CRA 2550E (UNS N06255)

CRA 2550E (UNS N06255) is a premium, electro-slag re-melted version of alloy 2550. The performance and consistency are enhanced through tightly controlled compositional limits and microstructural cleanliness. 2550 is a cold hardened nickel-based alloy intended for corrosion resistance to severe sour (H_2S) environments with high chloride content, requiring high strength and temperature resistance. The high nickel and molybdenum content of 2550 extends the sour service limits of nickel alloys while also providing excellent resistance to chlorides and dissolved oxygen. It is therefore used for downhole tubular components, packers, and other subsurface equipment in severely sour wells with high-pressure and high-temperature (HPHT) conditions, saltwater Injection wells, and Acid Gas Injection (AGI) wells. However, all environmental factors, including H_2S, CO_2, temperature, pH, and chloride concentration, should be considered before final material selection.

For sour service applications, it is classified in MR0175/ISO15156 as a type 4d alloy, with no restrictions to a partial pressure of H_2S below 300°F and resistant to 300 psi H_2S at 425°F.

CRA 2550E has excellent hydrogen embrittlement resistance at all standard strength levels.

NOMINAL COMPOSITION

Chromium 25% Nickel 50% Molybdenum 6% Iron Balance

Hydrogen Embrittlement SSRT Testing (-1.1Vsce in 3.5 wt % NaCl)			
Grade	**Elongation Ratio**	**RA Ratio**	**TTF Ratio**
2550E-110	1.00	0.98	0.98
2550E-125	1.00	0.98	0.95
2550E-140	0.98	1.00	1.00

SPECIFIED MECHANICAL PROPERTIES - API 5CRA / ISO 13680 Group 4 Category 25-50-6

Yield Strength min. (ksi)	Yield Strength max. (ksi)	Tensile Strength min. (ksi)	Elongation min. (%)	NACE MR0175/ISO 15156 Compliant
110	140	115	11	YES
125	150	130	10	YES
140	160	145	9	NO*

*NACE MR0175/ISO 15156 limits maximum yield strength to 150 ksi

TYPICAL ROOM TEMPERATURE LONGITUDINAL TENSILE PROPERTIES

Grade	Yield Strength ksi (MPa)	Tensile Strength ksi (MPa)	Elongation (%)
2550E-110	128 (883)	136 (938)	21
2550E-125	135 (931)	142 (979)	19
2550E-140	151 (1041)	166 (1145)	18

TYPICAL ELEVATED TEMPERATURE TENSILE PROPERTIES OF 2550E-125

	Longitudinal		Transverse	
Temperature	Yield Strength ksi (MPa)	Tensile Strength ksi (MPa)	Yield Strength ksi (MPa)	Tensile Strength ksi (MPa)
70°F	134 (924)	139 (958)	123 (848)	140 (965)
250°F	118 (814)	122 (841)	116 (800)	130 (896)
350°F	117 (807)	120 (827)	114 (786)	127 (876)
450°F	116 (800)	119 (820)	113 (779)	126 (869)
550°F	112 (772)	117 (807)	112 (772)	122 (841)

TYPICAL CHARPY V-NOTCH IMPACT TOUGHNESS

Grade	Temperature	Orientation	Ft-lbs (Joules)
2550E-110	14°F (-10°C)	Transverse (C-L)	131 (97)
2550E-125	14°F (-10°C)	Transverse (C-L)	124 (91)
2550E-125	-75°F (-60°C)	Transverse (C-L)	117 (87)
2550E-140	14°F (-10°C)	Transverse (C-L)	99 (73)

TYPICAL PHYSICAL PROPERTIES

		70°F	250°F	350°F	450°F
Density	lbs/in^3	0.297	0.296	0.295	0.294
Thermal Expansion	$X10^{-6}/°F$	-	7.2	7.4	7.7
Elastic Modulus	psi x 10^6	28.5	27.9	27.8	27.6
Poisson Ratio		0.29	0.29	0.29	0.3
Thermal Conductivity	W/ft °F	1.5	1.8	2.0	2.2
Specific Heat	Btu/lb °F	0.09	0.10	0.10	0.11