BHEL	**CORPORATE PURCHASING SPECIFICATION**	AA10502 Rev No.09 PREFACE SHEET

1.5% CHROMIUM – ALUMINIUM – MOLYBDENUM NITRIDING STEEL BARS - H & T

FOR INTERNAL USE ONLY

REMOVE THIS PREFACE BEFORE ISSUE TO SUPPLIERS

Equivalent/Comparable Standards:

1. INDIAN : IS 5517 – 1993, Gr: 40Cr7Al10Mo2, Type J, H & T

Suggested/Probable Suppliers and Grades:

Refer Plant Vendors list

User Plants and Replaced Plant Specifications/References:

1. HEP, BHOPAL : PS10605 & PS10567
2. HEEP, HARDWAR : HW0210299
3. HPEP, HYDERABAD : HY0210299

Revisions:			**APPROVED:** INTERPLANT MATERIAL RATIONALISATION COMMITTEE – MRC(S&GPS)		
As per Clause No.39.8 of MOM of MRC-S&GPS					
Rev No.09	Amd No.	Reaffirmed	Prepared	Issued	Dt. of 1st Issue
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1.5% CHROMIUM – ALUMINIUM – MOLYBDENUM NITRIDING STEEL BARS - H & T

1.0 GENERAL:

This specification governs the quality requirements of 1.5% Chromium-Aluminium-Molybdenum Nitriding Steel Bars, Gr:40Cr7Al10Mo2, in hardened and tempered condition.

2.0 APPLICATION:

For the manufacture of valve spindles, guide bushes, valve seats etc.

3.0 CONDITION OF DELIVERY:

Hot Rolled / Forged, Hardened and tempered.

Note: Sizes upto 100mm in hot rolled
>100 to 180mm in hot rolled or forged
above 180mm in forged

The ends of bars shall be reasonably square and true.
The bars shall be supplied in straight lengths without twists and bends.

4.0 COMPLIANCE WITH NATIONAL STANDARDS:

The material shall comply with the requirements of the following National standard and also meet the requirements of this specification.

IS: 5517 – 1993 : Steel for Hardening and Tempering – Specification
Gr: 40Cr7Al10Mo2, Type: J :
Hardened & Tempered

5.0 DIMENSIONS AND TOLERANCES:

5.1 Sizes:

The bars shall be supplied to the dimensions specified In BHEL order.

5.2 Tolerances:

5.2.1 For Forged bars:

The tolerances shall be + 8 mm − 0 mm

5.2.2 Tolerances on hot rolled bars shall comply with those of Grade 2 of IS: 3739: reproduced below:

Round and Square Bars:

Nominal size. Mm		Tolerance, mm	
Over	Upto & Including	Permissible deviation	Out of round/ square
---	25	± 0.50	0.50
25	50	± 0.75	0.75
50	80	± 1.00	1.00
80	100	± 1.25	1.25
100	125	± 1.50	1.50
125	160	± 2.00	2.00
160	200	± 2.50	2.50
200	250	± 3.00	3.00

5.2.3 On Straightness

Unless otherwise agreed to, the permissible deviation in straightness, shall not exceed the following limits in any 1000 mm length of the bar.

Upto & incl. 40 mm size of bars - 6 mm

Above 40 mm size of bars - 5 mm

5.3 Length

Bars shall be supplied in 3 to 6 metres length or in multiples with maximum of 10% shorts down to 1 metre.

Forged bars shall be supplied in length of 1.5 to 3 metres.

6.0 MANUFACTURE:

Material shall be manufactured from fully killed steel.

7.0 HEAT TREATMENT:

The recommended heat treatment is as follows:

Harden in oil / water from a temperature of 850 – 900°C.

Temper at a suitable temperature between 550 – 700°C.

8.0 FREEDOM FROM DEFECTS:

The bars shall be sound, straight and free from internal and surface defects, such as seams, laps, cracks or any other defects which may impair the end use.

9.0 CHEMICAL COMPOSITION:

The melt analysis of steel and the permissible variation in the composition of the finished product from the melt analysis shall be follows:

Element	Melt analysis, percent,		Permissible variation, percent, in product analysis
	Min.	Max.	
Carbon	0.35	0.45	± 0.02
Silicon	0.10	0.35	± 0.03
Manganese	0.40	0.70	± 0.04
Chromium	1.50	1.80	± 0.05
Molybdenum	0.10	0.25	± 0.03
Aluminium	0.90	1.30	± 0.10
Sulphur	---	0.035	+ 0.005
Phosphorus	---	0.035	+ 0.005

10.0 TEST SAMPLES:

10.1 One sample shall be taken from each melt for chemical analysis.

10.2 One sample shall be taken from each heat treatment batch for testing of mechanical properties. Test pieces for mechanical tests shall be taken in the longitudinal direction of the piece in accordance IS 5517.

For ruling section up to & including 40mm, the test piece shall be machined coaxially from the test bars. For ruling section above 40mm the longitudinal axis shall be atleast 12.5 mm from surface of the test bars.

Test methods for determining mechanical properties shall be as per IS:1598 (For IZOD impact test)/IS:1757 (For impact test in ISO-V Charpy) and IS:1608 (For tensile test).

10.3 For ruling section above 200mm, tensile test samples can be taken in tangential or transverse direction.

11.0 MECHANICAL PROPERTIES (In Hardened and Tempered Condition)

Ruling section, mm	Tensile strength, N/mm^2	0.2% PS/YS N/mm^2, min	% E $5.65\sqrt{S_0}$ min	* IZOD impact J, min
≤ 63	900 – 1050	700	15	48 (42)
> 63 to ≤ 100	800 – 950	600	16	55 (50)
>100	700 – 850	540	18	55 (50)

* Average of 3 samples applicable for sizes above 16 mm ruling section only. Values in bracket are in ISO - V Charpy.

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12.0 ULTRASONIC TEST:

12.1 Each bar above 100 mm shall be tested ultrasonically in accordance with BHEL standard AA0850118 to ensure freedom from internal defects. The norms of acceptance shall be as per category 2 of the above standard.

12.2 **Optional tests:** If specified on order, each bar >40 to 100 mm shall be tested ultrasonically in accordance with BHEL standard AA0850118 to ensure freedom from internal defects and the norms of acceptance shall be as per category 2 .

13.0 TEST CERTIFICATES:

Three copies of test certificates shall be supplied, unless otherwise stated on the order. In addition, the supplier shall ensure to enclose one copy of the test certificate along with their dispatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information:

BHEL References:
AA10502, Rev.No.09:1.5% Chromium – Aluminium – Molybdenum Nitriding Steel Bars - H & T
BHEL order No,

Result of Tests:
Dimensional inspection.
Results of chemical analysis, mechanical and Ultrasonic tests.

Supplier's References:
Name
Identification No.
Melt No.
Details of heat treatment.

14.0 PACKING AND MARKING

The bars shall be suitably packed in bundles to prevent corrosion and damage during transit. All bars 50mm and above in diameter or of equivalent cross sectional area shall be stamped with 'AA10502' and melt number on the side near the end or on the face.

Bars below 50 mm shall be bundled together and tied with wire at 3 to 4 places along the length of the bars.

A metal label shall be securely attached to each bundle and shall bear the following information:

AA10502:1.5% Chromium – Aluminium – Molybdenum Nitriding Steel Bars - H & T
BHEL Order No.
Consignment/Identification No.
Melt No.
Size and Weight.
Supplier's Name.

15.0 REFERRED STANDARDS (latest publications including amendments):

1) IS:1598 2) IS:1608 3) IS:1757
4) IS:3739 5) IS:5517 6) AA0850118