

Laboratory **Geo-Chem Laboratories (P) Ltd., 1st Floor, 36/37, Raja Industrial Estate, Purshottam Kheraj Marg, Mulund (W), Mumbai, Maharashtra**

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CHEMICAL TESTING

I.	METAL & ALLOYS			
1.	FERROUS			
a.	Low alloy steel & Carbon steel	Carbon (C)	ASTM E 1019 – 2011 ASTM E 415 – 2017	0.004% to 4.00% 0.020 % to 1.30%
		Sulphur (S)	ASTM E 415 – 2017 ASTM E 1019 – 2011	0.001 % to 0.080% 0.001 % to 0.32%
		Phosphorus (P)	IS 228 (Part 3) – 1987 RA 2012 ASTM E 415 – 2017	0.010 % to 0.15% 0.01 % to 0.080%
		Manganese (Mn)	IS 228 (Part 12) – 2001 (RA-2014) IS 228 (Part 2) – 1987 (R A -2012) ASTM E 415 – 2017	0.1 % to 10.0% 0.1 % to 10.0%
		Silicon (Si)	IS 228 (Part 8) – 1989 (RA-2014) ASTM E 415 – 2017	0.10 % to 2.00% 0.05 % to 5.0%
		Chromium (Cr)	ASTM E 415 – 2017 ASTM E 415 – 2017 GC-MLD/QS/CA-I/5.4/01 – Wet – 2013 Issue No. 02, Issue Date- 10/10/2017	0.02 % to 1.2% 0.010 % to 1.80% 0.10 % to 35.0%
		Nickel (Ni)	IS 228 (Part 5) – 1987 (RA-2014) GC-MLD/QS/CA-I/5.4/03 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.10 % to 30.0% 0.010 % to 2.0%
		Molybdenum (Mo)	ASTM E 415 – 2017 ASTM E 415 – 2017 IS 228 (Part 7) – 1990 (RA- 2012)	0.010 % to 2.40% 0.001 % to 0.5% 1.0 % to 10.0%

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			GC-MLD/QS/CA-I/5.4/03 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.010 % to 3.0%
		Cobalt (Co)	ASTM E 415 – 2017	0.012 % to 0.065%
		Boron (B)	ASTM E 415 – 2017	0.0010 % to 0.0070%
		Titanium (Ti)	GC-MLD/QS/CA-I/5.4/03 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.010 % to 1.0%
			ASTM E 415 – 2017	0.001 % to 0.045%
		Columbium / Niobium (Cb/Nb)	ASTM E 415 – 2017	0.001 % to 0.05%
			GC-MLD/QS/CA-I/5.4/03 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.010 % to 1.0%
		Vanadium (V)	ASTM E 415 – 2017	0.001 % to 0.46%
		Aluminium (Al)	ASTM E 415 – 2017	0.001 % to 0.050%
		Copper (Cu)	ASTM E 415 – 2017	0.005 % to 0.50%
			GC-MLD/QS/CA-I/5.4/03 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.010 % to 1.0%
		Nitrogen (N)	IS 228 (Part 23) – 2003 (RA-2014)	0.005 % to 0.50%
			ASTM E 415 – 2017	0.004 % to 0.015%
b.	Stainless steel	Carbon (C)	ASTM E 1019 – 2011	0.004 % to 4.00%
			ASTM E 1086 – 2014	0.020 % to 1.30%
		Sulphur (S)	ASTM E 1086 – 2014	0.001 % to 0.034%
			ASTM E 1019 – 2011	0.001 % to 0.32%
		Phosphorus (P)	IS 228 (Part 3) – 1987 (RA 2012)	0.010 % to 0.15%
			ASTM E 1086 – 2014	0.006 % to 0.048%
		Manganese (Mn)	IS 228 (Part 12) – 2001 (RA-2014)	0.1 % to 10.0%

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			IS 228 (Part 2) – 1987 (R A -2012)	0.1 % to 10.0%
		Silicon (Si)	ASTM E 1086 – 2014	0.21 % to 2.00%
			IS 228 (Part 8) – 1989 (RA-2014)	0.05 % to 5.0%
		Chromium (Cr)	ASTM E 1086 – 2014	0.15 % to 1.10%
			GC-MLD/QS/CA-I/5.4/01 – Wet – 2013 Issue No. 02, Issue Date- 10/10/2017	0.10 % to 35.0%
		Nickel (Ni)	ASTM E 1086 – 2014	10.00 % to 30.00%
			IS 228 (Part 5) – 1987 (RA-2014)	0.10 % to 30.0%
		Molybdenum (Mo)	ASTM E 1086 – 2014	4.50 % to 36.00%
			GC-MLD/QS/CA-I/5.4/03 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.010 % to 2.0%
		Cobalt (Co)	ASTM E 1086 – 2014	0.08 % to 7.00%
			IS 228 (Part 7) – 1990 (RA 2012)	1.0 % to 10.0%
		Boron (B)	GC-MLD/QS/CA-I/5.4/03 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.010 % to 3.0%
			ASTM E 1086 – 2014	0.05 % to 1.0%
		Titanium (Ti)	ASTM E 1086 – 2014	0.0004 % to 0.003%
			GC-MLD/QS/CA-I/5.4/03 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.010 % to 1.0%
		Niobium (Nb)	ASTM E 1086 – 2014	0.002 % to 0.58%
			GC-MLD/QS/CA-I/5.4/03 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.010 % to 1.0%
		Vanadium (V)	ASTM E 1086 – 2014	0.018 % to 1.10%
			ASTM E 1086 – 2014	0.08 % to 0.35%

