

TECHNICAL SPECIFICATION

EndurAlloy™ Production Tubing Manufactured by Endurance Technologies Inc.

Endurance Technologies Inc. (ETI) is the manufacturer and supplier of EndurAlloy Production Tubing. The production tubing has a uniform and consolidated iron boride (FeB) case depth through the entire working surface, e.g. inner surface, without spalling and delamination. The boronized surface is produced through the ETI proprietary EndurAlloy thermal diffusion process.

The tubing is mainly produced from J55 production tubing and casing.

1. Dimensions of Tubing and Casing

Typical dimensions are in accordance to API (see Table 1 and 2)

Tubing

Length is in the Range 2: 28 – 32 ft or 8.54 – 9.76 m

OD		ID		OD of Coupling (upset reg.)		Linear Density (upset)	
inch	mm	inch	mm	inch	mm	lb/ft	kg/m
2-3/8	60.3	1.995	50.67	3.063	77.80	4.70	6.99
2-7/8	70.3	2.441	62.00	3.668	93.17	6.50	9.67
3-1/2	88.9	2.992	76.00	4.500	114.30	9.30	13.84
4-1/2	114.3	3.958	100.53	5.563	141.30	12.75	18.97

Casing

Length is in the Range 2: 25 – 34 ft or 7.62 – 10.37 m

OD		ID		OD of Coupling		Linear Density	
inch	mm	inch	mm	inch	mm	lb/ft	kg/m
4-1/2	114.3	4.052	102.92	5.0	127	10.50	15.63
		4.000	101.60			11.60	17.26
5-1/2	139.7	4.950	125.73	6.050	153.8	15.50	23.07
		4.892	124.26			17.00	25.30

Other dimensions are possible upon request

2. Hardness

Hardness of the actual boronized layer 1600 - 1850 HK0.1 (Knoop hardness determined at 100-g load in accordance to ASTM E384-10)

Note: carbon steel (J55) hardness 160 – 180 HK0.1

3. Mechanical Properties

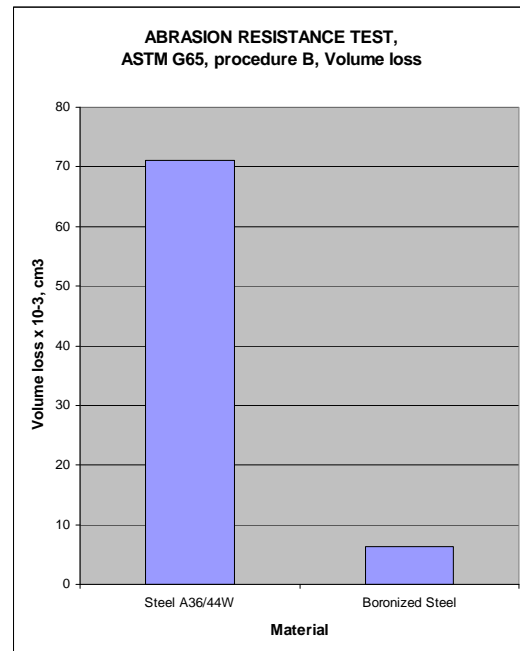
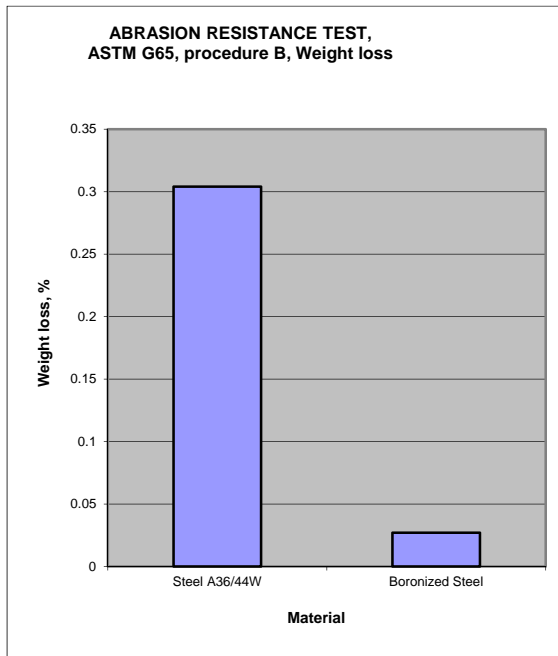
Typical yield strength, ultimate tensile strength and % of elongation of the boronized samples can be seen in Table 3

Property	Data
Yield strength, 0.2% offset, MPa	380 - 410
Ultimate tensile strength, MPa	600 - 660
% of elongation	18 - 20

Mechanical properties measured in accordance to ASTM A370-12A

4. Wear Resistance

Wear resistance determined in accordance to ASTM G65, procedure B (Dry sand rubber wheel test, 2000 revolutions) – weight loss (%) and volume loss (cm³) are compared for boronized and untreated carbon steels (typical data)



5. Corrosion and Temperature Resistance

Boronized coating can be successfully used without degradation at temperatures up to 500°C. They have stable behavior without degradation in many corrosive environments, including gaseous, acidic and salt environments at elevated temperatures and pressures.