

	CORPORATE PURCHASING SPECIFICATION	AA10501 Rev No.14 PREFACE SHEET			
1.5% NICKEL-CHROMIUM-MOLYBDENUM HOT ROLLED/FORGED STEEL BARS- H & T FOR INTERNAL USE ONLY REMOVE THIS PREFACE BEFORE ISSUE TO SUPPLIERS					
Comparable Standards: 1) INDIAN : IS: 5517 – 2004 Gr: 40Ni6Cr4Mo3, Type J, H&T					
Suggested/Probable Suppliers and Grades: Refer Plant Vendors list					
User Plants References: 1) HEP, BHOPAL : PS10559 2) HEEP, HARDWAR : --- 3) HPEP, HYDERABAD : HY0210299 4) HPBP, TRICHY : En 24					
Revisions: Revised as per email dt 18.12.08 from Shri Gopal Bhatt from Bhopal.		APPROVED: INTERPLANT MATERIAL RATIONALISATION COMMITTEE – MRC(S&GPS)			
Rev No.14	Amd No.	Reaffirmed	Prepared	Issued	Dt. of 1 st Issue
Dt:18-12-2008	Dt:	Year:2020	HEP, Bhopal	Corp.R&D	April, 1977

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1.5% NICKEL-CHROMIUM-MOLYBDENUM HOT ROLLED/FORGED STEEL BARS- H & T																				
1.0 GENERAL: This specification governs the quality requirements of 1.5% Nickel-Chromium-Molybdenum Hot rolled/forged Steel Bars, Gr: 40Ni6Cr4Mo3 in Hardened and Tempered condition. 2.0 APPLICATION: For the manufacture of bolts, studs and various components of machines. 3.0 CONDITION OF DELIVERY: Hot Rolled / Forged; Hardened and tempered. Note: Sizes up to 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 COMPILANCE WITH NATIONAL STANDARDS: The material shall comply with the requirements of the following National standard and also meet the requirements of this specification. <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> IS: 5517 – 1993 Gr: 40Ni6Cr4Mo3, Type: J Hardened & Tempered </td> <td style="width: 50%; border: none; border-left: 1px solid black;"> Steels for Hardening and Tempering - Specification </td> </tr> </table> 5.0 DIMENSIONS AND TOLERANCES: 5.1 Sizes: Bars shall be supplied to the dimensions specified on the order. 5.1.1 Length: Unless otherwise specified, hot rolled bars shall be supplied in 3 to 6 metres length or in multiples with maximum 10%, shorts down to 1 metre. Forged bars shall be supplied in lengths of 1.5 to 3.0 metres			IS: 5517 – 1993 Gr: 40Ni6Cr4Mo3, Type: J Hardened & Tempered	Steels for Hardening and Tempering - Specification																
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5.2 Tolerance:

5.2.1 Hot rolled bars: The bars shall not vary from specified diameter or distance across flats by more than $\pm 2\frac{1}{2}$ %.

5.2.2 Forged bars: The tolerance on the forged bars shall be as follows.

<u>Diameter, mm</u>	<u>Tolerance, mm</u>
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50 mm to 175 mm	+ 8.0 mm
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Above 175 mm	+ 12.5 mm
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Note: (Hot rolled & forged bars).

Insignificant surface defects in the form of dent and ripple marks are permissible provided their depth does not exceed half the tolerance on each size.

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 830 – 850°C.

Temper at a suitable temperature between 550 – 660°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
Nickel	1.25	1.75	± 0.05
Chromium	0.90	1.30	± 0.05
Molybdenum	0.20	0.35	± 0.03
Sulphur	---	0.035	+ 0.005
Phosphorus	---	0.035	+ 0.005



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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.

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 at least 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) or any other reputed International Standard.

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	Hardness ** BHN
up to 30	1200, min	1000	10	30 (25)	360 – 420
> 30 to = 63	1100 – 1250	880	11	41 (35)	330 – 390
> 63 to = 100	1000 – 1150	800	13	48 (42)	300 – 350
>100 to = 150	900 – 1050	700	15	55 (50)	270 – 300
>150	800 – 950	600	16	55 (50)	240 – 285

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

** Hardness shall be reported for information only.

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.

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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:

AA10501, Rev.No.14: 1.5% Nickel-Chromium-Molybdenum Hot Rolled/Forged Steel Bars- H&T
BHEL order No,

Supplier's References:

Name:

Identification No:

Melt No:

Details of heat treatment:

Result of Tests:

Dimensional inspection.

Results of chemical analysis, mechanical and & Ultrasonic tests.

14.0 PACKING AND MARKING

The bars shall be suitably packed in bundles to prevent corrosion and damage during transit.

Each bar equal to or greater than 50 mm in diameter or of equivalent cross sectional area shall be stamped with 'AA10501' 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:

AA10501: 1.5% Nickel-Chromium-Molybdenum Hot Rolled/Forged 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: 5517

5. AA0850118