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		Copper (Cu)	GC-MLD/QS/CA-I/5.4/03 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.010 % to 1.0%
			ASTM E 1086 – 2014	0.070 % to 3.50 %
		Nitrogen (N)	IS 228 (Part 23)–2003 (RA-2014)	0.005 % to 0.50%
			ASTM E 1086 – 2014	0.02 % to 0.10%
c.	Cast Iron	Carbon (C)	ASTM E 1019 – 2011	0.004 % to 4.00%
			ASTM E 1999 – 2011	1.90 % to 3.80 %
		Sulphur (S)	ASTM E 1019 – 2011	0.001 % to 0.32%
			ASTM E 1999 – 2011	0.005 % to 0.40 %
		Phosphorus (P)	IS 12308 (Part 5) – 1991 (RA -2012)	0.05 % to 0.50 %
			ASTM E 1999 – 2011	0.03 % to 1.80 %
		Manganese (Mn)	IS 12308 (Part 10) – 1991 (RA- 2012)	0.1 % to 7.0%
			ASTM E 1999 – 2011	0.03 % to 1.80 %
		Silicon (Si)	IS 12308 (Part 6) – 1991 (RA- 2012)	0.1 % to 6.00%
			ASTM E 1999 – 2011	0.15 % to 2.50%
		Tin (Sn)	ASTM E 1999 – 2011	0.004 % to 0.14%
		Chromium (Cr)	GC-MLD/QS/CA-I/5.4/01 – Wet – 2013 Issue No. 02, Issue Date- 10/10/2017	0.10 % to 35.0%
			ASTM E 1999 – 2011	0.025 % to 2.0%
		Nickel (Ni)	IS 12308 (Part 7) – 1991 (RA- 2012)	0.50 % to 36.0%
			GC-MLD/QS/CA-I/5.4/03 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.010 % to 2.0%
			ASTM E 1999 – 2011	0.020 % to 2.0%
		Molybdenum (Mo)	ASTM E 1999 – 2011	0.01 % to 1.20%

Ajay Kumar Sharma
Convenor

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			GC-MLD/QS/CA-I/5.4/03 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.010 % to 3.0%
		Titanium (Ti)	GC-MLD/QS/CA-I/5.4/03 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.010 % to 1.0%
			ASTM E 1999 – 2011	0.001 % to 0.12%
		Niobium (Nb)	GC-MLD/QS/CA-I/5.4/03 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.010 % to 1.0%
		Vanadium (V)	ASTM E 1999 – 2011	0.008 % to 0.22%
		Copper (Cu)	ASTM E 1999 – 2011	0.015 % to 0.75%
			GC-MLD/QS/CA-I/5.4/03 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.010 % to 1.0%
d.	High Manganese Steel	Carbon (C)	ASTM E 1019 – 2011	0.004 % to 4.00%
			ASTM E 2209 – 2013	0.070 % to 0.20%
		Sulphur (S)	ASTM E 2209 – 2013	0.001 % to 0.005%
			ASTM E 1019 – 2011	0.001 % to 0.32%
		Phosphorus (P)	IS 228 (Part 3) – 1987 RA 2012	0.010 % to 0.15%
			ASTM E 2209 – 2013	0.015 % to 0.035%
		Manganese (Mn)	IS 228 (Part 12) – 2001 (RA-2014)	0.1 % to 10.0%
			IS 228 (Part 2) – 1987 (RA- 2012)	0.1 % to 10.0%
			ASTM E 2209 – 2013	6.0 % to 16.5%
		Silicon (Si)	IS 228 (Part 8) – 1989 (RA-2014)	0.05 % to 5.0%
			ASTM E 2209 – 2013	0.50 % to 1.50%
		Chromium (Cr)	GC-MLD/QS/CA-I/5.4/01 – Wet – 2013 Issue No. 02, Issue Date- 10/10/2017	0.10 % to 35.0%

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			ASTM E 2209 – 2013	1.00 % to 18.00 %
		Nickel (Ni)	IS 228 (Part 5) – 1987 (RA-2014)	0.10 % to 30.0%
			ASTM E 2209 – 2013	0.050 % to 6.0%
			GC-MLD/QS/CA-I/5.4/03 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.010 % to 2.0%
		Molybdenum (Mo)	ASTM E 2209 – 2013	0.20 % to 0.55%
			GC-MLD/QS/CA-I/5.4/03 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.010 % to 3.0%
			IS 228 (Part 7) – 1990 (RA-2012)	1.0 % to 10.0%
		Titanium (Ti)	GC-MLD/QS/CA-I/5.4/03 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.010 % to 1.0%
		Niobium (Nb)	GC-MLD/QS/CA-I/5.4/03 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.010 % to 1.0%
		Copper (Cu)	GC-MLD/QS/CA-I/5.4/03 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.010 % to 1.0%
		Nitrogen (N)	IS 228 (Part 23) – 2003 (RA-2014)	0.005 % to 0.50%
e.	Low alloy Steel Mild steel Stainless steel Tool steel	Manganese (Mn) Chromium (Cr) Nickel (Ni) Molybdenum (Mo) Copper (Cu) Vanadium (V) Niobium (Nb) Titanium (Ti)	ASTM E 1476 – 2014 API 578 – 2010	Qualitative

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2.	NON FERROUS			
a.	Aluminium & Its Alloys	Silicon (Si)	IS 504 (Part 1) – 2002 (RA 2012) ASTM E 1251 – 2017a	0.1 % to 20.0% 0.002 % to 15.00%
		Lead (Pb)	IS 504 (Part 1) – 2002 (RA- 2012) ASTM E 1251 – 2017a	0.001 % to 1.0% 0.002 % to 0.25%
			GC-MLD/QS/CA-I/5.4/37 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.0%
		Manganese (Mn)	IS 504 (Part 5) – 2002 (RA 2012) ASTM E 1251 – 2017a	0.01 % to 2.0% 0.02 % to 1.2%
			ASTM E 34 – 2011	0.005 % to 2.0%
		Magnesium (Mg)	IS 504 (Part 6) – 2002 (RA- 2012) ASTM E 1251 – 2017a	1.0 % to 12.0% 0.15 % to 11.0%
			GC-MLD/QS/CA-I/5.4/37 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.0%
		Nickel (Ni)	IS 504 (Part 7) – 2002 (RA 2012) ASTM E 1251 – 2017a	0.10 % to 4.0% 0.01 % to 0.60%
			GC-MLD/QS/CA-I/5.4/37 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.0%
		Chromium (Cr)	IS 504 (Part 8) – 2002 (RA- 2012) ASTM E 1251 – 2017a	0.1 % to 1.0% 0.01 % to 0.35%
			GC-MLD/QS/CA-I/5.4/37 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.0%

