgings passed by the Inspector are too small for individual marking they shall be made into parcels, which shall bear a tag stamped with the mark of the Inspector and such other marking as will ensure full identification of the material.

TABLE 1
MARGINS OF MANUFACTURE
Round and Square Bars

1	2	3
Nominal Size of Bar (Diameter or width across flats)	Rolled	Drawn after Rolling
	Margin of Manufacture -0.000	Margin of Manufacture +0.000
in.	in.	in.
$\frac{1}{16}$ (0.125)	—	-0.0015
$\frac{1}{8}$ (0.1875)	—	-0.002
$\frac{1}{4}$ (0.25)	+0.010	-0.002
$\frac{3}{16}$ (0.3125)	+0.010	-0.002
$\frac{1}{2}$ (0.375)	+0.010	-0.002
$\frac{5}{16}$ (0.4375)	+0.010	-0.002
$\frac{3}{8}$ (0.5)	+0.010	-0.002
$\frac{7}{16}$ (0.5625)	+0.010	-0.002
$\frac{1}{2}$ (0.625)	+0.010	-0.002
$\frac{9}{16}$ (0.75)	+0.010	-0.002
$\frac{5}{8}$ (0.875)	+0.010	-0.003
1	+0.015	-0.003
$1\frac{1}{16}$ (1.125)	+0.015	-0.003
$1\frac{1}{8}$ (1.25)	+0.015	-0.003
$1\frac{1}{4}$ (1.375)	+0.020	-0.003
$1\frac{3}{8}$ (1.5)	+0.020	-0.004
$1\frac{1}{2}$ (1.625)	+0.020	-0.004
$1\frac{3}{4}$ (1.75)	+0.020	-0.004
$1\frac{7}{8}$ (1.875)	+0.025	-0.004
2	+0.025	-0.004
Over 2 and up to and including 3	+1.5 per cent.	±0.5 per cent.
Over 3	+2.0 per cent.	±1.0 per cent.

Note. - Bars intermediate between the sizes given in Column 1 shall not be ordered.

TABLE 2
Hexagon Bars

Rolled Bars			Drawn Bars			Corresponding Sizes of Bright Hexagon Nuts and Bolt-heads				
Width across flats		Margin of Manufacture	Width across flats		Margin of Manufacture	Nominal Size			Width across flats	
Max.	Min.		Max.	Min.		B.S.W	B.S.F.	B.A.	Max.	Min.
in.	in.	in.	in.	in.	in.	in.	No.	in	in	
0.117	0.114	0.003	0.117	0.115	0.002	—	10	0.117	0.115	
0.152	0.149	0.003	0.152	0.150	0.002	—	8	0.152	0.150	
0.193	0.189	0.004	0.193	0.191	0.002	—	6	0.193	0.190	
0.248	0.244	0.004	0.248	0.246	0.002	—	4	0.248	0.245	
0.282	0.278	0.004	0.282	0.280	0.002	—	3	0.282	0.279	
0.324	0.320	0.004	0.324	0.322	0.002	—	2	0.324	0.321	
0.365	0.361	0.004	0.365	0.363	0.002	—	1	0.365	0.362	
0.413	0.409	0.004	0.413	0.411	0.002	—	$\frac{7}{16}$	0.413	0.410	
0.445	0.441	0.004	0.445	0.443	0.002	—	$\frac{1}{2}$	0.445	0.440	
0.525	0.521	0.004	0.525	0.523	0.002	$\frac{1}{2}$	$\frac{5}{16}$	0.525	0.520	
0.565	0.561	0.004	0.565	0.563	0.002	—	$\frac{3}{8}$	0.565	0.560	
0.600	0.596	0.004	0.600	0.597	0.003	$\frac{3}{8}$	$\frac{1}{2}$	0.600	0.595	
0.655	0.651	0.004	0.655	0.652	0.003	—	$\frac{3}{8}$	0.655	0.650	
0.710	0.706	0.004	0.710	0.707	0.003	$\frac{1}{2}$	$\frac{7}{16}$	0.710	0.705	
0.765	0.760	0.005	0.765	0.762	0.003	—	$\frac{3}{8}$	0.765	0.760	
0.820	0.815	0.005	0.820	0.817	0.003	$\frac{7}{16}$	$\frac{1}{2}$	0.820	0.815	
0.920	0.915	0.005	0.920	0.917	0.003	$\frac{1}{2}$	$\frac{7}{16}$	0.920	0.915	
1.010	1.005	0.005	1.010	1.006	0.004	$\frac{3}{8}$	$\frac{1}{2}$	1.010	1.002	
1.100	1.095	0.005	1.100	1.096	0.004	$\frac{5}{16}$	$\frac{3}{8}$	1.100	1.092	
1.200	1.195	0.005	1.200	1.196	0.004	$\frac{3}{8}$	$\frac{1}{2}$	1.200	1.192	
1.300	1.295	0.005	1.300	1.296	0.004	$\frac{1}{2}$	$\frac{3}{8}$	1.300	1.292	
1.390	1.384	0.006	1.390	1.386	0.004	—	$\frac{3}{8}$	1.390	1.382	
1.480	1.474	0.006	1.480	1.476	0.004	$\frac{1}{2}$	1	1.480	1.468	
1.670	1.664	0.006	1.670	1.666	0.004	1	$1\frac{1}{8}$	1.670	1.658	
1.860	1.854	0.006	1.860	1.856	0.004	$1\frac{1}{8}$	$1\frac{1}{4}$	1.860	1.845	
2.050	2.042	0.008	2.050	2.046	0.004	$1\frac{1}{2}$	$1\frac{1}{2}$	2.050	2.035	
2.220	2.212	0.008	—	—	—	$1\frac{3}{8}$	$1\frac{3}{8}$	2.220	2.200	
2.410	2.402	0.008	—	—	—	$1\frac{3}{8}$	$1\frac{3}{4}$	2.410	2.390	
2.580	2.570	0.010	—	—	—	$1\frac{3}{4}$	$1\frac{3}{4}$	2.580	2.555	
2.760	2.750	0.010	—	—	—	$1\frac{3}{4}$	2	2.760	2.735	
3.150	3.140	0.010	—	—	—	2	—	3.150	3.125	
Above 3.150		± 1.0 per cent.								

Note. - Bars intermediate between the sizes given in the above table shall not be ordered.

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