ARORA IRON & STEEL ROLLING MILLS (P) LTD.

DHANDARI KHURD, NEAR PHASE-VII, FOCAL POINT, LUDHIANA- 141 010.
Website : www.arorairon.com

IATF 16949:2016 - IATF 0338859
ISO 14001 : 2015 EMS 680449
OHSAS 18001 : 2007 OHS 680450
ISO 9001:2015 - 48544/A/0001/UK/EN

METALLURGICAL TEST REPORT

Customer Address:	**Material**	Billet Route -	**Test Certificate No.**	117446
	Process Route	EAF-LRF-VD-CCM-AMLC-EMS-RM	**Date**	07-07-2019
M/S ARIHANT ENGINEERING WORKS	**Specification**	Standard	**Invoice No.**	**3494/2019-20**
58/A. INDUSTRIAL AREA NO. 1			**Weight (MT.)**	36.890
A.B. ROAD, DEWAS -455001	**Heat No.**	**A11174**	**Input/Billet Size**	160X160 MM
(M.P.)	**Grade**	20MnCr5	**Reduction Ratio**	9.06:1
	Supply Size	60 MMØ	**No's of Pcs**	NA
	Supply Condition	AS HOT ROLLED	**No's of Bundle**	NA
	Colour Code	BLUE+YELLOW	**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	0.020	-	1.000	-	-	-	-	-	-	-	-	-	-	-	-
	Max	0.220	1.400	0.350	0.035	0.035	1.300	-	-	-	-	-	-	-	-	-	-	-	-
Achieved		0.170	1.100	0.270	0.020	0.018	1.030	0.080	0.020	0.006	0.026	0.125	-	-	-	0.0006	-	-	-

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

Distance		4/16"																	
Spec. (HRC)	Min	33																	
	Max	37																	
Achieved (HRC)		36.0																	

Mechanical Properties (IS 1608 / ASTM A370)

Parameters		Tensile Strength (Kg/mm^2)	Yield Strength (Kg/mm^2)	Elongation (%)	Reduction Area (%)	Impact Strength IZOD/Charpy V-notch/U-notch (Joules)	D.I. Value ASTM A255 (Inch)	D.I. Value ASTM A255 (mm)	Surface Hardness As Rolled (BHN)
Spec.	Min	-	-	-	-	-	-	-	-
	Max	-	-	-	-	-	-	-	-
Achieved		-	-	-	-	-	-	-	170/187

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						
	Series	Thin	Thick	Thin	Thick	Thin	Thick	Thin	Thick			Complete	Partial	Uniform	Banding	Structure
Spec.	Min	-	-	-	-	-	-	-	-	-	-	-		-	-	-
	Max	-	-	-	-	-	-	-	-	-						
Achieved		1.5	0.0	0.5	0.0	0.0	0.0	1.0	0.0	-	6.0 to 6.5	-	-	Yes	15micron max	Pearlite+Ferrite

Physical Properties, Non Destructive Test & Other Test

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

Parameters	Dimensional Tolerance IS 3739	Spark Test	X-RF	Gas Analysis Report Test method-Leco		
				O_2 (ppm)	N_2 (ppm)	H_2 (ppm)
Spec.	-	-	-	-	-	-
Achieved	As per IS 3739 Grade 1	100%	100%	9.00	72.00	0.54

Remarks :

Material is free from Radioactive Contamination.

Prepared By:		Approved By:
GURPREET		

In case of any quality issue, please inform Head-Quality Assurance at **bdchawla@arorairon.com**, Mobile No. **+919914503980**