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		Tin (Sn)	IS 504(Part 9) 2002 (RA 2012)	0.10 % to 1.0%
			ASTM E 1251 – 2017a	0.005 % to 0.20%
			GC-MLD/QS/CA-I/5.4/37 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.0%
		Titanium (Ti)	IS 504 (Part 11) – 2002 (RA- 2012)	0.01 % to 1.0%
			ASTM E 1251 – 2017a	0.01 % to 0.20%
			GC-MLD/QS/CA-I/5.4/37 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.0%
		Iron (Fe)	IS 504 (Part 2) – 2002 (RA- 2012)	0.01 % to 2.0%
			ASTM E 1251 – 2017a	0.001 % to 0.75%
			GC-MLD/QS/CA-I/5.4/37 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.0%
		Copper (Cu)	GC-MLD/QS/CA-I/5.4/37 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.005 % to 1.0%
			ASTM E 1251 – 2017a	0.005 % to 5.10%
			ASTM E 34 – 2011	0.010 % to 10.0%
			IS 504 (Part 3) – 2002 (RA- 2012)	0.1 % to 1.0%
		Zinc (Zn)	IS 504 (Part 4) – 2002 (RA- 2012)	0.05 % to 4.0%
			ASTM E 1251-2017a	
			GC-MLD/QS/CA-I/5.4/37 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.005 % to 1.0%
b.	Copper & Its Alloys	Copper (Cu)	GC-MLD/QS/CA-I/5.4/08 – Wet – 2013 Issue No. 02, Issue Date- 10/10/2017	45.56 % to 99.99%
			IS 440 – 1964 (RA-2012)	

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		Lead (Pb)	BS EN 15079 – 2015	0.001 % to 12.50%
			GC-MLD/QS/CA-I/5.4/08 – Wet – 2013 Issue No. 02, Issue Date- 10/10/2017	0.10 % to 20.0%
			GC-MLD/QS/CA-I/5.4/36 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.0%
		Tin (Sn)	BS EN 15079 – 2015	0.001 % to 12.0%
			IS 4027 (Part 5) – 1987 (RA-2012)	0.10 % to 15.0%
			ASTM E 478 – 2008	0.10 % to 15.0%
			GC-MLD/QS/CA-I/5.4/36 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.0%
			IS 4667 (Part 2) – 1969 (RA - 2012)	0.10 % to 15.0%
		Iron (Fe)	BS EN 15079 – 2015	0.001 % to 4.10%
			IS 440 – 1964 (RA-2012)	0.010 % to 10.0%
			GC-MLD/QS/CA-I/5.4/36 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.0%
		Nickel (Ni)	BS EN 15079 – 2015	0.001 % to 33.00%
			IS 440 – 1964 (RA-2012)	0.010 % to 20.0%
			GC-MLD/QS/CA-I/5.4/36 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.0%
		Silicon (Si)	IS 3685 – 1966 (RA - 2012)	0.01 % to 2.0%
			BS EN 15079 – 2015	0.005 % to 0.05%
		Aluminium (Al)	BS EN 15079 – 2015	0.005 % to 11.00%
			GC-MLD/QS/CA-I/5.4/36 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.0%
			ASTM E 478 – 2008	0.10 % to 12.0%

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		Phosphorus (P)	BS EN 15079 – 2015	0.005 % to 1.10%
			GC-MLD/QS/CA-I/5.4/36 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.0%
			IS 440 – 1964 (RA-2012)	0.01 % to 1.0%
		Arsenic (As)	BS EN 15079 – 2015	0.005 % to 0.22%
			GC-MLD/QS/CA-I/5.4/36 – ICP – 2013 (Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.0%
		Bismuth (Bi)	BS EN 15079 – 2015	0.001 % to 0.064%
			GC-MLD/QS/CA-I/5.4/36 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.0%
		Manganese (Mn)	BS EN 15079 – 2015	0.001 % to 1.70%
			IS 4027 (Part 2) – 1987 (RA-2012)	0.01 % to 2.5%
		Tellurium (Te)	IS 3863 – 1966 (RA-2012)	0.5 % to 1.0%
		Cadmium (Cd)	GC-MLD/QS/CA-I/5.4/36 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.0 %
			BS EN 15079 – 2015	0.001 % to 0.050 %
		Antimony (Sb)	BS EN 15079 – 2015	0.02 % to 0.05%
		Zinc (Zn)	BS EN 15079 – 2015	0.040 % to 30.00%
			GC-MLD/QS/CA-I/5.4/36 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.00%
			IS 4027 (Part 6) – 1987 (RA-2012)	1.0 % to 50.0%
			IS 4611 – 1991 (R 2015)	
		Sulphur (S)	BS EN 15079 – 2015	0.001 % to 0.19%
c.	Nickel & Its Alloys	Carbon (C)	ASTM E 1019 – 2011	0.001 % to 0.25%
		Sulphur (S)	ASTM E 1019 – 2011	0.001 % to 0.10%

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		Phosphorus (P)	IS 228 Part 3 – 1987 (RA- 2012)	0.010 % to 0.15%
		Manganese (Mn)	ASTM E 1473 – 2016	0.050 % to 2.0%
		Silicon (Si)	ASTM E 1473 – 2016	0.01 % to 5.0%
		Chromium (Cr)	GC-MLD/QS/CA-I/5.4/01 – Wet – 2013 Issue No. 02, Issue Date- 10/10/2017	0.1 % to 35.0%
		Nickel (Ni)	ASTM E 1473 – 2016	0.1 % to 84.0%
		Molybdenum (Mo)	GC-MLD/QS/CA-I/5.4/46 – Wet – 2013 Issue No. 02, Issue Date- 10/10/2017	0.10 % to 30.0%
			ASTM E 1473 – 2009	0.01 % to 1.50 %
		Cobalt (Co)	ASTM E 1473 – 2016	0.1 % to 5.0%
		Aluminium (Al)	ASTM E 1473 – 2016	0.2 % to 7.0%
		Copper (Cu)	GC-MLD/QS/CA-I/5.4/08 – Wet – 2013 Issue No. 02, Issue Date- 10/10/2017	10.0 % to 50.0%
		Manganese (Mn)	ASTM E 1476 – 2014	Qualitative
		Chromium (Cr)	API 578 – 2010	
		Nickel (Ni)		
		Molybdenum (Mo)		
		Copper (Cu)		
		Vanadium (V)		
		Niobium (Nb)		
		Titanium (Ti)		
d.	Zinc & Its Alloys	Copper (Cu)	ASTM E 1277 – 2014	0.001 % to 2.0%
			GC-MLD/QS/CA-I/5.4/38 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	
		Tin (Sn)	ASTM E 1277 – 2014	0.001 % to 1.0%
			GC-MLD/QS/CA-I/5.4/38 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	

