

Laboratory

**Usha Martin Limited (Material Testing Laboratory), Phase-V,
Adityapur Industrial Area, Gamharia, Dist. Saraikela-Kharsawan,
Jharkhand**

Loction -1 : Phase-V, Adityapur Industrial Area, Gamharia, Dist. Saraikela-Kharsawan, Jharkhand

Loction -2 : Phase-IV, Adityapur Industrial Area, Gamharia, Dist. Saraikela-Kharsawan, Jharkhand

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-6352

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Validity 27.09.2017 to 26.09.2019

Last Amended on 16.10.2018

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
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CHEMICAL TESTING

Location-1				
I.	METALS & ALLOYS			
1	Carbon & Low Alloy Steel	Carbon	IS 8811	0.015 %to 1.5 %
		Silicon	ASTM E 415	0.001% to 2.00 %
		Manganese		0.15 %to 2.0 %
		Phosphorus		0.005% to 0.100 %
		Sulphur		0.005% to 0.100 %
		Chromium		0.05 % to 3.0 %
		Molybdenum		0.01 % to 1.0 %
		Cobalt		0.005% to 0.20 %
		Nickel		0.01 % to 3.5 %
		Copper		0.015% to 0.50 %
		Vanadium		0.001% to 0.60 %
		Aluminium		0.001% to 0.50 %
		Arsenic		0.002% to 0.10 %
		Tin		0.002% to 0.100 %
		Titanium		0.001 % to 0.25 %
		Boron		0.0003% to 0.010 %
		Hydrogen	IS 228 (Part 22)	0.0001% to 0.0006 %
Nitrogen	ASTM E 1019	0.0030% to 0.030 %		
Oxygen		0.0005% to 0.025 %		
Carbon	ASTM E 1019	0.01 % to 3.5 %		
Sulphur		0.002 % to 0.350 %		
2	Sponge Iron	Carbon	ASTM E 1019	0.030 % to 0.50 %
		Sulfur	ASTM E 1019	0.010 % to 0.050 %

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Kharsawan, Jharkhand****Accreditation Standard ISO/IEC 17025: 2005****Certificate Number TC-6352****Page 2 of 7****Validity 27.09.2017 to 26.09.2019****Last Amended on 16.10.2018**

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		Metallic Iron, Fe(M)	WI/QA/08/22 Issue No: 01 Issue date 11.10.2016	70.0 %to 83.0 %
II.	SOLID FUELS			
1.	Coal	Ash	IS 1350 (Part 1)	3.0 %to 60 %
		Volatile Matter (VM)		2.0% to 50 %
		Crucible Swelling Index (CSN)	IS 1353	1.0% to 9.0
2.	Coke	Ash	IS 1350 (Part 1)	5.0% to 15.0%
		Volatile Matter (VM)		0.40% to 2.0 %
		Coke Reactivity Index(CRI)	IS 4023	15.0 %to 45.0 %
		Coke Strength after Reaction (CSR)		50.0 %to 75.0 %
III.	Ores and Minerals			
1.	Limestone Calcined Lime Dolomite Calcined Dolo	SiO ₂	ASTM C 1271	0.20 % to 6.0 %
		Al ₂ O ₃		0.20% to 2.0 %
		CaO		25.0% to 55.0 %
		MgO		0.20% to 35.0 %
		Loss on Ignition (LOI)	IS 1760 (Part 1)	40.0 % to 50.0 %
2.	Quartzite	Silica as SiO ₂	WI/QA/08/26 Issue No. 01 Issue date: 23-05-2016	70.0% to 98.0 %
3.	Iron Ore	Total iron as Fe(T)	WI/QA/08/26 Issue No. 01 Issue date: 23-05-2016	40.0% to 65.0 %
		Al ₂ O ₃		1.0 % to 15.0 %
		SiO ₂		1.0 % to 15.0 %
4.	Iron Ore Sinter	Total iron as Fe(T)	WI/QA/08/26 Issue No. 01 Issue date: 23-05-2016	50.0% to 56.0 %
		Al ₂ O ₃		2.0% to 5.0 %
		CaO		7.0% to 13.0 %

