



SERIAL NUMBER: N-050 / 051 COOK DATE: —

MOLD SIZE — BY —

ORDER DATE 20 FEB 18 SHIP DATE: 05 MAR 18 PO —

FOR SLB SIZE 5.000 TYPE SK

THREAD 2 3/8 PAC OTHER —

MATRIX (H) — WEIGHT —

MATRIX (S) — WEIGHT —

BINDER — WEIGHT —

BLANK — TJ —

BILLET A174587 TUBE —

WELD BY — MPI BY — MPI PIC —

THREAD GAGE — STAND OFF .625

NOTES —

FINAL DIAMOND GRIND SIZE —

LENGTH TO WELD — / —

FINISHED PIC TAKEN BY — SHIPPED BY — DATE: —

SHORT BIT & TOOL CO
225 GOLD STREET
GARLAND TX 75042
972-205-1011
main@shortbits.com

Certified Material Test Report

Cert #: 273738	Mill Order: 1718824	Heat #: A174587	Issued: 10/9/2017 13:56:12
Work Order: 238065	Sales Order: 184567-1	Customer: Sigma Tube and Bar, LLC	PO #: M01505418-1
Load #: 281087	Reference #:	Reference Desc:	End Use:
Size: 5-1/4"	Shape: Round	Grade: 4140	Length: 20' 1"
Grain Practice: AI Fine Grain (5-8) per ASTM A29		Reduction Ratio: 6.7 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	0.91	0.009	0.007	0.29	0.025	0.14	0.22	1.05	0.22	0.007	0.0082	0.023	0.027	0.0004	0.0014	0.000	0.001	6.73
Pb	Co	As	Sb	Zr	Bi	H (ppm)	O (ppm)	Ceq	J-Factor									
0.001	0.006	0.003	0.002	0.000	0.000	1.1		0.85	192									

Product Check Analysis (ASTM A29)

	C	Mn	P	S	Si	Al	Cu	Ni	Cr	Mo	Sn	N	V	Cb	Ti	B	Ca	O
Front	0.44	0.86	0.010	0.011	0.26	0.019	0.15	0.22	1.03	0.21	0.007	0.0090	0.018	0.020	0.001	0.0005	0.0010	
Back	0.44	0.88	0.012	0.008	0.26	0.018	0.15	0.23	1.06	0.22	0.008	0.0100	0.019	0.024	0.001	0.0004	0.0004	

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	57	57	57	55	52	51	51	51	49	45
Calc'd Metric	1.5	3	5	7	9	11	13	15	20	25	30	35	40	45	50			
Front	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J12	J14	J16	J18	J20	J24	J28	J32
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	O	Tot	M	Tot
1.0	0.8	0.0	0.0	0.0	0.0	1.0	0.5										

Decarb		Grainsize		Macrostructure (ASTM E381)			Magnetic Particle Inspection	
Depth	% of Diameter	Austenitic	Ferritic	S	R	C	Frequency	Severity
		8		1	1	2		

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

Electric Arc Furnace Melted - Vacuum Tank Degassed ---- UT Tested to ASTM A388 1/8FBH ---- UT Tested to ASTM A388 1/8FBH ---- Normalize, Q&T, Straighten, Stress Relieve ---- Normalize, Q&T, Straighten, Stress Relieve ---- DIN EN 10204:2004 Paragraph 3.1 ---- Pres Equip Direct(PED) 97/23/EC/7/2 Anx I, Par 4.3 ---- Sigma Tube & Bar STB-20 Rev 5 (125-140k Yield) ---- EAF, VTD, 10x14 Continuous Bloom Cast ---- Batch Furnace Heat Treatment ---- Magnetic Particle Inspection Capable ---- Test Bars taken from Production Heat Treat Bars

dwyrick
10/9/2017, 4:15 PM
MTR Approved

Condition : Normalize, Quench, Temper, Straighten, Stress Relieve, Shot Blast

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 - 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.

Certified Material Test Report Heat Treatment Addendum

Cert #: 273738	Mill Order: 1718824	Heat #: A174587	issued: 10/9/2017 13:56:14
Work Order: 238065	Sales Order: 184567-1	Customer: Sigma Tube and Bar, LLC	PO #: M01505418-1
Load #: 281087	Reference #:	Reference Desc:	End Use:
Size: 5-1/4"	Shape: Round	Grade: 4140	Length: 20' 1"

Normalize		Austenitize		Quench Media		Temper		Stress Relieve		
Time	Temp	Time	Temp	Type	Time	Temp	Time	Temp	Time	Temp
3.63 hrs	1650 F	3.8 hrs	1600 °F	Water	20 min	100-104 °F	6.4 hrs	1100 °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	
40700	Longitudinal	Mid-Radius	Q1	-26	61	59	59	60	24	25	25	25	50	50	50	50
41000	Longitudinal	Mid-Radius	Q1	-26	67	66	67	67	26	32	36	31	60	60	60	60
41700	Longitudinal	Mid-Radius	Q1	-26	51	51	50	51	25	20	21	22	50	50	50	50

Hardness (ASTM A370)		
Sample ID	Location	HB
40700	Mid-Radius Q1	307
41000	Mid-Radius Q1	305
41700	Mid-Radius Q1	324
40710	Mid-Radius Q2	307
41010	Mid-Radius Q2	305
41710	Mid-Radius Q2	324

dwyrick
10/9/2017, 4:16 PM
MTR Approved

Tensile (ASTM A370)							
Sample ID	Orientation	Location	Tensile	0.2% Yield	0.6% EUL Yield	%ROA	%E (2")
40700	Longitudinal	Mid-Radius Q1	149,800 psi	131,700 psi	131,900 psi	54	18
41000	Longitudinal	Mid-Radius Q1	142,100 psi	122,200 psi	123,050 psi	55	19
41700	Longitudinal	Mid-Radius Q1	148,000 psi	126,800 psi	124,500 psi	53	19
41010	Longitudinal	Mid-Radius Q2	139,100 psi	119,000 psi	119,300 psi	56	19
41710	Longitudinal	Mid-Radius Q2	155,800 psi	136,500 psi	135,800 psi	52	19
4710	Longitudinal	NR Q1	147,000 psi	127,500 psi	127,600 psi	53	18

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 - Bar Finishing Metallurgist

Any alteration to this report voids Steel Dynamic's warranting of results.