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		Lead (Pb)	ASTM E 1277 – 2014 GC-MLD/QS/CA-I/5.4/38 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.0%
		Nickel (Ni)	GC-MLD/QS/CA-I/5.4/38 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.0%
		Aluminium (Al)	ASTM E 1277 – 2014 GC-MLD/QS/CA-I/5.4/38 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 5.0%
		Iron (Fe)	ASTM E 1277 – 2014 GC-MLD/QS/CA-I/5.4/38 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.0%
		Magnesium (Mg)	ASTM E 1277 – 2014 GC-MLD/QS/CA-I/5.4/38 – ICP – 2013 Issue No. 02, Issue Date- 10/10/2017	0.001 % to 1.0%
		Cadmium (Cd)	ASTM E 1277-2014	0.001 % to 1.0 %
e.	Tin & Lead Base Alloys	Tin (Sn)	IS 998 1983 (Part I) (RA - 2014)	1.0 % to 80.0%
		Antimony (Sb)	IS 998(Part 1):1983 (RA 2014)	1.0 % to 20.0%
f.	Silver & Brazing Alloy	Silver (Ag)	IS 4667(Part 4):2001(RA 2012)	1.0 % to 60.0%
			IS 4667 (Part 1): 1968 (RA2012)	
			IS 4667 (Part 2) – 1969 (RA-2012)	
		Copper (Cu)	IS 4667 (Part 4) – 2001 (RA-2012)	10.0 % to 40.0%
			IS 4667 (Part 1) – 1968 (RA-2012)	
			IS 4667 (Part 2) – 1969 (RA-2012)	

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		Zinc (Zn)	IS 4667 (Part 4) – 2001 (RA-2012)	0.1 % to 20.0%
		Cadmium (Cd)	IS 4667 (Part 4) – 2001 (RA-2012)	0.1 % to 20.0%
		Phosphorus (P)	IS 440 – 1964 (RA-2012)	0.01 % to 20.0%
		Tin (Sn)	IS 4667 (Part 2) – 1969 (RA-2012)	1.0 % to 10.0%
3.	Ferro Alloys			
a.	Ferro Silicon (Fe-Si)	Phosphorus (P)	IS 1559 (Part 4) – 1982 (RA-2012)	0.01 % to 0.15 %
		Silicon (Si)	IS 1559 (Part 1) – 1988 (RA-2014)	10.0 % to 85.0%
		Aluminium (Al)	IS 1559 (Part 5) – 2003 (RA-2014)	0.1 % to 2.0 %
b.	Ferro Chrome (Fe-Cr)	Carbon (C)	ASTM E 1019-2011	0.001 % to 8.50%
		Sulphur (S)	ASTM E 1019-2011	0.001 % to 0.35%
		Phosphorus (P)	IS 13452 (Part 7) – 2003 (RA-2014)	0.01 % to 0.75%
		Chromium (Cr)	IS 13452 (Part 5) – 2003 (RA-2012) IS 13452 (Part 6) – 1997 (RA-2012)	50.0 % to 80.0 %
		Silicon (Si)	IS 13452 (Part 1) – 1992 (RA-2012)	0.01 % to 10.0%
c.	Ferro Manganese (Fe-Mn)	Carbon (C)	ASTM E 1019-2011	0.001 % to 7.00%
		Sulphur (S)	ASTM E 1019-2011	0.001 % to 0.35%
		Phosphorus (P)	IS 13452 (part 7) 2003 (RA 2014)	0.01 % to 0.50%
		Manganese (Mn)	IS 1559 – 1961 (RA-2012)	10.0 % to 85.0%
		Silicon (Si)	IS 13452 (part 1) 1992 (RA 2012)	0.01 % to 7.0%

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d.	Silico Manganese (Si-Mn)	Carbon (C)	ASTM E 1019-2011	0.001 % to 4.50%
		Sulphur (S)	ASTM E 1019-2011	0.001 % to 0.35%
		Phosphorus (P)	IS 1559 part 4 –1982 RA 2012	0.01 % to 0.35%
		Manganese (Mn)	IS 1559 part 2 –1982 RA 2012	10.0 % to 75.0%
		Silicon (Si)	IS 1559 part 1 –1982 RA 2014	5.0 % to 35.0%
e.	Ferro Molybdenum (Fe-Mo)	Phosphorus (P)	IS 12614 (Part 5) – 1988 (RA-2014)	0.01 % to 1.0%
		Molybdenum (Mo)	IS 12614 (Part 1) – 1988 (RA-2014)	30.00 % to 75.00%
		Silicon (Si)	IS 12614 (Part 3) – 1988 (RA-2014)	0.10 % to 5.0%
f.	Ferro Phosphorus (Fe-P)	Carbon (C)	ASTM E 1019 – 2011	0.001 % to 4.50%
		Sulphur (S)	ASTM E 1019 – 2011	0.001 % to 0.35%
		Phosphorus (P)	IS 1559 – 1961 (RA-2012)	0.01 % to 30.0%
g.	Ferro Titanium (Fe-Ti)	Silicon (Si)	IS 13840 PART 2 – 1993 (RA-2014)	0.01 % to 30%
		Titanium (Ti)	IS 13840 PART 3 – 1993 (RA-2014)	5.00 % to 80.00%
		Aluminium (Al)	IS 13840 PART 4 – 1998 (RA-2014)	0.5 % to 10.0%
h.	Ferro Vanadium (Fe-V)	Phosphorus (P)	IS 1559 – PART 4-1982 (RA-2012)	0.01 % to 1.0%
		Silicon (Si)	IS 1559 – PART 1-1988 (RA-2014)	0.01 % to 10.0%
		Vanadium (V)	IS 1559 – 1961 (RA-2012)	5.0 % to 85.0%
		Aluminium (Al)	IS 1559 – 1961 (RA-2012)	0.1 % to 10.0%

