



**PLANT PURCHASING
SPECIFICATION
HYDERABAD**

HY10561

REV. NO. 04

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1.5% NICKEL-CHROMIUM-MOLYBDENUM STEEL BARS - H & T

**Gr : 34 Cr Ni Mo 6
(Old Grade : 817 M40 (En24))**

1.0 GENERAL:

This specification governs the requirements of 1.5% Nickel-Chromium-Molybdenum Steel Bars in hardened and tempered condition.

2.0 APPLICATION :

For general engineering applications requiring high tensile strength combined with good ductility and resistance to shock.

3.0 CONDITION OF DELIVERY :

Hot Rolled/Forged, Hardened and Tempered.

4.0 COMPLIANCE WITH NATIONAL STANDARDS:

This specification complies with DIN EN 10083 : 1996 ; Quenched and tempered : Technical delivery conditions for special steels ; Grade 34 Cr Ni Mo 6.

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.

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.

Revisions: Updated in line with EN10083-1.			Issued : STANDARDS ENGINEERING DEPARTMENT		
Rev.No. 04	Amd.No.	Reaffirmed	Prepared:	Approved:	Dt.of 1st Issue
Dt. FEB. 06	Dt.	Year:	STDS	SR.MGR(TS)	JAN., 1982

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Diameter, mm Tolerance, 8 mm

50 mm to 175 mm + 8.0 mm

Above 175 mm + 12.5 mm

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:

The method of steel manufacture is left to the discretion of the manufacturer. However air or mixed air and oxygen bottom blown converter process is not acceptable. The steel shall be fully killed.

7.0 FREEDOM FROM DEFECTS:

The bars shall be free from surface and internal defects such as piping, segregation etc.

8.0 HEAT TREATMENT:

The recommended heat treatment shall be as follows:

Hardening: 830 - 860° C followed by oil quenching.

Tempering: 660° C max.

Note (1) Tempering between 280 - 500°C shall be avoided.

(2) The cooling rate between the tempering temperature and 200° C shall be such as to avoid temper embrittlement.

(3) The actual heat treatment cycle followed shall be reported in the Test certificate.

9.0 SELECTION OF TEST SAMPLES:

9.1 Chemical Analysis: Each melt shall be analysed for chemical composition.

9.2 Hardness: Hardness shall be checked for 5% of the bars of same size, melt and heat treatment batch. In any case minimum two bars shall be tested for hardness.

9.3 Mechanical Properties: One sample per lot, comprising of bars of same size, melt and heat treatment batch shall be taken for mechanical tests.



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10.0 CHEMICAL COMPOSITION:

The melt analysis of material shall be as follows:

Element		C	Si	Mn	Ni	Cr	Mo	S	P
Melt analysis	Min.	0.30	0.10	0.50	1.30	1.30	0.15	-	-
	Max.	0.38	0.40	0.80	1.70	1.70	0.30	0.035	0.035
Permissible variation in check Analysis		± 0.02	± 0.03	± 0.04	± 0.05	± 0.05	± 0.03	+ 0.005	+ 0.005

11.0 MECHANICAL PROPERTIES:

The mechanical properties shall be as follows:

Ruling Section, mm (d=dia, t=thickness)	Tensile strength N/mm ²	0.2% Proof stress, min. N/mm ²	Elongation min (L=5d)	Reduction in area % min.	Notch bar impact strength, min. (ISO -V notch)	Hardness BHN
d ≤ 16 (t ≤ 8)	1200-1400	1000	9	40	35	360-420
16 < d ≤ 40 (8 < t ≤ 20)	1100-1300	900	10	45	45	330-390
40 < d ≤ 100 (20 < t ≤ 60)	1000-1200	800	11	50	45	300-360
100 < d ≤ 160 (60 < t ≤ 100)	900-1100	700	12	55	45	270-300
160 < d ≤ 250 (100 < t ≤ 160)	800-950	600	13	55	45	240-285

NOTE: 1) The tensile test shall be carried out in accordance with IS:1608 or any other reputed national standard.

2) The charpy impact test shall be performed in accordance with IS:1757 or any other reputed national standard. The specimen size shall be 10x10x55mm with a 2 mm V-Notch.

An impact test shall consist of three specimens from a single test location, the average value of which shall be as specified above.

Only one value of the three can be below the specified minimum, but in no case below 2/3rd of the specified average value.

All the three test results shall be reported in test certificate.

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11.1 Hardness test: The hardness shall be tested in accordance with IS 1500 or any other equivalent international standard.

12.0 ULTRASONIC TEST:

Each bar above 50 mm shall be tested ultrasonically in accordance with corporate standard AA 085 01 18 to ensure freedom from internal defects. The norms of acceptance shall be as per category 2 of the above standard.

13.0 RETESTS:

13.1 If any of the test specimen fails to meet the requirements specified in cl. 11, the sample bar from which the test specimen was cut shall be rejected and two further sample bars from the same lot shall be taken for retest.

13.2 If the retests also fail, manufacturer is at liberty to reheat treat the bars in question. Not more than two reheat treatments are allowed. However, retempering is not considered as reheat treatment.

13.3 If after reheat treatment, the mechanical properties are not complied with, the entire lot shall be rejected.

14.0 INSPECTION AT SUPPLIER’S WORKS:

14.1 BHEL representative/BHEL appointed Inspection Agency shall have free entry and access to all areas where the manufacture of the bars is carried out. All reasonable facilities shall be extended to him including labour wherever necessary.

14.2 BHEL representative/BHEL appointed Inspection Agency shall be given sufficient advance intimation to witness the various processes, tests, etc. Punching and identification of test coupons and execution of various tests shall be done in presence of BHEL representative/BHEL appointed Inspection Agency.

15.0 TEST CERTIFICATE:

Five copies of the test certificate shall be supplied bearing the following details.

BHEL Order No
BHEL Specification No: HY 10561/ Rev. 04
Supplier’s Name:
Identification No:
Size
Cast No.
Details of Heat treatment.
Results of Chemical analysis, mechanical tests including hardness & NDT called for in this specification.

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16.0 PACKING AND MARKING:

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

Bars above 50mm in diameter or of equivalent cross-sectional area shall be stamped HY 10561/ Rev.04 and cast no. on the side near the end or on the end face.

A metal label shall be securely attached to each bundle and shall bear the following information for the sizes less than 50 mm diameter.

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BHEL Order No.

Consignment or Identification No:

Cast No.

Size & Weight.

Supplier's Name.

17.0 REJECTION & REPLACEMENT:

In the event of the bar material proving defective in the course of further processing at BHEL, the same shall be rejected notwithstanding any previous acceptance.

The supplier shall replace the material forging at his own cost and the rejected bars shall be returned after all the commercial conditions are satisfied.