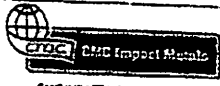


New West
PO 75706
WO 5399 CPA

MM10101093



EMC IMPACT METALS Ohio
15 Union St. Building 3
Structures OH 44471-2901
800-682-7137
www.emcimpactmetals.com

Material Test Report

Production Date
10.07.2010

[Signature]

Tom Carter, Technical Director



Customer PO No.	65055 SO 63573	BOL No.	0000308252	Delivery No.	0080391281	Sales Order No.	0000415057
Customer Part No.							

Product Description	ROUND:SBQ 5-1/2" 20R 1022M, 1022 Mod Norm A105/A350 LF2	Alternate Grades:	ASTM/ASME A/SA 105-10, ASTM A696-90A GR C ASTM/ASME A/SA 350-07 GR. LF2 CLASS 1 ASTM/ASME A/SA 675-03 GR 70, NACE MRO175-03 EN 10204:04 3.1
Processing	Normalize, Straighten		

CHEMICAL ANALYSIS

Heat No.	C (%)	Mn (%)	P (%)	S (%)	Si (%)	Cu (%)	Cr (%)	Ni (%)	Mo (%)	V (%)	Cb (Nb) (%)	Al (%)
MM10101093	0.20	0.88	0.010	0.019	0.21	0.22	0.08	0.08	0.030	0.003	0.002	0.032
Batch No.	Ti (%)	B (%)	As (%)	Pb (%)	Sb (%)	Zr (%)	N2 (ppm)	O2 (ppm)	H2 (ppm)	DI (in.)	CE (%)	
101003Y617											0.39	

THERMAL PROCESSING

Furnace No.	Austenitizing Temp. (°F)	Austenitizing Time (min)	Tempering Temp. (°F)	Tempering Time (min)	Normalizing Temp. (°F)	Normalizing Time (min)	Quench Media	Quench Temp. (°F)
Y6417					1692	23		

Notes: Certified a true copy of the original, retained in our file.

Test	Tensile Test						Hardness Test					
	Yield (ksi)	Tensile (ksi)	Elongation (%)	Reduction of Area (%)	Yield at 0.6% Elongation Under Load (ksi)	Yield at 0.02% (ksi)	Test Orientation	Test Location	Brinell (BHN)	Test Location	Rockwell (HRC)	Test Location
1	45.0	75.0	30	63					131	Surface		
2									141	Mid-Radius		
3												
4												
5												
6												
7												
8												

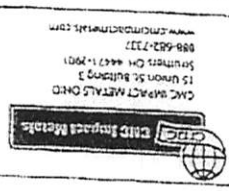
JOMINY RESULTS (HRC)

Test	Distance (in.)											
	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12
1	J13	J14	J15	J16	J18	J20	J22	J24	J26	J28	J30	J32

COPY

5-1/2" Dia. Dark H11 HH10101093
SR-150 LF-2 SR-675-70 Green Baby Blue
SR-105

P139401



Material Test Report

Production Date: 10.07.2010
 Heat No.: MM10101093
 Furnace No.: Y6417
 Tom Carter, Technical Director

CHARPY IMPACT TESTS

Test	Average	Specimen 1	Specimen 2	Specimen 3	Specimen 4	Specimen 5	Specimen 6	Specimen 7	Specimen 8	Specimen 9	Specimen 10
	mb	mb	mb	mb	mb	mb	mb	mb	mb	mb	mb
1	30	36	10	0.038	29	10	0.033	26	10	0.033	-50
2											Full
3											Mid-Radius
4											Longitudinal
5											
6											
7											
8											

*Absorbed energy values converted from sub-size results (ref. ASTM A370) when applicable.

INCLUSION RATING

Method	Thin (T)	Heavy (H)	Thin (T)	Heavy (H)	Thin (T)	Heavy (H)	Thin (T)	Heavy (H)
1								
2								
3								

BEND TESTS

Test	Final Radius (in.)	Orientation	Result	Final Bend Angle
1				
2				

OTHER TESTS

Type of Test	Method	Grain Size	Req'd Velocity	Observed Velocity	Result
Ballistic Test 1	ASTM E112	5	Req'd Velocity:	Observed Velocity:	Result:
Ballistic Test 2			Req'd Velocity:	Observed Velocity:	Result:
Ultrasonic Test			Criteria:	Result:	
Decarburization					
Macro Test	ASTM E381	SRC			
Reduction Ratio		131			

Additional Comments

COPY

70139491

5-1/2" Dia
 HI. MM10101093
 Baby Blue