Ajay Kumar Sharma
Convenor

N. Venkateswaran
Program Director

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i.	Ferro Tungsten (Fe-W)	Phosphorus (P)	IS 1559 –PART 4-1982- (RA-2012)	0.01 % to 0.5%
		Silicon (Si)	IS 1559 –PART 1-1988- (RA-2014)	0.1 % to 10.0%
		Tungsten (W)	IS : 1559-1961 (RA-2012)	70.0-95.0%
5.	Others			
A.	a.Copper concentrates b.Copper ores , c.Copper slags .	Silver	GC-MLD/QS/CA-I/5.4/64 - 2018 based on ASTM E 1898-2013 (ICP)	0.0001% to 5 %
		Gold	ASTM E 1805-2013 (FIRE ASSAY)	0.0001% to 5 %
B.	Copper wire	Persulphate	IS 10810 (Part 4) – 1984 (RA-2016)	1.0 to 5.0 g/m ²
II METALLIC COATING & TREATMENT SOLUTIONS				
1.	a. Copper base metal b. Iron base metal	Mass of Zinc Coating	IS 6745 – 1972 (RA-2016)	10 g/m ² to 800 g/m ²
		Thickness of Zinc (Zn) Coating	IS 1573 – 1986 (RA-2016)	10 microns to 40 microns
		Uniformity of Coating	IS 2633 – 1986 (RA-2016)	Qualitative
III HAZARDOUS AND RESTRICTED CHEMICALS				
a.	Jewellery , Decorative Articles (Metallic, Glass, Plastics)	Cadmium (Cd)	GC-MLD/QS/CA-I/5.4/65 - 2018 based on EPA 3050B (ICP) – 1996 Issue No. 02, Issue Date- 10/10/2017	1.0 mg/kg to 100 mg/kg
		Mercury (Hg)	GC-MLD/QS/CA-I/5.4/66- 2018 based IEC 62321 – 111/24/CD (ICP) Issue No. 02, Issue Date- 10/10/2017	2.5 mg/kg to 1000 mg/kg

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c.	Stationary items (Plastic, metal, Paper)	Lead (Pb)	GC-MLD/QS/CA-I/5.4/65 - 2018 based on EPA 3050B (ICP) – 1996 Issue No. 02, Issue Date- 10/10/2017	1.0 mg/kg to 1000 mg/kg
		Hexavalent Chromium (Cr+6)	GC-MLD/QS/CA-I/5.4/67 - 2018 based on EPA 3060A (UV – vis Spectrometer) – 1996 Issue No. 02, Issue Date- 10/10/2017	1.0 mg/kg to 1000 mg/kg
d.	Cooking utensils, cutlery, cookwares (Ceramic, Metallic, glass, plastics)	Leachable Lead	84/500/EEC – 1984 (Amended 2005) (Council directive)	0.01 mg/kg to 1.0 mg/kg
		Leachable Cadmium		0.01 mg/dm ² to 1.0 mg/dm ²
IV.	INDUSTRIAL & FINE CHEMICALS			
1.	Inorganic Chemicals			
a.	Edible Common Salt / Iodized Salt	Water insoluble matter	IS 253 – 2014 cl A-4	0.1 % to 4.0%
			IS 7224 – 2006 (RA-2016) Annex C	
		Chloride Content (NaCl)	IS 253 – 2014 cl A-5	75.0 % to 99.90 %
			IS 7224 – 2006 (RA-2016) Annex D	
		Acid Insoluble Matter	IS 253 – 1985 cl A-6	0.1% to 2.0%
		Matter soluble in Water other than Sodium Chloride	IS 253 – 2014 cl A-7	0.3 % to 4.0%
			IS 7224 – 2006 (RA-2016) Annex E	
		Calcium (Ca) Water soluble	IS 253 – 2014 A-8	0.01 % to 0.5%

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Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
			IS 7224 – 2006 (RA-2016) Annex F	
		Magnesium (Mg) Water soluble	IS 253 – 2014 A-8	0.01 % to 0.5%
			IS 7224 – 2006 (RA-2016) Annex F	
		Sulphates (SO ₄)	IS 253 – 2014 A-9	0.01 % to 1.0%
			IS 7224 – 2006 (RA-2016) Annex G	
		Alkalinity (Na ₂ CO ₃)	IS 7224 – 2006 (RA-2016) Annex J	0.1 % to 0.5%
		Lead (Pb)	IS 7224 – 2006 (RA-2016) Annex K	2.0 mg/kg to 10.0 mg/kg
		Iron (Fe)	IS 253 – 2014 A-12	10.0 mg/kg to 25.0 mg/kg
			IS 7224 – 2006 (RA-2016) annex M	
		Copper (Cu)	IS 253 – 2014 Cl A 14	0.3 mg/kg to 4.0 mg/kg
		Iodine Content	IS 7224 – 2006 (RA-2016) Annex H	1.0 mg/kg to 100.0 mg/kg
		pH .	IS 12981 – 1991 (RA-2015) cl A-3	1.0 to 5.0
		Moisture	IS 7224 – 2006 (RA-2016) Annex A	0.1 % to 10.0%
		Ferro Cyanide	IS 7224 – 2006 (RA-2016) Annex B	Qualitative
b.	Caustic Soda	Sodium Carbonate (Na ₂ CO ₃)	IS 252 – 2013 Cl A 3.1	0.1 % to 3.0%
		Sodium Hydroxide (NaOH)	IS 252 – 2013 cl A-4	40.0 % to 99.50%
		Chlorides (Cl)	IS 252 – 2013 cl A-5	0.05 % to 4.0%
		Sulphate (SO ₄)	IS 252 – 2013 cl A-6	0.01 % to 0.20%
		Silicates (SiO ₂)	IS 252 – 2013 cl A-7	0.01 % to 0.05%
		Iron (Fe)	IS 252 – 2013 cl A- 8	10.0 mg/kg to 400.0 mg/kg
		Manganese (Mn)	IS 252 – 2013 cl A 10.1	0.05 mg/kg to 2.0 mg/kg

