# SPECIFICATION FOR 17-4PH STAINLESS STEEL BARS & TUBING - DOUBLE H1150 CONDITION, -20F & -50F CHARPY IMPACTS

| Rev | Reason of Change | Date | Made By | Reviewed By | Approved By | Status |
|---|---|---|---|---|---|---|
| 0 | Initial release | 08-03-2018 | MN | AS | KKD | Released |


Summary: This specification covers 17-4PH (UNS S17400) precipitation-hardening stainless steel bars, shapes and tubing in the Double H1150 condition with minimum yield strength of 100,000 psi (689 MPa), and with -20ºF and -50ºF impacts.

# 1.0 Scope

This specification covers 17-4PH (UNS S17400) precipitation-hardening stainless steel bars, shapes and tubing in the Double H1150 condition with -20ºF and -50ºF impacts.

# 2.0 Reference Specifications

| Documents | Descriptions |
|---|---|
| ASTM A564 GR 630 | Standard Specification for Hot-Rolled and Cold- Finished Age-Hardening Stainless Steel Bars and Shapes |
| ASTM A370 | Standard Test Methods and Definitions for Mechanical Testing of Steel Products |
| ASTM A484 | Standard Specification for General Requirements for Stainless Steel Bards, Billets, and Forgings |
| ASTM A519 | Standard Specification for Seamless Carbon and Alloy Steel Mechanical Tubing |
| NACE MR0175/ ISO 15156 | Petroleum and natural gas industries - Materials for use in H2S-containing environments in oil and gas production |
| ASTM E23 | Standard Test Methods for Notched Bar Impact Testing of Metallic Materials |
| ISO 148 | Metallic Materials - Charpy Pendulum Impact Test |

# 3.0 Chemical Requirements

The chemistry shall meet the requirements listed in Table 1.

Table 1: Chemical Requirements (All are maximums unless otherwise noted)

| Elements | Wt. Percentage (%) |
|---|---|
| Carbon | 0.07 |
| Manganese | 1.00 |
| Phosphorus | 0.040 |
| Sulfur | 0.030 |
| Silicon | 1.00 |
| Chromium | 15.00 - 17.50 |
| Nickel | 3.00 - 5.00 |
| Copper | 3.00 - 5.00 |
| Niobium & Tantalum | 0.15 - 0.45 |

# 4.0 Heat Treatment

## 4.1 Bars, shapes, and tubes shall be solution treated and aged as follows.

4.1.1 Solution anneal at 1900°F (+/- 25°F) and air cool or suitable liquid quench to below 90°F before precipitation hardening.

4.1.2 Precipitation harden at 1150°F (+/- 25°F) for a minimum of 4 hours at temperature and air cool to below 90°F before the second precipitation hardening step.

4.1.3 Precipitation harden at 1150°F (+/- 25°F) for a minimum of 4 hours at temperature and air cool.

## 4.2 The following process may be used in lieu of 4.1.

4.2.1 Solution anneal at 1900°F (+/- 25°F) and air cool or suitable liquid quench to below 90°F before precipitation hardening.

4.2.2 Precipitation harden at 1400°F (+/- 25°F) for 2 hours minimum at temperature and air cool to below 90°F before the second precipitation hardening step.

4.2.3 Precipitation harden at 1150°F (+/- 25°F) for a minimum of 4 hours at temperature and air cool.

# 5.0 Mechanical Properties

The material shall meet the requirements of Table 2. Test specimens shall be removed in the longitudinal direction from actual product shape at mid-radius/mid-wall for sizes up to 10 inches. For sizes over 10", test specimens shall be taken 1" minimum below surface. Test specimens and test methods shall be per ASTM A370.

All the bars and tubing shall be checked for hardness.

Table 2: Mechanical Requirements (All are minimums unless otherwise noted)

| | |
|---|---|
| Tensile Strength | 125,000 psi (862 MPa) |
| Yield Strength | 100,000 psi (689 MPa) |
| Elongation in 2" or 4D | 18% |
| Reduction of Area[1] | 35% |
| Hardness (Raw)[2] | 28-31 HRC |
| Hardness (Finished), max | 33 HRC |
| [1]Reduction of area need not be reported on tubing with wall thickness less than 7/8". | |
| [2]Reduced hardness to compensate for work hardening during machining. | |

The material shall meet the impact requirements of Table 3. Impact testing shall be in accordance with ASTM E23 or ISO 148. Charpy V Notch impact testing shall be performed in the longitudinal direction. In the event that the material diameter or thickness is too small to permit the smallest sub size charpy specimen listed in the above industry specifications, then the requirement shall be waived. An example would be that of a small diameter spring.

Table 3: Impact Property Requirements

| | | |
|---|---|---|
| Testing Temperature[1] | -20°F (-29°C) | -50°F (-46°C) |
| Average Impact energy, min (set of 3) | 31 ft-lb (42 J) | 20 ft-lbs (27 J) |
| Single value Impact energy, min | 23.6 ft-lb (28 J) | 15 ft-lbs (20 J). |
| Mils Lateral Expansion | 0.015 in (0.38 mm) | --- |
| Percent Shear | Report Actual Values | |
| [1] Testing at lower test temperatures is acceptable as long as the same minimum impact energies are met. | | |

**NOTE: If material tested at -50°F or colder has energy values which meet or exceed the values listed for -20°F, the tests at -20°F are not required. When the -20°F test is not run, then the lateral expansion must meet the - 20°F value and the percent shear must be reported.**

## 6.0 **Workmanship**

Material shall be inspected in accordance with part report (DBI). Material shall be free of injurious defects that are detrimental to the integrity of the final product, such as laps, scabs, cracks and exogenous inclusions.