



Certificate of Conformance

Serial Number	Size	Type	Steel or Matrix	Shank Diameter	Bore
N-088	2.50	SJT	Steel		
Component					
Material		Vender		Lot or Heat Number	
Blank	4140 Steel		RHW	A174250	
Hard Powder					
Soft Capping Powder					
Tool Joint					
MIG Weld					
WP Tube					
Inspection					
Diamond Grinding To Size					
Weld MPI					
Thread Gaging	#48401 .375" stand-off		1"		
Signed By: _____ date: _____					

Certified Material Test Report

Cert #: 272099	Mill Order: 1716796	Heat #: A174250	Issued: 10/18/2017 16:04:29
Work Order: 239526	Sales Order: 185108-1	Customer: EMJ	PO #: P814831-453-1
Load #: 282063	Reference #: 533460	Reference Desc:	End Use:
Size: 2-3/4"	Shape: Round	Grade: 4140/4142	Length: 20' 1"
Grain Practice: A1 Fine Grain (5-8) per ASTM A29	Reduction Ratio: 24.5 to 1	Disposition: Rolled Prime	

Ladle Chemistry Analysis (ASTM A29)

C	Mn	P	S	Si	Al	Cu	Ni	Cr	Mo	Sn	N	V	Cb	B	Ca	W	Ti	DI
0.42	0.84	0.009	0.016	0.25	0.034	0.24	0.11	1.03	0.20	0.010	0.0100	0.004	0.001	0.0004	0.0005	0.000	0.001	5.76
Pb	Co	As	Sb	Zr	Bi	H (ppm)	O (ppm)	Ceq	J-Factor									
0.000	0.008	0.004	0.003	0.000	0.000	1.5		0.83	207									

Product Check Analysis (ASTM A29)

	C	Mn	P	S	Si	Al	Cu	Ni	Cr	Mo	Sn	N	V	Cb	Ti	B	Ca	O
Front																		
Back																		

Jominy (ASTM A255)

	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J12	J14	J16	J18	J20	J24	J28	J32
Calc'd Standard	57	57	57	57	57	57	57	57	55	54	50	50	48	47	47	45	43	40
Calc'd Metric	1.5	3	5	7	9	11	13	15	20	25	30	35	40	45	50			
	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J12	J14	J16	J18	J20	J24	J28	J32
Front																		
Back																		

Microcleanliness (ASTM E45)

Method A								Method C		Method E		Microcleanliness (DIN 50602)	
AT	AH	BT	BH	CT	CH	DT	DH	S	O	SAM "B"	SAM "D"	S	M
												Tot	Tot

Decarb

Depth	% of Diameter

Grainsize

Austenitic	Ferritic
7	

Macrostructure (ASTM E381)

S	R	C
1	1	2

Magnetic Particle Inspection

Frequency	Severity

Mechanical Properties (ASTM A370)

Tensile Properties					Hardness	
Tensile Strength	0.2% Yield Strength	% Elong (2")	% ROA	0.35% EUL Yield Strength	(MR)	(Surf)

Steel Dynamics - Engineered Bar Products has a quality system in place which has been certified ISO 9001:2008 compliant, including PED certification.

Comments/Specs

ASTM A322-13 — Electric Arc Furnace Melted - Vacuum Tank Degassed — Quench & Temper, Straighten, Stress Relieve — Quench & Temper, Straighten, Stress Relieve — ASTM A434-17 Class BD

Condition: Quench, Temper, Straighten, Stress Relieve, Contact UT

UT: Passed Ultrasonic Inspection

I hereby certify that the content of this report is correct and accurate, and that all tests and operations performed on this material were in compliance with applicable material specifications and purchaser designated requirements.

Jonathan Vallosio
 Jonathan Vallosio - Rolling Mill Metallurgist (ES)

Any alteration to this report voids Steel Dynamic's warranting of results. No weld repair has been performed on this material. This material is not radioactive and has not been exposed to radioactivity while under the control of Steel Dynamics. This material has not been exposed to mercury while under the control of Steel Dynamics. Unless otherwise noted, this material was melted, continually cast, and rolled in the USA; w/ all testing performed by Steel Dynamics.

2.5 SK

N-086
 (1)

2.5 SJT-N-088

10/14/17 533460 A174250 R325858 @

Certified Material Test Report Heat Treatment Addendum

Cert #: 272099	Mill Order: 1716796	Heat #: A174250	Issued: 10/18/2017 16:04:31
Work Order: 239526	Sales Order: 185108-1	Customer: EMJ	PO #: P814831-453-1
Load #: 282063	Reference #: 533460	Reference Desc:	End Use:
Size: 2-3/4"	Shape: Round	Grade: 4140/4142	Length: 20' 1"

Normalize		Austenitize		Quench Media			Temper		Stress Relieve	
Time	Temp	Time	Temp	Type	Time	Temp	Time	Temp	Time	Temp
hrs	F	2.3 hrs	1650 °F	Water	15 min	95-104 °F	5.5 hrs	1075 °F	6.0 hrs	900 F

* Furnaces are calibrated to API 6A Annex M, and use atmospheric thermocouples.
** QTC is 12" prolongation from longitudinal orientation, machined to a 0.505" buttonhead for tensile.

Charpy Impact (ASTM E23) (v-notch 10mm x 10mm)				Impact Energy (ft-lbs)				Lateral Expansion (0.001")				% Shear				
Sample ID	Orientation	Location	Temp(F)	1	2	3	Avg	1	2	3	Avg	1	2	3	Avg	
47701	Longitudinal	1" Below	Q1	-20	51	52	53	52	31	31	31	31	10	10	10	10
47801	Longitudinal	1" Below	Q1	-20	45	45	45	45	24	26	23	24	10	10	10	10
47711	Longitudinal	1" Below	Q2	14	47	47	48	47	25	26	28	26	10	10	10	10
47811	Longitudinal	1" Below	Q2	14	48	49		48	25	26	30	27	10	10	10	10
47721	Longitudinal	1" Below	Q3	70	57	56	57	56	41	35	34	37	10	10	10	10
47821	Longitudinal	1" Below	Q3	70	61	60	61	61	36	38	39	38	10	10	10	10

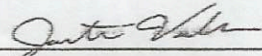
Hardness (ASTM A370)

Sample ID	Location	HB
47701	1" Below Q1	321
47801	1" Below Q1	322
47704	Surface Q1	302
47804	Surface Q1	311
47714	Surface Q2	302
47814	Surface Q2	321

Tensile (ASTM A370)

Sample ID	Orientation	Location	Tensile	0.2% Yield	%ROA	%E (2")
47700	Longitudinal	Mid-Radius Q1	152,700 psi	133,600 psi	psi 54	18
47800	Longitudinal	Mid-Radius Q1	154,900 psi	137,100 psi	psi 53	17

I hereby certify that the content of this report is correct and accurate, and that all tests and operations performed on this material were in compliance with applicable material specifications and purchaser designated requirements.


Jonathan Vallosio - Bar Finishing Metallurgist

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