**K Siribabu
Convenor****Jitendra B. Vispute
Program Manager**

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		MgO		1.0 % to 3.0 %
		SiO ₂		3.0 % to 7.0 %
		Reducibility Index (RI)	IS 8167	55.0 % to 75.0 %
		Reduction Degradation Index (RDI)	IS 10823	15.0% to 45.0 %
7	Iron Ore Pellet	Total iron as Fe(T)	WI/QA/08/26	60.0% to 65.0 %
		SiO ₂	Issue No. 01	2.0 % to 5.0 %
		Al ₂ O ₃	Issue date: 23-05-2016	2.0 % to 5.0 %
		Cold Compression Strength (CCS)	IS 8625	30 kg/pellet to 600 kg/pellet
		Reducibility Index (RI)	IS 8167	50.0% to 80.0 %
		Reduction Degradation Index (RDI)	IS 10823	5.0 % to 45 %

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<u>MECHANICAL TESTING</u>				
Location-1				
I.	MECHANICAL PROPERTIES OF METALS			
1.	Ferrous materials, alloys & products	Tensile Strength	IS 1608	100 Mpa to 1500 Mpa
		0.2% Proof Strength	ASTM E8/8M	100 Mpa to 1200 Mpa
		Yield Stress		100 MPa to 1200 MPa
		Reduction in area		2 % to 80 %
		Elongation		2 % to 80 %
		Brinell hardness	IS 1500(Part-1,4) ASTM E10	50 HBW to 500 HBW (10mm /3000kgf)
		Charpy V notch Impact -at ambient temperature	IS 1757 (Part-1)	2 JOULES to 290 JOULES
		Hardenability	ASTM A255 IS 3848	1) 1mm to 50 mm. 2) 20HRC to 70HRC
		Cold upset	IS 11169(Part-1)	Qualitative
	Rockwell Hardness	IS 1586	20 HRC to 70 HRC	
II.	METALLOGRAPHY TEST			
1.	Ferrous materials, alloys & products	Blue Fracture	ISO 3763	Qualitative
		Macro streak flaw for Steel	IS 4075	Qualitative
		Macro Etch Test with Rating	ASTM E 381	Qualitative (Magnification up to 10X)
		Degree of Banding or Orientation of Microstructure	ASTM E 1268 WI/QA/07/32 Issue date: 28.04.2018 Issue no: 01	Qualitative (Magnification 50X, 100X, 200X, 500X, 1000X)

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		Carbide Banding	SEP 1520	Qualitative (Magnification 50X, 100X, 200X, 500X, 1000X)
		Average grain size -by Comparison method	ASTM E 112 IS 4748	Qualitative (Magnification 100X)
		Depth of Decarburized layer in steel -Microscopic Method	IS 6396	0.01 mm to 2.0 mm
		Inclusion Rating of Steel	IS 4163 ASTM E 45	Qualitative (Magnification 100X)
		Spherodisation	ASTM F 2282	Qualitative (Magnification 100X)

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<u>MECHANICAL TESTING</u>				
Location-2				
I.	MECHANICAL PROPERTIES OF METALS			
1.	Ferrous materials, alloys & products	Hardenability Test	ASTM A255 IS 3848	20HRC to 70HRC (1mm to 50 mm)
		Rockwell Hardness Test	IS 1586	20 HRC to 70 HRC
II.	METALLOGRAPHY TEST			
1.	Ferrous materials, alloys & products	Macrobreak flaw for Steel	IS 4075	Qualitative
		Macro Etch Test with Rating	ASTM E 381	Qualitative (Magnification up to 10X)
		Degree of Banding or Orientation of Microstructure	ASTM E 1268	Qualitative (Magnification 50X, 100X, 200X, 500X, 1000X)
		Average grain size -by Comparison method	ASTM E 112 IS 4748	Qualitative (Magnification 100X)
		Depth of Decarburized layer in steel -Microscopic Method	IS 6396	0.01 mm to 2.0 mm
		Inclusion Rating of Steel	IS 4163 ASTM E 45	Qualitative :Magnification : 100X

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<u>NON DESTRUCTIVE TESTING</u>				
Location-1 and Location-2				
I.	METALS & ALLOYS			
1	Steel Forging	Ultrasonic Testing -Contact Method	ASTM A388/388M	Qualitative (Size: 28 mm to 160 mm. RCS: 55 mm to 200 mm (Back Echo Method only)
		Magnetic Particle Testing -Fluorescent	ASTM E 709 ASTM A275/275M	Qualitative: (Surface & Sub surface upto 3 mm depth. (Circular Magnetization only)