ALLOY STEEL (AISI 4340) BARS AND TUBING, 120 KSI YIELD, LONGITUDINAL AND TRANSVERSE IMPACT REQUIREMENTS AT -40F, STANDARD SERVICE

Rev	Reason of Change	Date	Made By	Reviewed By	Approved By	Status
0	Initial release	26-05-2018	MN	AS	KKD	Released

Summary: This specification covers the requirements for AISI 4340 grade of alloy steel bars, tubing and shapes with impact test required in both transverse and longitudinal directions.

1.0 SCOPE

1.1 This specification covers the requirements for AISI 4340 grade of alloy steel bars, tubing and shapes with impact test required in both transverse and longitudinal directions. The material is intended for component parts for standard service applications only.

2.0 APPLICABLE SPECIFICATIONS

2.1 ASTM A29, A322, A370, and A519

3.0 MANUFACTURE

3.1 The steel shall be made by electric-furnace process. Primary melting may incorporate separate degassing or refining and may be followed by secondary melting.

3.2 The steel shall be fully killed and made to fine austenitic grain size.

3.3 Tubes shall be made by a seamless process and shall be either hot finished or cold finished as specified.

4.0 CHEMICAL ANALYSIS

4.1 The chemical analysis of the steel shall conform to the chemical requirements listed below. The product analysis tolerances of the steel shall be per the applicable tables of ASTM A29.

Carbon.....	0.38-0.43%	Silicon.....	0.15-0.35
Manganese.....	0.65-0.85	Nickel.....	1.65-2.00
Phosphorus.....	0.025 max	Chromium.....	0.70-0.90
Sulfur.....	0.025 max	Molybdenum.....	0.20-0.30

5.0 HEAT TREATMENT

5.1 Bars, tubes and shapes shall be furnished in the normalized, quenched, and tempered condition.

6.0 MECHANICAL PROPERTIES

6.1 The material shall meet the following mechanical properties. Test specimens and test methods shall be per ASTM A370.

6.2 Tensile and impact properties of the forgings/material shall meet the following requirements.

Tensile strength, min..... 130 ksi (896 MPa)
Yield (0.2% offset) strength, min... 120 ksi (827 MPa)
Elongation in 2" or 4D, min..... 16%
Reduction of area, min..... 35%

Charpy V-notch Impact Energy Values (10mm x 10mm specimens) at test temperature of -40ºF (-40ºC):

	Longitudinal	Transverse
Min. average for set of 3 specimen	31 ft-lb (42 J)	21 ft-lb (28 J)
Min. for individual specimens of set	21 ft-lb (28 J)	14 ft-lb (18.7J)
Lateral expansion	Actual values	Actual values
Percent shear (reference only)	Actual values	Actual values

6.3 Maximum hardness.....341 HB
Minimum hardness (for reference only)..... 285 HB

7.0 HEAT TREATMENT

PROCESS	ATMOSPHERE/MEDIA	TEMPERATURE	TIME AT TEMPERATURE
Normalized	Air	1600 ºF – 1700 ºF (870 ºC – 925 ºC)	30 Minutes / Inch of T, Minimum Time is 30 Minutes.
Still air cool to below 400 degrees F (204 degrees C) before further processing			
Austenitize	Air	1550 ºF - 1650 ºF (840 ºC – 900 ºC)	30 Minutes / Inch of T, Minimum Time is 30 Minutes.
Quench	Oil, Polymer	104 ºF (40 ºC) - 158 ºF (70 ºC)	
First Temper	Air	1050 ºF – 1250 ºF (565 ºC – 680 ºC)	1 hour per inch of maximum through thickness. One-hour Minimum.
Second Temper	Air	1025 ºF – 1225 ºF (551 ºC – 666 ºC)	1 hour per inch of maximum through thickness. One-hour Minimum.

Note: Maximum holding time shall not exceed Five times (5X) the maximum holding time. In all case, holding time shall not start until parts or materials have reached specified heat treatment temperature. The 5X rule does not apply to the separate QTC (e.g. ER 5").

8.0 WELD REPAIRS

7.1 No weld repairs shall be performed.