



CORPORATE PURCHASING SPECIFICATION

AA 104 01

Rev. No. 12

PREFACE SHEET

CARBON STEEL PLATES - INTERMEDIATE AND HIGH TEMPERATURE

FOR INTERNAL USE ONLY

REMOVE THIS PREFACE SHEET BEFORE ISSUE TO SUPPLIERS

Comparable Standards:

- | | | |
|-----------|---|---|
| 1. INDIAN | : | IS : 2002-1992
Gr : 2, Normalised |
| 2. GERMAN | : | DIN EN 10028, Part 2, Gr:P 265 GH
(Material No.1.0425) |

Suggested/Probable Suppliers And Grades:

- | | | |
|-------------|---|-------------------|
| 1. M/S SAIL | : | IS : 2002, Gr : 2 |
|-------------|---|-------------------|
- Refer Plant Vendors list

User Plant References:

- | | | |
|-------------------|---|-----------|
| 1. BHOPAL | : | PS 101 40 |
| 2. HARDWAR - HEEP | : | 0640.202 |

Revisions :

Cl. 27.3d MOM of MRC-S&GPS

APPROVED :

INTERPLANT MATERIAL RATIONALISATION
COMMITTEE-MRC (S&GPS)

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HYDERABAD

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CARBON STEEL PLATES - INTERMEDIATE AND HIGH TEMPERATURE

1.0 GENERAL:

This specification governs the quality requirements of Carbon Steel Plates for Intermediate and High temperature service.

2.0 APPLICATION:

For intermediate and high temperature applications requiring welding, cutting and cold and hot flanging.

3.0 CONDITION OF DELIVERY:

Plates above 12 mm thick shall be supplied in the normalizing rolling condition.

Plates 25 mm and above thickness shall be ultrasonically tested, unless otherwise specified.

The edges of plates shall be sheared with an allowance of + 12 mm over the specified dimensions.

4.0 COMPLIANCE WITH NATIONAL STANDARDS:

Material shall comply with the requirements of the following national standards and also meet the requirements of this specification.

4.1 Material shall comply with the requirements of IS:2002-1992, Gr:2.

4.2 Material offered to DIN EN 10028, part 2, Gr : P2656H (Material number 1.0425) is also acceptable.

5.0 DIMENSIONS AND TOLERANCES:

5.1 Sizes:

Material shall be supplied to the dimensions specified in BHEL order.

5.2 Tolerances:

Plates shall be supplied to the tolerances given below. Thickness shall be measured at 40 mm from locations approximately on edge and 100 mm from the corners. However, no plate shall be under the specified thickness at any point.

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**5.2.1 Thickness :**

The tolerance on thickness shall comply with the following :

Nominal thickness, mm		Permissible Deviation from the nominal thickness, mm	Permissible differences between the smaller thickness of the same plate for nominal widths, mm				
From	Upto but not incl.	Usual lower deviation from nominal thickness	From 600 upto but not incl. 2000	From 2000 upto but not incl. 2500	From 2500 upto but not incl. 3000	From 3000 upto but not incl. 3500	From 3500 4000
5	8	+1.1	0.9	0.9	1.0	1.0	--
8	15	+1.2	0.9	1.0	1.0	1.1	1.1
15	25	+1.3	1.0	1.1	1.2	1.2	1.3
25	40	+1.4	1.1	1.2	1.2	1.3	1.3
40	80	+1.8	1.2	1.3	1.4	1.4	1.5
80	150incl	+2.2	1.3	1.4	1.5	1.5	1.6
Above	150	To be agreed between BHEL and manufacturer					

5.2.2 Width:

The tolerance on width shall be as given below:

Nominal width, mm	Permissible upper deviation from nominal width, mm
From 2000 to below 3000	25

5.2.3 Length:

The tolerance on length shall be as given below:

Nominal length, mm	Permissible upper deviation from nominal length, mm
From 4000 to below 6000	30
From 6000 to below 8000	40

5.2.4 Flatness:

The tolerance on flatness shall be as follows:

Nominal thickness, mm		Deviation, mm
From	upto but not incl.	
5	8	12
8	15	11
15	25	10
25	40	9
40	150	8
>150		On mutual agreement



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6.0 MANUFACTURE :

Material shall be manufactured only from silicon killed steel having a Carbon Equivalent of 0.44 max. (melt analysis). Total aluminium content shall not exceed 0.22% for plates upto 150 mm thick and 0.035% for plates above 150mm thick.

