# MATERIAL SPECIFICAITON FOR CARBON STEEL ASTM A-105 CARBON STEEL (42 KSI YIELD) HOT FINISHED AND NORMALIZED FORGED BAR AND SHAPES

| Rev | Reason of Change | Date | Made By | Reviewed By | Approved By | Status |
|---|---|---|---|---|---|---|
| 1 | Complete Amended | 09-05-2013 | USR | J Gulati | KKD | Released |


Summary: This specification covers the requirements for ASTM A105 hot finished and normalized forged bar and other shapes with restricted mechanical properties.

COVERS THE REQUIREMENTS FOR HOT FINISHED AND NORMALIZED A105 FORGED BAR AND SHAPES WITH RESTRICTED MECHANICAL PROPERTIES FOR STANDARD AND SOUR GAS SERVICE.

## 1.0 SCOPE

This specification covers the requirements for ASTM A105 hot finished and normalized forged bar and other shapes with restricted mechanical properties. This material is intended for use in both standard and sour gas service.

## 2.0 APPLICABLE SPECIFICATIONS

2.1 ASTM A105
2.2 ASTM A370
2.3 NACE MR0175

## 3.0 MANUFACTURE

3.1 For forgings, the forging ratio shall be 3:1 or greater and shall be reported in the material certification.

## 4.0 CHEMICAL ANALYSIS

4.1 The chemical analysis of the steel shall conform to the following requirements:

| | | |
|---|---|---|
| Carbon, max | 0.35% | |
| Manganese | 0.60 1.05% | |
| Phosphorus, max | 0.035% | |
| Sulfur, max | 0.040% | |
| Silicon | 0.10 0.35% | |
| Copper, max | 0.40% | B |
| Nickel, max | 0.40% | B |
| Chromium, max | 0.30% | B,C |
| Molybdenum, max | 0.12% | B,C |
| Vanadium, max | 0.08% | |

A For each reduction of 0.01% below the specified carbon maximum, an increase of 0.06% manganese above the specified maximum will be permitted up to 1.35% max.
B These four elements combined shall not exceed 1.00%.
C These two elements combined shall not exceed 0.32%.

## 5.0 HEAT TREATMENT

5.1 Allow the forgings to cool to a temperature below 1000°F immediately after forging or rolling before normalizing.

5.2 Normalize the forgings uniformly to a temperature between 1550°F and 1700°F and allow it to cool in air.

5.3 As a manufacturing option, the vendor may temper the material after normalizing, if needed to meet the hardness requirement. Per ASTM A105, the tempering shall consist of heating the forgings to a temperature between 1100°F and the lower transformation temperature for a minimum of 1/2 hour per inch of the maximum section thickness.

## 6.0 MECHANICAL PROPERTIES

6.1 The material shall conform to the mechanical properties listed below when tested per ASTM A370:

Tensile Strength, min ..... 70 ksi (483 MPa)
Yield Strength (0.2% offset), min ..... 42 ksi (290 MPa)
Elongation in 2in. or 50 mm, min
a. Strip tests (walls 5/16 in. and over), basic min . 30%
b. Std. round 2 in. or 50 mm gage length ..... 22%
c. For strip test, a deduction for each 0.032" decrease in wall thickness below 0.312" from the basic min. elongation of item "a" above ..... 1.50%
Reduction of area (round specimens only), min ..... 30%

6.2 Hardness of forgings shall not exceed 187 HB.