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	CORPORATE PURCHASING SPECIFICATION			AA10404	
				Rev No.05	
				PREFACE SHEET	
<div>CARBON STEEL PLATES FOR PRESSURE VESSELS FOR INTERMEDIATE AND HIGH TEMPERATURE SERVICES ASME SA515, Gr.: 70</div> <div>FOR INTERNAL USE ONLY REMOVE THIS PREFACE BEFORE ISSUE TO SUPPLIERS</div> <div>Equivalent / Comparable Standards: International : ASME SA515 Grade-70</div> <div>Probable / Suggested Suppliers and Grades: Refer plant vendors list</div> <div>User Plants and Replaced Plant Specifications / References:</div>					
Revisions:			APPROVED: INTERPLANT MATERIAL RATIONALISATION COMMITTEE – MRC(FCF+HTM)		
Rev No.05	Amd No.	Reaffirmed	Prepared HPEP, Hyderabad	Issued Corp.R&D	Dt. of 1 st Issue September 1978
Dt:12-04-2024	Dt:	Year:			

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CARBON STEEL PLATES FOR PRESSURE VESSELS FOR INTERMEDIATE AND HIGH TEMPERATURE SERVICES ASME SA515, Gr.: 70

1 GENERAL

The plates shall conform to the latest version for ASME SA515, Gr:70 and comply with the following additional requirements.

2 APPLICATION

For high temperature service at stress levels and temperatures allowed by ASME Boiler & Pressure Vessel Code, Section I and Indian Boiler Regulations.

3 MANUFACTURE

3.1 All plates shall be of fully killed steel. Drum plates shall be Vacuum Degassed conforming to S1 of SA20 and the final rolling shall be done Lengthwise.

3.2 Plates may be made from ingots or strand cast slabs wherein a reduction ratio in thickness from slab/ingot to plate shall be maintained to at least 3:1 reduction ratio up to 75mm plates and plates of 75mm thickness and above can be with reduction ratio less than 3:1 subject to meeting the requirements of clause 5.3 of SA-20/SA-20M. Sufficient "Top of Ingot" has to be discarded to ensure plate free of segregation. After top discard, the increase in carbon content at the top- mid width, mid thickness of the plate shall not exceed 20% of the reported ladle analysis value and this value shall be duly indicated in the Test certificate.

3.3 Ladle analysis: 1 sample per cast; Product analysis: Min.1 sample per plate as rolled.

Max. Carbon: CS: 0.25%.

Max. Carbon Equivalent for Carbon Steel: As per S20 of SA20.

4 HEAT TREATMENT

4.1 Normalizing Temperature: 880-920°C

4.2 SIMULATION HEAT TREATMENT for test coupons in addition to clause 4.1 shall be as follows (For CS Drum plates only as indicated in the Enquiry/PO)

Stress Relieving (SR): $615 \pm 10^{\circ}\text{C}$, 3 hr/inch of thick (t), furnace cool to 400°C

ROH/ROC for SR: $< 220^{\circ}\text{C/hr}$ divided by t in inches, but need not be slower than 55°C/hr .

5 CHEMICAL COMPOSITION

Carbon content obtained through ladle analysis shall be restricted to a maximum of 0.25% irrespective of the thickness. Maximum Carbon equivalent shall be governed by S20 of SA20.

6 TEST SAMPLES

One tensile, One High Temperature Tensile (For CS Drum plates only as indicated in the Enquiry/PO) and one bend sample for each rolled/mother plate.

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7 MECHANICAL PROPERTIES (In simulated heat treated condition for CS Drum plates and in “as delivered condition” for other CS plates)

a) Tensile Test

a) Bend Test: Angle of bend: 180 deg. Diameter of the Mandrel = 2 x Thickness of the plate as rolled.

b) High temperature tensile test for carbon steel drum plates shall be as per S7 of SA20. Min yield strength at 350°C: 19.7 kg/mm².

8 ADDITIONAL TESTS

8.1 Ultrasonic examination and acceptance standards shall be as per SA578 Level B (For all plates of thickness > 10mm).

8.2 All dimensions shall be as per PO. Tolerance on thickness of plates shall be positive only.

9 INSPECTION AT SUPPLIER'S WORKS

BHEL's representative shall have free access at all times to all parts of the manufacture's works, until the work on the contract of BHEL is being performed. The manufacturer shall offer BHEL's representative all reasonable facilities, without charge, to satisfy the latter that the material is being furnished in accordance with the specification.

10 MARKING

Hard stamping of melt number, specification, size and grade, plate number and the inspection authority's stamp on each plate along rolling direction.

a) For plates of thickness > 6mm, marking shall be by stencilling & steel die stamping.

b) For plates of thickness ≤ 6mm, marking shall be by stencilling & steel die stamping using low stress on each plate & bordered by white paint.

11 REPAIR

11.1 Fusion welding is prohibited.

11.2 When done by mechanical means, the specified thickness to be met with and the surface to be smoothly dressed up from any sharp edges.

11.3 Plates to be free of mill scales, edge crack & other injurious defects.

12 CERTIFICATION

12.1 Wherever specified in BHEL order, Test certificates (in English) shall be furnished as per IBR format FORM IV clearly specifying material meeting the requirements of ASME SA515 Gr.70 and AA10404 Rev.05 as follows

- Imported: Inspecting Authority approved by IBR for the country of origin (to be concurred by BHEL).
- Indigenous Supply: Director of Boilers/Chief Inspector of Boilers/Inspecting Authority approved by IBR, for the respective state.
- For Non-IBR application, Form IV is not applicable
- Additionally, manufacturer's test certificate shall be submitted meeting all the requirements contained in the purchase order, this specification, and the applicable ASME Specification.



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12.2 In addition to above, the following details shall be furnished with the test certificates.

- BHEL Purchase Order No, AA10404 & Rev No. 05, Test certificate number & Date, Quantity.
- Specification and Grade with applicable year of code, Heat Number, Plate number.
- Steel making process, Chemistry including incidental elements - Ladle and Product analysis [as per clause 3.3].
- Heat Treatment details of material and test coupons like temperature, soaking time, cooling medium etc.
- The certification of reduction ratio in thickness $\geq 3:1$ from a strand-cast slab/ingot to plate shall be reported in the test certificate.
- Mechanical, NDE & other test results with reference & acceptance standards.
- Print of the stamp of Inspecting Officer, which is used on the plate.
- The manufacturer shall furnish a certificate of compliance stating that the plates have been manufactured, inspected, and tested in accordance with the requirements of the applicable product specification.

13 REJECTION AND REPLACEMENT

In the event of any material proving defective during the course of preparation, machining, testing or erection such material shall be rejected notwithstanding any previous certification of satisfactory testing and/or inspection.

The supplier shall under take to replace the rejected material at his own cost and the rejected material shall be taken back by the supplier after fulfilling the commercial terms and condition.

14 REFERRED STANDARDS (Latest Publications Including Amendments)

- 1) ASME SA20
- 2) ASME SA578