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		Chlorates and Perchlorates (NaClO ₃)	IS 252 – 2013 cl A-11	5 mg/kg to 40.0 mg/kg
		Matter insoluble in water	IS 252 – 2013 cl A-12	0.01 % to 0.1%
2.	Others			
a.	Dry Chemical Powder (Mono ammonium Phosphate (MAP))	Apparent Density	IS 14609-1999 (RA 2010) cl 4.2 IS 4308-2003 (RA 2008) cl 4.2	0.50 g/ml to 1.50 g/ml
		Mono Ammonium Phosphate	IS 14609-1999 (RA 2010) cl 4.3	30 % to 95 %
		Moisture	IS 14609-1999 (RA 2010) cl 4.8	0.05 % to 10 %
		Water Repellency Test	IS 14609-1999 (RA 2010) cl 4.7 IS 4308-2003 (RA 2008) cl 4.7	0.10 % to 5 %
		Sodium or Potassium bicarbonate Content	IS 4308-2003 (RA 2008) Annex D	10 % to 99 %
V.	ORES & MINERALS			
1.	Manganese Ores	Total Manganese (Mn)	IS 1473 – 2004 (RA-2016)	30.0 % to 60.00%
		Manganese Dioxide (MnO ₂)	IS 1473 – 2004 (RA-2016)	35.0 % to 90.00%
		Iron (Fe)	IS 1473 – 2004 (RA-2016)	1.0 % to 48.0%
		Silica (SiO ₂)	IS 1473 – 2004 (RA-2016)	0.1 % to 15.0%
		Alumina (Al ₂ O ₃)	IS 1473 – 2004 (RA-2016)	0.1 % to 6.0%
		Phosphorus (P)	IS 1473 – 2004 (RA-2016)	0.01 to 1.00 %
		Sulphur (S)	IS 1473 – 2004 (RA-2016)	0.010 % to 0.20%
2.	Limestone	Loss On Ignition (LOI)	IS 1760 (Part 1) – 1991 (RA-2017)	40.0 % to 52.0%
		Silica (SiO ₂)	IS 1760 (Part 2) – 1991 (RA-2017)	1.0 % to 20.0%

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		Alumina (Al ₂ O ₃)	IS 1760 (Part 3) – 1992 (RA-2017)	0.1 % to 8.0%
		Ferric Oxide (Fe ₂ O ₃)	IS 1760 (Part 3) – 1992 (RA-2017)	0.1 % to 5.0%
		Calcium Oxide (CaO)	IS 1760 (Part 3) – 1992 (RA-2017)	25.00 % to 58.0%
		Magnesium Oxide (MgO)	IS 1760 (Part 3) – 1992 (RA-2017)	0.5 % to 10.0%
		Manganese (Mn)	IS 3204 – 1978 A-2	Qualitative
		Sulphur (S)	IS 3204 – 1978 (RA -2015)	0.01 % to 1.0%
		Phosphorus (P)	IS 3204 – 1978 (RA- 2015)	0.01 % to 0.1%
3.	Iron Ore	Total Iron (Fe)	IS 1493 Part 1-1981(RA-2016)	40.0 % to 90 .00%
		Alumina (Al ₂ O ₃)	IS 1493 Part 1-1981 (RA-2016)	0.5 % to 13.0%
		Silica (SiO ₂)	IS 1493 Part 1-1981 (RA-2016)	1.0 % to 15.0%
		Phosphorus (P)	IS 1493 Part 1-1981 (RA-2016)	0.01 % to 0.1%
		Manganese (Mn)	IS 1493 – 1959 (RA-2006)	0.01 % to 0.15%
		Sulphur (S)	IS 1493 Part 1-1981 (RA-2016)	0.01 % to 1.0%
		Total Moisture	IS 1493 – part 1 1981 (RA 2016)	0.1 %to 15 %
4.	Chrome Ore	Chromic Oxide (Cr ₂ O ₃)	IS 4737 – 1982 (RA-2016)	30.0 % to 80.0%
		Total Iron (Fe ₂ O ₃)	IS 4737 – 1982 (RA-2016)	1.0 % to 20.0%
		Alumina (Al ₂ O ₃)	IS 4737 – 1982 (RA-2016)	1.0 % to 14.0%
		Silica (SiO ₂)	IS 4737 – 1982 (RA-2016)	0.5 % to 7.0%
		Lime (CaO)	IS 4737 – 1982 (RA-2016)	0.5 % to 3.0%
		Magnesia (MgO)	IS 4737 – 1982 (RA-2016)	1.0 % to 14.0%
5.	Bauxite	Total Alumina (Al ₂ O ₃)	IS 2000 (Part 3) – 1985 (RA-2017)	25.00 % to 70.0 %
		Silica (SiO ₂)	IS 2000 (Part 2) – 1985 (RA-2017)	0.5% to 10.0%

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		Iron Oxide (Fe ₂ O ₃)	IS 2000 (Part 4) – 1985 (RA-2017)	0.1 % to 20.0%
		Loss on Ignition (LOI)	IS 2000 (Part 1) – 1985 (RA-2017)	1.0 % to 40.0%
		Titanium Dioxide (TiO ₂)	IS 2000 (Part 5) – 1985 (RA-2017)	0.5 % to 12.0%
		Vanadium (V)	IS 2000 (Part 6) – 1985 (RA-2017)	0.01 % to 0.1 %
		Phosphorus Pentoxide (P ₂ O ₅)	IS 2000 (Part 7) – 2001 (RA-2017)	0.01 % to 1.00 %
6.	Rock Phosphate	Total Phosphates as P ₂ O ₅	IS 11224-1985 (RA 2010)	10 % to 40 %
		Silica as SiO ₂	IS 11224-1985 (RA 2010)	1 % to 15 %
		Fluoride as F	IS 11224-1985 (RA 2010)	0.5 % to 10 %
		Moisture	IS 11224-1985 (RA 2010)	0.5 % to 10 %
		Calcium Oxide CaO	IS 9386-1979 (RA 2006)	30 % to 65 %
		Magnesium Oxide as MgO	IS 11224-1985 (RA 2010)	0.10 % to 5 %
		Chloride as Cl	IS 11224-1985 (RA 2010)	0.001 % to 0.50%
V.	BUILDING MATERIALS			
1.	Cement OPC PPC PSC	Loss on Ignition (LOI)	IS 4032 – 1985 (RA-2014)	0.2 % to 5.0%
		Silica (SiO ₂)	IS 4032 – 1985 (RA-2014)	1.0 % to 35.0%
		Combined Ferric Oxide & Alumina (Fe ₂ O ₃ + Al ₂ O ₃)	IS 4032 – 1985 (RA-2014)	3.00 % to 15.0%
		Ferric Oxide (Fe ₂ O ₃)	IS 4032 – 1985 (RA-2014)	0.2 % to 6.0%
		Alumina (Al ₂ O ₃)	IS 4032 – 1985 (RA-2014)	1.00 % to 12.00%
		Calcium Oxide (CaO)	IS 4032 – 1985 (RA-2014)	30.0 % to 65.0%
		Magnesia (MgO)	IS 4032 – 1985 (RA-2014)	0.5 % to 10.0%
		Sulphuric Anhydride	IS 4032 – 1985 (RA-2014)	0.2 % to 3.0%
		Insoluble Residue	IS 4032 – 1985 (RA-2014)	0.5 % to 40%
		Free Lime	IS 4032 – 1985 (RA-2014)	0.1 % to 2.00%

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2.	ADMIXTURE	Relative Density	IS 9103 – 1999 (RA-2013)	1.00 % to 1.50
		Ash Content	IS 9103 – 1999 (RA-2013)	10 % to 40.0%
		pH	IS 9103 – 1999 (RA-2013)	5 to 10
		Chloride Ion content	IS 9103 – 1999 (RA-2013)	0.005 % to 0.10%
		SO4 Content	GC-MLD/QS/CA-I/5.4/63 - 2018 based on IS 255 – 1982 R 2016	0.05 % to 5.0%
3.	Gypsum, Gypsum Plaster	Dry Material Content	IS 9103 – 1999 (RA-2013)	30 % to 50.0%
		Sulphates (SO ₃)	IS 1288 : 1982 (RA-2016)	20% to 60 %
		Calcium Oxide (CaO)	IS 1288 : 1982 (RA-2016)	20% to 50 %
		Free Water	IS 1288 : 1982 (RA-2016)	0.2% to 10 %
		Combined Water	IS 1288 : 1982 (RA-2016)	1.0% to 25 %
		Silica and Acid insolubles	IS 1288 : 1982 (RA-2016)	0.2 % to 20%
		Iron and Alumina Oxides	IS 1288 : 1982 (RA-2016)	0.2 %to 5 %
		Loss on Ignition (LOI)	IS 2547 : 1976 Part I App. B	0.5 to 15 %
	Free Lime	IS 2547 : 1976 Part I App. C	0.1% to 5 %	
VI.	SOIL & ROCK			
1	Soil	pH	IS 2720 part-26- 1987 (RA- 2002)	2 to 10
		Organic matter	IS 2720 part – 22 -1972 (RA- 2010)	0.10 % to 10 %
VII.	SOLID FUELS			
1.	Coal/Coke	Total Moisture (TM)	IS 1350 (Part 1) – 1984 (RA 2013) ASTM D 3302/ D 3302M – 2017 ISO 589 – 2008	1.00 % to 60.00%
		Moisture / Air Dried Moisture	IS 1350 (Part 1) – 1984 (RA 2002) ASTM D 3173 – 2017 ISO 687 – 2010	0.50 % to 30.00%

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		Volatile Matter (VM)	IS 1350 (Part 1) – 1984 (RA 2002) ASTM D 3175 – 2017 ISO 562 – 2010	1.00 % to 70.00%
		Ash	IS 1350 (Part 1) – 1984 (RA 2002) ASTM D 3174 – 2012 ISO 1171 – 2010	0.50 % to 70.00%
		Fixed Carbon (FC)	IS 1350 (Part 1) – 1984 (RA 2002) ASTM D 3172 – 2013	By Calculation
		Gross Calorific Value (GCV) / Net Calorific Value (NCV)	IS 1350 (Part 2) – 1970 (RA 2010) ASTM D 5865 – 2013 ASTM D 240 – 2017	500 Kcal/kg. to 10000 Kcal/kg.
		Sulphur (S)	ASTM D 4239 – 2017	0.10 % to 6.0%
		Carbon (C)	ASTM D 5373 – 2016	35.00 % to 85.00%
		Hydrogen (H)	ASTM D 5373 – 2016	1.00 % to 7.00%
		Nitrogen (N)	ASTM D 5373 – 2016	0.50 % to 4.00%
		Oxygen (O)	ASTM D 3176 – 2015	By Calculation
		Ash Fusion	ASTM D 1857/ 1857M – 2004 (RA 2017)	900 °C to 1500°C
		Proximate Analysis By TGA	ASTM D 7582 – 2015	
			Moisture	0.50 % to 25.00%
			Volatile Matter (VM)	1.00 % to 60.00%
			Ash	0.50 % to 60.00%
			Fixed Carbon (FC)	By Calculation
		Hard Groove Grindability Index	IS 4433-1979 (RA 2015) ASTM D 409M-2016	37 to 89

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VIII.	PETROLEUM AND PRODUCTS			
1.	Low Sulphur Heavy Stock (LSHS)/Vacuum Gas Oil(VGO)	Gross Calorific Value (GCV) / Net Calorific Value (NCV)	IS 1448 (Part 7) – 2004 ASTM D 4809 – 2013	8000 kcal/kg to 11000 kcal/kg
		Gross Calorific Value (GCV) / Net Calorific Value (NCV) (By Calculation)	ASTM D 4868 – 2017	8000 kcal/kg to 11000 kcal/kg
		Water Content	ASTM D 95 – 2013e1 IS 1448 (Part 40) – 1987 (RA 2006) ISO 3733 – 1999	0.05 % to 10.0%
		Total Acid Number (TAN)	ASTM D 664 – 2011a IS 1448 (Part 1; Sec 1) – 2002 (RA 2007)	0.01 to 0.50 mg KOH/g
		Total Sulfur	ASTM D 4294 – 2010 ISO 8754 – 2003	0.1 % to 5.0%
		Sediments by Extraction	IS 1448 (Part 30) – 2013 ASTM D 473 – 07 (RA 2012)	0.01 % to 0.50%
		Asphaltenes	IS 1448 (Part 22) – 1985 (RA 2007) ASTM D 6560 – 2012	0.5 % to 18.0%
		Flash Point (Pensky Marten)	IS 1448 (Part 21) – 2012 ASTM D 93 – 2015 ISO 2719 – 2002	40 °C to 370°C
		Kinematic Viscosity at 100°C	IS 1448 (Part 25) – 1976 (RA 2002) ASTM D 445 – 2015 ISO 3104 – 1994	10 cSt to 50 cSt
		Sp. Gravity@15.56°C	IS 1448 (Part 16) – 2014 ASTM D 1298 – 2012b ISO 3675 – 1998	0.850 to 0.980

