



SA 263 Clad Plate Material Specification

FOR THE

CARTAGENA REFINERY EXPANSION PROJECT

CB&I CONTRACT NO. 166000

Doc. No.: 000-SP-MV09-0007

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1.0 MATERIALS

- 1.1 This material shall conform to the requirements of ASME SA-263 (SA-240 Type 410S stainless steel clad on SA-387 GR11 CL 2 base steel plate) with the additional supplementary requirements as described herein.
- 1.2 The 2004 ASME Code Section II is applicable, including the 2005 addenda.
- 1.3 Any apparent conflict between the requirements given herein and the applicable ASME Specifications shall be brought to the attention of CB&I for clarification.
- 1.4 The cladding thicknesses specified on the purchase order is 7/64" minimum thicknesses.
- 1.5 The composite thicknesses specified on the purchase order are nominal thicknesses.

2.0 MANUFACTURE

- 2.1 The clad plate shall be manufactured by roll bond cladding. Explosively bonded plates may be used when approved by CB&I.
- 2.2 The steel shall be made to fine grain practice.
- 2.3 The hardness of the base material of the test specimens shall not exceed 225 BHN at the surface.
- 2.4 The tensile strength of the material in the as-produced condition (prior to any PWHT) shall not exceed the maximum permitted by the SA-387 Gr 11 Class 2 specification.
- 2.5 Clad plate shall be supplied in accordance with the requirements of SA-263 with the minimum bond shear strength of 20,000 psi.
- 2.6 With elements expressed as percentages, all 1-1/4Cr-1/2Mo plate shall have a J factor not exceeding 120 by heat analysis, where $J = (Si + Mn) (P + Sn) (10^4)$, unless approval is obtained from CB&I for a maximum J factor of 150.
- 2.7 The 410S clad material shall conform to the following product analysis:
 - S 0.010% max
 - P 0.03% max
 - Si 0.65% max
 - Mo 0.50% max
 - Cu 0.25% max
 - N 0.05% max

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Al 0.031% max

Km 7.0 to 9.0, where $Km = (Cr+6Si+8Ti+4Mo+2Al) - (2Mn+4Ni+40C+40N+20P+5Cu)$

- 2.8 There shall be no deliberate addition of any microalloying elements without prior approval by CBI.

3.0 HEAT TREATMENT

- 3.1 The material shall be supplied in the quenched and tempered condition. The tempering temperature shall be 1275° F minimum. The tempering time shall be one half hour per inch of thickness.
- 3.2 Test coupons shall be heat treated per SA-20 S3 to simulate the postweld heat treatment during fabrication by heating uniformly to a temperature of 1275° F minimum, 1300°F maximum, and held for 8 hours minimum. The furnace for heating the test coupons shall be controlled to $\pm 10^\circ$ F. Heating above 800°F shall not be performed at a rate more than 290°F/hr and cooling above 800°F shall be performed at a rate not higher than 360°F/hr. From 800°F, the coupons may be cooled in still air.

4.0 TESTING

- 4.1 Tensile tests shall be conducted with the cladding material removed. The material shall meet the tension test requirements for SA387 Gr11 Class 2 after all heat treatment cycles.
- 4.2 Charpy V-notch impact testing shall meet the requirements below.
- 4.2.1 Impact tests shall be taken per ASME SA-20 S.
- 4.2.2 One set of impact test specimens shall be taken from each heat treated plate.
- 4.2.3 Test specimens shall be taken transverse to the principal rolling direction.
- 4.2.4 The tests shall be made at a maximum of -20°F.
- 4.2.5 The minimum average energy value of the three specimens shall be 20 ft-lbs with no more than one specimen below the minimum average and in no case shall this value be below 15 ft-lbs.

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5.0 INSPECTION

- 5.1 Clad plate shall be subject to 100% ultrasonic examination in accordance with SA-578 Supplementary Requirement S7.
- 5.2 Each heat of clad plate shall be analyzed for positive material identification, delineating the percentages of the elements specified in the applicable material specifications.

6.0 REJECTIONS AND REPAIR OF DEFECTS

- 6.1 No repair welding is permitted without prior approval by CB&I. Unless otherwise agreed to by CB&I, repairs requiring welding shall be made by CB&I with the cost charged to the plate manufacturer. Only ASME Code Section IX qualified welders and welding procedures may be used.
- 6.2 The manufacturer shall record all necessary repairs on a scaled sketch and include with the mill test report.

7.0 IDENTIFICATION

Plates shall be identified as required by Paragraph 13 of SA-20 using round bottom low stress stamps.

8.0 DOCUMENTATION

- 8.1 Mill test reports per ASME SA-20 Paragraph 19 are required.
- 8.2 The manufacturer shall report all heat treatments on the mill test reports (including times, temperatures, and method of cooling) for the base metal and test coupons.
- 8.3 The test report shall be mailed within 48 hours after shipment of the plates.