



NATIONAL PETROCHEMICAL COMPANY  
STANDARDS

MATERIAL STANDARD  
FOR  
H.P. & H.T. HEAT EXCHANGERS  
NPCS-MS-HM-02  
REVISION : 0

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1 SCOPE

This standard shall be considered as supplementing the Material Standard for Shell and Tube Heat Exchangers, NPCS-MS-HM-01 and shall be considered as taking precedence where conflict occurs.

2 MATERIALS

2.1 All forgings including those used for shells, channels, nozzles, tube sheets and covers, shall have the test coupons cut from the forging prolongations as outlined in ASTM A 336 (separate test blocks or bars are unacceptable). All forgings shall be electric furnace steel vacuum degassed.

2.2 When low Chrome materials are used, all structural and other attachments welded to them shall be of the same alloy composition.

2.3 Materials used shall be acceptable under the non-destructive examination and material testing requirements of section 6.

2.4 2 1/4% Cr 1% Mo and 3% Mo MATERIAL

2.4.1 In addition to the chemical analysis required in ASTM A 387, A 182 and A 336 analysis of Ni, Cu, As, Sn and Sb shall be included. The materials shall have a "J" factor  $(Si + Mn) \times (P + Sn) \times 10^4$  less than 180, where the concentrations are in percent. Analysis shall also be performed on deposited weld metal. The temper embrittlement factor "X" shall be 20 parts per million maximum.

$$X = (10P + 4Sn + Sb + As)/100.$$

(element concentrations are in ppm).

2.4.2 For welding materials Mn and Si levels shall be the lowest possible consistent with good weldability. Analysis for P, Sn, Sb and As shall be performed on deposited weld metal. The temper embrittlement factor "X" shall be 20 ppm maximum.

$$X = (10P + 4Sn + Sb + As)/100.$$

(element concentrations are in ppm).

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