7.0 HEAT TREATMENT:

Plates above 12 mm thick shall be normalized. Normalizing can be replaced by equivalent temperature control during and after hot rolling.

8.0 FREEDOM FROM DEFECTS :

Plates shall be cleanly rolled to the dimensions specified. The finished material shall be free from excessive segregation of impurities and cracks, surface flaws, laminations, rough, jagged & imperfect edges and internal & surface defects.

Slight scale or shell may, however, be removed by such means as chisel, file, buff or shot blast or other suitable means provided that the thickness of the material is no where reduced below the specified thickness. Hammer dressing, patching or welding of defects is prohibited.

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	Percent,		Permissible variation, percent, maximum
	min.	max.	
Carbon	---	0.20	± 0.03
Silicon	0.15	0.35	± 0.03
Manganese	0.50	1.20	± 0.04
Sulphur	—	0.040	+ 0.005
Phosphorus	—	0.035	+ 0.005

- Note :
- For plates over 25 mm and upto & including 65mm thickness, the maximum carbon content may be increased by 0.02% maximum and for plates over 65mm thickness, the maximum carbon content may be increased by 0.04%.
 - Total Aluminium content shall not exceed:
For plates upto 150mm thick - 0.020%
For plates above 150 mm thick -0.035 %
Whenever steels aluminium killed, these limits are not applicable.
 - Whenever any alloying elements are added for achieving strength, maximum carbon equivalent (CE) based on melt analysis shall not exceed 0.44.

$$CE = C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5} + \frac{Ni+Cu}{15}$$

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**10.0 TEST SAMPLES :**

Test samples shall be selected and prepared in accordance with IS : 2002.

One tensile and one bend test from each plate shall be conducted. In case of plates delivered in lengths exceeding 7 metres, one sample each shall be taken from both ends of each rolled plate (mother plate).

11.0 MECHANICAL PROPERTIES :**11.1 Tensile :**

The test pieces shall show the following properties when tested in accordance IS : 1608. The final value, observed or calculated, shall be rounded off in accordance with IS:2 Rules for rounding off numerical value.

Thickness mm	Tensile strength, N/mm ²	Yield strength, N/mm ² , min	Elongation on 5.65 $\sqrt{S_0}$ gauge length, percent, min.
≤16	410-530	265	22
>16 to ≤40	410-530	255	22
>40 to ≤60	410-530	245	22
>60 to ≤100	410-530	215	21
>100 to ≤350	400-530	200	21

11.2 Bend Test :

Bend test pieces shall be 230 mm long and not less than 40 mm wide. Bend test shall be conducted in accordance with IS : 1599.

The test piece, when cold, shall withstand without fracture, being doubled over through 180°, either by pressure or by slow and steady blows from a hammer till the internal diameter is not greater than twice the thickness of the test piece.

12.0 ULTRASONIC EXAMINATION AND ACCEPTANCE STANDARDS :

All plates 25 mm and above thick shall be ultrasonically examined in accordance with AA 085 01 20 (or ASTM A 435), unless otherwise specified and shall comply with the acceptance standards mentioned therein.

13.0 OPTIONAL:**PRESERVATION:**

If specified in the order, all plates shall be applied with a suitable rust preventive to avoid pitting.



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14.0 TEST CERTIFICATES :

Unless otherwise specified in the order, three copies of test certificates shall be supplied.

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 :

AA 104 01 Rev.12/ IS: 2002 Gr.2/DIN EN 10028, Part 2, Gr. P265 GH

BHEL order no.,

Melt no, Size & Quantity,

Batch no. with heat treatment details,

Results of chemical analysis, mechanical and Ultrasonic tests.

Supplier's name, Identification No, TC No, Signature of competent authority, etc.

15.0 PACKING AND MARKING :

Plates shall be transported suitably to avoid damage during transit.

For plates below 10 mm thick, each pile (preferably of 16 plates) and each plate 10mm thick & above shall be marked with the suppliers Identification No, Melt No. AA 10401, BHEL order no., Suppliers name, Size and weight, on any one corner and encircled with paint preferably of white colour.

16.0 REFERRED STANDARDS (Latest Publications Including Amendments):

1. IS : 2

2. IS : 1599

3. IS : 1608

4. IS : 2002

5. ASTM A 435

6. DIN EN 10028 Part 2

7. DIN EN 10029

8. BHEL CS AA 085 01 20

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