

Certified Material Test Report

Cert #: 302055	Mill Order: 1824430	Heat #: A185465	Issued: 1/2/2019 00:18:10
Work Order: 272327	Sales Order: 208477-1	Customer: American Alloy Steel	PO #: 116892-1
Load #: 320940	Reference #:	Reference Desc:	End Use:
Size: 1-3/4"	Shape: Round	Grade: A350/LF2 Chem	Length: 28'
Grain Practice: Al Fine Grain (5-8) per ASTM A29		Reduction Ratio: 60.4 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
0.18	1.14	0.011	0.004	0.24	0.030	0.20	0.08	0.11	0.03	0.008	0.0063	0.031	0.000	0.0000	0.0010	0.000	0.001	0.86
Pb	Co	As	Sb	Zr	Bi	H (ppm)	O (ppm)	Ceq	J-Factor									
0.000	0.006	0.004	0.003	0.000	0.000	1.4		0.42	262									

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	1.5	3	5	7	9	11	13	15	20	25	30	35	40	45	50			
Calc'd Metric																		
Front																		
Back																		

Microcleanliness (ASTM E45)

Method A								Method C (SAE J422)		Method E	
AT	AH	BT	BH	CT	CH	DT	DH	S	O	SAM "B"	SAM "D"

Microcleanliness (DIN 50902)

K			M
S	O	Tot	Tot

Decarb

Depth	% of Diameter

Grainsize

Austenitic	Ferritic

Macrostructure (ASTM E381)

S	R	C

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 9001:2015 compliant, including PED certification.

Comments/Specs

Electric Arc Furnace Melted - Vacuum Tank Degassed --- Normalize and Machine Straighten --- Normalize and Machine Straighten --- ASTM A350-12 LF2 Class 1 --- ASTM A696-90a Grade C --- ASTM A675-03 Grade 70 --- ASME SA350-04 LF-2 Class 1 --- ASME SA105-04 --- ASME SA696-04 Gr C --- ASME SA675-04 Gr 70 --- Complies with EN 10204 type 3.1 --- Pres Equip Direct(PED) 97/23/EC/7/2 Annex I, Par 4.3 --- ASTM A105/A105M -18

Certified true copy of the original retained in our file.
AMERICAN ALLOY STEEL
 AL 1-4-19

Condition: Normalize, Straighten

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.

1-3M Dic SA 350 LF-2 / SA 105 / SA 675-70 / SA 696-04 C
 Part Green
 Ht. A185465
 Silver

Certified Material Test Report Heat Treatment Addendum

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Normalize		Austenitize		Quench Media		Temper		Stress Relieve		
Time	Temp	Time	Temp	Type	Time	Temp	Time	Temp	Time	Temp
hrs	°F	hrs	°F		min	°F	hrs	°F	hrs	°F
3.5	1670									

* 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)

Sample ID	Orientation	Location	Temp(F)	Impact Energy (ft-lbs)				Lateral Expansion (0.001")				% Shear				
				1	2	3	Avg	1	2	3	Avg	1	2	3	Avg	
97900	Longitudinal	Mid-Radius	Q1	-50	80	96	92	90	55	59	58	57	100	100	100	100

Hardness (ASTM A370)

Sample ID	Location	HB
97900	Mid-Radius Q1	148
97910	Mid-Radius Q2	148

Tensile (ASTM A370)

Sample ID	Orientation	Location	Tensile	0.2% Yield	%ROA	%E (2")
97900	Longitudinal	Mid-Radius Q1	73,000 psi	49,800 psi	69	35

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Jonathan Vallosio
 Jonathan Vallosio - Bar Finishing Metallurgist

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