Laboratory	**SGS India Private Limited, C/o.-Pioneer Paper Plast Private Ltd., H.O.S.-3/21, Sector- A, Zone-B, Mancheswar Ind. Estate, Bhubaneswar, Odisha**
Accreditation Standard	**ISO/IEC 17025: 2005**
Certificate Number	**TC-5867** ***(in lieu of T-2470)*** **Page 1 of 8**
Validity	**01.04.2017 to 31.03.2019** **Last Amended on 30.06.2017**

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

CHEMICAL TESTING

I.	**SOLID FUELS**			
1.	**Coal/Coke**	Ash Fusion Temperature(AFT), Reducing		
		Initial Deformation Temperature(IDT)	ASTMD1857 D1857M – 17 ISO:540:2008	900 °C to 1600 °C
		Spherical Temperature(ST)		900 °C to 1600 °C
		Hemispherical Temperature(HT)		900 °C to 1600 °C
		Flow Temperature(FT)		900 °C to 1600 °C
		Ash Fusion Temperature(AFT), Oxidizing		
		Initial Deformation Temperature(IDT)	ASTMD1857 D1857M – 17 ISO:540:2008	900 °C to 1600 °C
		Spherical Temperature(ST)		900 °C to 1600 °C
		Hemispherical Temperature(HT)		900 °C to 1600 °C
		Flow Temperature(FT)		900 °C to 1600 °C
		Ultimate Analysis (C,H,N & O)		
		Carbon as C	ASTM D5373-16 ISO 29541:2010	35 % to 95 %
		Hydrogen as H		0.2 % to 8%
		Nitrogen as N		0.2 % to 6.0 %
		Oxygen as O	ASTM D 3180-15 ASTM D3176-15 ISO 17247:2013	By calculation
		Net Calorific Value	ASTM D5865-13 ISO 1928-2008	1500 kcal/kg to 8500 kcal/kg
2.	**Coal / Coke / Fly ash**	Silica as SiO2	ASTM D4326-13 (XRF Method)	30.0 % to 65.00 %
		Ferric Oxide as Fe2O3		0.5 % to 15.00 %
		Alumina as Al2O3		5.0 % to 40.00 %
		Titanium as TiO2		0.20 % to 2.00 %

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		Calcium Oxide as CaO		0.5 % to 5.00 %
		Magnesium Oxide MgO		0.2 % to 3.00 %
		Manganese Oxide as MnO2		0.02 % to 0.50 %
		Sulphur Trioxide as SO3		0.1 % to 2.00 %
		Sodium Oxide as Na2O		0.2 % to 2.00 %
		Potassium Oxide as K2O		0.5 % to 4.00 %
		Phosphorus Pent oxide as P2O5		0.100 % to 1.20 %
		Barium oxide as BaO		0.05 % to 0.50 %
		Strontium oxide as SrO		0.020 % to 0.200 %
3.	**Coal/Coke**	Total moisture as TM	IS-1350 (Part-1) -1984 Reaff.2013 ASTM D3302M-17 ISO 589-2008 ISO 579-2013	1.00 % to 50.00 %
		Moisture in analysis sample as IM	IS-1350 (Part-1) -1984 Reaff.2013	0.50 % to 20.00 %
			ASTM D3173-17	
			ISO:687:2010	
			ISO:11722-13	
		Ash	IS-1350 (Part-1) -1984 Reaff.2013	0.50 % to 60.00 %
			ASTM D3174-12	
			ISO:1171:2010	
		Volatile matter as VM	IS-1350 (Part-1) -1984 Reaff.2013	0.40 % to 50.00 %
			ASTM D3175-17	
			ISO:562:2010	
		Fixed Carbon as FC	IS-1350 (Part-1) -1984 Reaff.2013 ASTM D3172-13 ISO 17246-2010	NA

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		Phosphorous	ISO 622-2016	0.010 % to 0.200 %
		Sulphur	ASTM-D4239-14^{E2}	0.100 % to 7.000 %
			ISO:19579:2006	
			IS: 1350 (part-3)-1969 Reaff. 2010	0.100 % to 7.000 %
		GCV	ASTM D 5865 - 13	1500 Kcal/Kg to 8000 Kcal/Kg
			IS:1350(P-2):1970 RA 2010	
			ISO 1928-2009	
		Equilibrated Moisture (at 40 deg C & 60% RH)	IS:1350(P-1):1984 RA 2013	0.5 % to 10.0 %
		Mercury	ASTM D6414-14 (Method-A)	0.03 mg/kg to 0.30 mg/kg
		Hardgrove Grindabilty Index(HGI)	ASTM D 409M-16	30.0 % to 100.0 %
			ISO 5074: 2015	
		Crucible swelling Number (CSN)	IS 1353 : 1993 (Reaff.2010)	0.0 % to 9.0 %
		Washabilty (Sink & Float test)	ISO 7936:1992 (E)	Specific Gravity (1.3 to 2.0)
II.	**ORES & MINERALS**			
1.	**Iron ore**	Total Iron as Fe	IS:1493 (Part 1) – 1981(Reaff:2011)	5.00 % to 70.00 %
			SGSIN-LAB/BBSR-WI 01 (IHM) Ver.1.1/05.10.2015	5.00 % to 70.00 %
			ISO 9516:2003(XRF method)	5.00 % to 70.00 %
			SGSIN-LAB/BBSR-WI XRF-03 Ver.1.0/14.10.2016	
		Silica as SiO2	IS:1493 (Part 1) – 1981 (Reaff:2011)	1.00 % to 30.00 %
			ISO 9516:2003(XRF method)	0.20 % to 40.00 %

