

**METALLURGICAL TEST REPORT**

Customer Address:  M/S -HORIZON METALTECH PVT.LTD PLOT NO.19,EPIP-1 JHARMAJRI,BADDI DISST.SOLAN (H.P)	Material	Billet Route	Test Certificate No.	88480
	Process Route	EAF-LRF-VD-CCM-AMLC-EMS-RM	Date	24-12-2017
	Specification	Standard	Invoice No.	8609
	Heat No.	A04691	Weight (MT.)	6.865
	Grade	20MNCRS	Input/Billet Size	200x200 MM
	Supply Size	75 MM RCS	Reduction Ratio	7.1:1
	Supply Condition	AS HOT ROLLED	No's of Pcs	NA
	Colour Code	BLUE+YELLOW	No's of Bundle	NA
			Multiple	NA

**TEST RESULT**

**CHEMICAL ANALYSIS (ASTM E 415-14 / IS 8811-1998)**

Element	C%	Mn%	Si%	S%	P%	Cr%	Ni%	Mo%	V%	Al%	Cu%	Ti%	Sn%	B%	Ca%	Co%	CE%	Cr+Ni+Mo
Spec.	Min	0.170	1.100	0.150	-	-	1.000	-	-	-	0.020	-	-	-	-	-	-	-
	Max	0.220	1.400	0.400	0.035	0.035	1.300	-	-	-	0.035	-	-	-	-	-	-	-
Achieved	0.170	1.130	0.250	0.023	0.016	1.000	0.090	0.027	0.004	0.028	0.080	-	-	0.0005	-	-	-	-

**HARDENABILITY TEST (IS:3848, ASTM A255, SAE J406)**

Distance (INCH)	4/16																	
Spec. (HRC)	Min	33																
	Max	37																
Achieved (HRC)	36.5																	

**Mechanical Properties (IS 1608 / ASTM A370)**

Parameters	Tensile Strength (Kg/mm <sup>2</sup> )	Yield Strength (Kg/mm <sup>2</sup> )	Elongation (%)	Reduction Area (%)	Impact Strength IZOD/Charpy V-notch/U-notch (Joules)	D.I. Value ASTM A255		Surface Hardness As Rolled (BHN)
						(Inch)	(mm)	
Spec.	Min	-	-	-	-	-	-	-
	Max	-	-	-	-	-	-	-
Achieved	-	-	-	-	-	-	-	156/163

**Metallographic Properties**

Parameters	Inclusion Rating (IS : 4163 / ASTM : E45A / JK Chart) WROST FIELD RATING										Grain Size IS 4748 / ASTM E112 (No.)	Depth of Decarburization IS 6396/ASTM E1077		Micro Structure		
	Type	A		B		C		D		DS		Complete	Partial	Uniform	Banding	Structure
	Series	Thin	Thick	Thin	Thick	Thin	Thick	Thin	Thick							
Spec.	Min	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Max	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Achieved		1.0	0.0	0.5	0.0	0.0	0.0	1.0	0.0	-	6.0 to 6.5	-	-	-	15micron max	Pearlite+ Ferrite

**Physical Properties, Non Destructive Test & Other Test**

Parameters	Internal Soundness ASTM E381	Step Down Test IS 4075	Surface Inspection IS 13352	Magnetic Particle Inspection IS 10138	Ultrasonic Test ASTM A388 / IS 2417	Upsetting Test IS 11169
Spec.	-	-	-	-	-	-
Achieved	Better than C2,R1,S1	Satisfactory	Satisfactory	-	100%	-

Parameters	Dimensional Tolerance IS 3739	Spark Test	X-RF	Gas Analysis Report Test method-Leco		
				O <sub>2</sub> (ppm)	N <sub>2</sub> (ppm)	H <sub>2</sub> (ppm)
Spec.	-	-	-	-	-	-
Achieved	As per IS 3739 Grade 1	100%	100%	16.0	73.1	0.77

Remarks :

Prepared By:  
Santosh Sharma

Approved By: