

**HIGH CARBON HIGH CHROMIUM TOOL STEEL BARS - ANNEALED**1. **GENERAL:**

This specification governs the quality of High Carbon High Chromium Tool Steel Bars, Annealed.

2. **APPLICATION:**

For the manufacture of heavy duty punches, dies, cutting saws and tools.

3. **CONDITION OF DELIVERY:**

Hot rolled/Forged and annealed.

The bars shall be supplied with ends square and true.

The bars shall be supplied in straight lengths without twists and bends.

4. **COMPLIANCE WITH NATIONAL STANDARDS:**

The material shall comply with the requirements of:

IS: 3748-1990 |
Gr: XT215Cr12, | Tool And Die Steels
Annealed |

5. **DIMENSIONS AND TOLERANCES:**5.1 **Sizes:**

Bars shall be supplied to the dimensions specified on the order.

5.2 **Tolerances:**5.2.1 **Hot Rolled Bars:**

The tolerances on hot rolled bars shall comply with those of Grade 2 of IS: 3739, reproduced below:

5.2.1.1 **Round And Square Bars:**

The permissible deviation in size for hot rolled round and square bars shall be as follows:

Revisions:			Approved:		
Ref. Cl. 16.2.60 of MOM of MRC (S&GPS)			INTERPLANT MATERIAL RATIONALISATION COMMITTEE - MR C (S&GPS)		
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Nominal size, mm		Tolerance, mm	
Over	Upto & incld.	Permissible deviation	Out of round or out of 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

5.2.1.2 Flat Bars:

The permissible deviation in size for hot rolled flat bars shall be as follows:

Nominal Width, mm			Tolerance, mm		
Over	Upto & incld.	On Width	on thickness		
			6 to 13 incld.	Over 13 to 25 incld.	Over 25 to 50 incld.
--	50	± 1.0	± 0.5	± 0.8	± 1.0
50	100	± 2.0	± 0.5	± 1.0	± 1.5
100	150	± 3.0	---	---	± 2.0

5.2.1.3 Straightness For Hot Rolled Bars:

The permissible deviation shall not exceed 5 mm in any 1000 mm length of the bar.

5.2.2 Forged Bars:

The tolerance on size for forged bars shall be +8 percent of the size.

5.3 Length:

Bars shall be supplied in 2 to 4 metres length or in multiples with maximum of 10 percent shorts down to 1 metre.

6. MANUFACTURE:

Material shall be manufactured from fully killed steel.



Sufficient reduction and discard shall be made from each ingot to ensure freedom from piping, segregation and other defects.

The material shall be rough machined, chipped or ground to remove all surface imperfections which are likely to produce defects in the finished product.

If the material is conditioned by grinding or chipping, depth of conditioning shall not exceed half the machining allowance per side and width of conditioning shall be at least four times its greatest depth.

7. FREEDOM FROM DEFECTS:

The material shall be free from defects such as seams, flakes, laps, cracks, pipes, bursts, excessive non-metallic inclusions and injurious metallic segregate.

Total decarburization shall be kept at the minimum level and in no case shall exceed 80 percent of the machining allowance.

8. CHEMICAL COMPOSITION:

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

Element	Percent		Permissible variation, percent, max.
	Min.	Max.	
Carbon	2.00	2.30	± 0.05
Silicon	0.10	0.35	± 0.03
Manganese	0.25	0.50	± 0.04
Chromium	11.00	13.00	± 0.15
Molybdenum	---	0.80	+ 0.05
Vanadium *	---	0.80	+ 0.04
Sulphur	---	0.035	+ 0.005
Phosphorus	---	0.035	+ 0.005

* Optional

Note:

Elements not quoted above shall not be added to the steel, other than for the purpose of finishing the melt and shall not exceed the following limits:



Element	Percent, Max.
Nickel	0.25
Copper	0.35
Tungsten	0.25
Tin	0.05
Cobalt	0.10

9. **TEST SAMPLES:**

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

For hardness test 5 percent of the number of pieces in the charge upto a maximum of 10 and minimum of 2 covering all sizes shall be taken.

10. **MECHANICAL PROPERTIES:**

Hardness (Brinell): As Received Condition:

When tested in accordance with IS: 1500, the test pieces shall show a Brinell hardness of 255 HB maximum.

11. **RESPONSE TO HEAT TREATMENT:**

Bars shall be capable of responding to the heat treatment specified below and the material must achieve a minimum Rockwell hardness of 60 HRC without showing any sign of over heating.

Pre-heat slowly to a temperature of 750-800°C, raise the temperature to 950-980°C and soak adequately. Quench in oil.

Temper at a suitable temperature between 100-350°C.

12. **TEST CERTIFICATES:**

Three copies of test certificates shall be supplied unless otherwise stated on the order.

The test certificate shall bear the following information:

BHEL References:

AA 108 22; Rev. No. 03

BHEL Order No.

Supplier's References:

Name.

Identification No.



Melt No.

Details of heat treatment.

Results of Tests:

Results of dimensional inspection.

Results of chemical analysis and hardness tests in annealed and hardened and tempered conditions.

13. PACKING AND MARKING:

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

Bars of sizes upto & incl. 45 mm shall be bundled together.

Bars above 45 mm in diameter or of equivalent cross-sectional area shall be stamped AA 108 22 and "melt number" 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:

AA 108 22 : High Carbon High Chromium Tool Steel Bars - Annealed.

BHEL Order No.

Consignment or Identification No.

Melt No.

Size & Weight.

Supplier's Name.