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			SGSIN-LAB/BBSR-WI XRF-03 Ver.1.0/14.10.2016	
		Alumina as Al2O3	IS:1493 (Part 1) – 1981 (Reaff:2011)	0.50 % to 25.00 %
			SGSIN-LAB/BBSR-WI 02 (IHM) Ver.1.1/23.10.2015	0.50 % to 25.00 %
			ISO 9516:2003(XRF method)	0.10 % to 25.00 %
			SGSIN-LAB/BBSR-WI XRF-03 Ver.1.0/14.10.2016	
		Phosphorus as P	IS:1493 (Part 1) – 1981(Reaff:2011)	0.05 % to 0.500 %
			SGSIN-LAB/BBSR-WI 04 (IHM) Ver.1.1/02.11.2015	0.02 % to 0.500 %
			ISO 9516:2003(XRF method)	0.02 % to 1.00 %
			SGSIN-LAB/BBSR-WI XRF-03 Ver.1.0/14.10.2016	
		Sulphur as S	IS-1493-1959 (Reaff.2011) IS 1493(Part-1)-1981 Reaff. 2011	0.05 % to 0.100 %
			ISO 9516:2003(XRF method)	0.008 % to 1.00 %
			SGSIN-LAB/BBSR-WI XRF-03 Ver.1.0/14.10.2016	0.01 % to 1.00 %
		Manganese as Mn	SGSIN-LAB/BBSR-WI 05 (IHM) Ver.1.1/20.10.2015	0.05 % to 10.00 %
			ASTM E 314-16	
		Manganese as Mn	ISO 9516:2003 (XRF method)	0.03 % to 10.0 %
			SGSIN-LAB/BBSR-WI XRF-03 Ver.1.0/14.10.2016	

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		Calcium Oxide as CaO	ISO 9516:2003(XRF method)	0.02 % to 5.00 %
			SGSIN-LAB/BBSR-WI XRF-03 Ver.1.0/14.10.2016	
		Magnesium Oxide as MgO	ISO 9516:2003(XRF method)	0.02 % to 5.00 %
			SGSIN-LAB/BBSR-WI XRF-03 Ver.1.0/14.10.2016	
		Titanium dioxide as TiO2	ISO 9516:2003(XRF method)	0.03 % to 8.00 %
			SGSIN-LAB/BBSR-WI XRF-03 Ver.1.0/14.10.2016	
			ISO:4691:2009	0.050 % to 0.300 %
		Sodium Oxide as Na2O	ISO 9516:2003(XRF method)	0.1 % to 1.50 %
			SGSIN-LAB/BBSR-WI XRF-03 Ver.1.0/14.10.2016	
		Potassium as K2O	SGSIN-LAB/BBSR-WI XRF-03 Ver.1.0/14.10.2016	0.02 % to 1.00 %
		Arsenic as As	SGSIN-LAB/BBSR-WI XRF-03 Ver.1.0/14.10.2016	0.020 % to 0.10 %
		Chromium as Cr	SGSIN-LAB/BBSR-WI XRF-03 Ver.1.0/14.10.2016	0.020 % to 0.10 %
		Loss on ignition	SGSIN-LAB/BBSR-WI -08 Ver.1.0/01.06.2016	0.10 % to 20.00 %
2.	**Mn ore**	Manganese as Mn	IS-1473-2004 Reaff 2011	5.00 % to 50.00 %
			ISO 4298:1984	
			SGSIN-LAB/BBSR-WI XRF-01 Ver.1.0/14.10.2016	
		Iron as Fe	IS-1473-2004 Reaff 2011	1.00 % to 40.00 %
			SGSIN-LAB/BBSR-WI XRF-01 Ver.1.0/14.10.2016	0.10 % to 25.00
		Silica as SiO_2	IS-1473-2004 Reaff 2011	0.5 % to 15.00 %

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			SGSIN-LAB/BBSR-WI XRF-01 Ver.1.0/14.10.2016	0.20 % to 30.00 %
		Phosphorus as P	IS-1473-2004 Reaff 2011	0.02 % to 0.200 %
			SGSIN-LAB/BBSR-WI XRF-01 Ver.1.0/14.10.2016	0.02 % to 2.00 %
		Alumina as Al2O3	SGSIN-LAB/BBSR-WI -07 Ver.1.0/01.06.2016	0.10 % to 15.00 %
			SGSIN-LAB/BBSR-WI XRF-01 Ver.1.0/14.10.2016	0.10 % to 30.00 %
		Sulphur as SO3		0.03 % to 1.00 %
		Titanium dioxide as TiO2		0.02 % to 5.00 %
		Calcium oxide as CaO		0.05 % to 20.00 %
		Magnesium Oxide as MgO		0.03 % to 10.00 %
		Loss on Ignition as LOI	SGSIN-LAB/BBSR-WI -08 Ver.1.0/01.06.2016	0.10 % to 15.00 %
3.	**Lime Stone/ Dolomite**	Silica as SiO2	IS:1760 (Part 2) - 1991 Reaff.2011	0.50 % to 15.00 %
			ASTMC1271-99 (RA-2012) (XRF Method)	0.5 % to 15.00 %
		Calcium oxide as CaO	IS:1760 (Part 3) - 1992 Reaff.2011	10.0 % to 56.00 %
			ASTMC1271-99 (RA-2012) (XRF Method)	10.0 % to 56.00 %
		Magnesium oxide as MgO	IS-1760 (Part-3) -1992 Reaff.2011	0.50 % to 10.00 %
			ASTMC1271-99 (RA-2012)(XRF Method)	0.5 % to 22.00 %
		Alumina as Al2O3	IS-1760 (Part-3) -1992 Reaff.2011	0.2 % to 2.00 %
			ASTMC1271-99 (RA-2012) (XRF Method)	0.1 % to 5.00 %
		Titanium dioxide as TiO2	ASTMC1271-99 (RA-2012) (XRF Method)	0.02 % to 2.00 %
		Iron oxide as Fe2O3		0.05 % to 5.00

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		Phosphorus pentoxide as P2O5	ASTMC1271-99 (RA-2012) (XRF Method)	0.005 % to 0.50 %
		Potassium oxide as K2O		0.02 % to 1.00 %
		Manganese dioxide as MnO2		0.02 % to 1.0%
		Strontium oxide as SrO		0.01 % to 0.10%
		Sulphur trioxide as SO3		0.05 % to 0.20%
		Loss on Ignition as LOI	IS-1760 (Part-1) -1991 Reaff.2011	40.00 % to 50.00 %
4.	**Chrome Ore**	Chromic Oxide as Cr2O3	IS:4737:1982 Reaff.2011	5.00 % to 70.00 %
		Total Iron as Fe		10.00 % to 50.00 %
		Silica as SiO2		1.00 % to 20.00 %
		Alumina as Al2O3		0.30 % to 10.00 %
5.	**Quartzite & High silica Sand**	Silica as SiO2	SGSIN-LAB/BBSR-WI XRF-04 Ver.1.0/14.10.2016	0.10 % to 99.80 %
		Calcium oxide as CaO		0.03 % to 3.00 %
		Alumina as Al2O3		0.05 % to 5.00 %
		Titanium dioxide as TiO2		0.03 % to 5.00 %
		Iron oxide as Fe2O3		0.04 % to 5.00 %
		Potassium oxide as K2O		0.02 % to 2.00 %
		Loss on Ignition as LOI	IS:1917 Part- 1:1991 (Reaff .2011)	0.10 % to 1.00 %
6.	**Bauxite**	Iron oxide as Fe2O3	SGSIN-LAB/BBSR-WI XRF-02 Ver.1.0/14.10.2016	0.10 % to 40.00 %
		Silica as SiO2		0.20 % to 20.00 %
		Alumina as Al2O3		0.1 % to 90.00 %
		Titanium dioxide as TiO2		0.02 % to 5.00 %
		Phosphorous as P2O5		0.03 % to 2.00 %
		Chromium as Cr2O3		0.01 % to 0.25 %
		Manganese as MnO2		0.03 % to 1.00 %
		Sulphur as SO3		0.02 % to 1.00 %
		Potassium oxide as K2O		0.03 % to 1.00 %
		Calcium oxide as CaO		0.05 % to 5.00 %

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		Magnesium oxide as MgO		0.05 % to 5.00 %
		Vanadium as V2O5		0.02 % to 0.50 %
		Zinc as ZnO		0.01 % to 0.20 %
		Loss on Ignition as LOI	IS 2000 P-1:1985 (Reaff 2011)	0.50 % to 30.00 %

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