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		Pour Point	IS 1448 (Part 10) – 1970 (RA 2012) ASTM D 97 – 2015 ISO 3016 – 1994	(-)15°C to (+)39°C
		Density @15°C	IS 1448 (Part 16) – 2014 ASTM D 1298 – 2012b ISO 3675 – 1998	0.85-0.98 g/cc 850.0 kg/m ³ to 980.0 kg/m ³
2.	Furnace Oil (FO)	Total Sediments	IP 375 – 2011 IP 390 (A&B) – 2011 ASTM D 4870 – 2014 ISO 10307 – 2 – 2009	0.01 % to 0.5%
		Ash Content	ASTM D 482 – 2013 IS 1448 (Part 4) – 1984 (RA 2002) ISO 6245 – 2001	0.001 % to 0.18%
		Micro Carbon Residue	ASTM D 4530 – 2015 ISO 10370 – 1993	0.01 % to 30.00%
		Conradson Carbon Residue	ASTM D 189 – 06 (RA 2014)	0.01 % to 30.00%
		Water Content	ASTM D 95 – 2013e1 IS 1448 (Part 40) – 1987 (RA 2006) ISO 3733 – 1999	0.05 % to 25.0%
		Total Acid Number (TAN)	ASTM D 664 – 2017 IS 1448 (Part 1; Sec 1) – 2007	0.01 to 0.50mg KOH/g
		Total Sulfur	ASTM D 4294 – 2016 ISO 8754 – 2003	0.1 % to 5.0%
		Sediments by Extraction	IS 1448 (Part 30) – 2013 ASTM D 473 – 07 (RA 2017)	0.01 % to 0.50%
		Gross Calorific Value (GCV) / Net Calorific Value (NCV) (By Calculation)	ASTM D 4868 – 2017	8000 kcal/kg to 11000 kcal/kg

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		Gross Calorific Value (GCV) / Net Calorific Value (NCV)	IS 1448 (Part 7) – 2004 ASTM D 4809 – 2013	8,000 kcal/kg to 11000 kcal/kg
		Density @15°C	IS 1448 (Part 16) – 2014 ASTM D 1298 – 2017 ISO 3675 – 1998	0.920 g/cc to 0.995 g/cc 920.0 kg/m ³ to 995.0 kg/m ³
		Sp. Gravity@15.56°C	IS 1448 (Part 16) – 2014 ASTM D 1298 – 2017 ISO 3675 – 1998	0.920 to 0.995
		Asphaltenes	IS 1448 (Part 22) – 1985 (RA 2007) ASTM D 6560 – 2012	0.5 % to 30.0%
		Flash Point (Pensky Marten)	IS 1448 (Part 21) – 2012 ASTM D 93 – 2016 ISO 2719 – 2002	50 °C to 200°C
		Kinematic Viscosity at 100°C	IS 1448 (Part 25) – 1976 (RA 2002) ASTM D 445 – 2017a ISO 3104 – 1994	10 cSt to 50 cSt
		Kinematic Viscosity at 50°C	IS 1448 (Part 25) – 1976 (RA 2002) ASTM D 445 – 2017a ISO 3104 – 1994	20 cSt to 400 cSt
		Pour Point	IS 1448 (Part 10) – 1970 (RA 2012) ASTM D 97 – 2016 ISO 3016 – 1994	(-)27 °C to (+)15°C
		CCAI	ISO 8217-2010 (E) Annex F	820 to 876
		Hydrogen Sulphide	IP 570 – 2013	0.40 mg/kg to 15.0 mg/kg
3.	High Speed Diesel (HSD)	Gross Calorific Value (GCV) / Net Calorific Value (NCV)	IS 1448 (Part 7) – 2004 ASTM D 4809 – 2013	8000 kcal/kg to 12000 kcal/kg

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SI.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Gross Calorific Value (GCV) / Net Calorific Value (NCV) (By Calculation)	ASTM D 4868 – 2010	8000 kcal/kg to 12000 kcal/kg
		Ash Content	ASTM D 482 – 2013 IS 1448 (Part 4) – 1984 (RA 2002) ISO 6245 – 2001	0.001 % to 0.18%
		Micro Carbon Residue@10% Dist. Residue	ASTM D 4530 – 2015 ISO 10370 – 1993	0.01 % to 2.5%
		Conradson Carbon Residue@10% Dist. Residue	ASTM D 189 – 06 (RA 2014)	0.01 % to 2.5%
		Moisture Content	ASTM E 203-2016	0.01 % to 2.5%
		Strong Acid Number / Total Acid Number	ASTM D 974 – 2014 e1	0.01 mg KOH/g to 0.50 mg KOH/g
		Total Sulfur	ASTM D 4294 – 2016 ISO 8754 – 2003	0.0017 % to 4.6 %
		Total Sulfur	ASTM D 3120 – 2014	1 mg/kg to 500 mg/kg
		Carbon & Hydrogen Ratio	IS 1448 (Part 7) – 2004	By Weight (Calculation)
		Color, ASTM	IS 1448 (Part 12) – 2013 ASTM D 1500 – 2016	0.5 to 8.0
		Cu-Strip Corrosion	IS 1448 (Part 15) – 2004 (RA 2010) ASTM D 130 – 2012	1a to 4c unit
		Hydrogen Sulphide	IP 570 – 2013	0.40 mg/kg to 15.0 mg/kg
		Density @15°C	IS 1448 (Part 16) – 2014 ASTM D 1298 – 2017 ISO 3675 – 1998	0.8000 g/cc to 0.8750 g/cc 800.0 kg/m ³ to 875.0 kg/m ³
		Sp. Gravity@15.56°C	IS 1448 (Part 16) – 2014 ASTM D 1298 – 2017 ISO 3675 – 1998	0.8000 to 0.8750

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Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Distillation	IS 1448 (Part 18) – 1991 (RA 2010) ASTM D 86 – 2017	100 °C to 400°C
		Flash Point (Abel)	IS 1448 (Part 20) – 1998 IP 170 – 2013	26 °C to 70°C
		Flash Point (Pensky Marten)	IS 1448 (Part 21) – 2012 ASTM D 93 – 2016 ISO 2719 – 2002	50 °C to 200°C
		Kinematic Viscosity at 40°C	IS 1448 (Part 25) – 1976 (RA 2002) ASTM D 445 – 2017a ISO 3104 – 1994	1.5 cSt to 5.0 cSt
		Pour Point	IS 1448 (Part 10) – 1970 (RA 2012) ASTM D 97 – 2016 ISO 3016 – 1994	(-)30 °C to (+)15°C
		Cold Filter Plugging Point (CFPP)	IP 309 – 1999 (RA 2014) IS 1448 (Part 110) – 1981 (RA 2003)	(-)30 °C to (+)15°C
		Sediments by Extraction	IS 1448 (Part 30) – 2013 ASTM D 473 – 07 (RA 2017)	0.01 % to 0.50%
		Cloud Point	ASTM D 2500 – 2017 ISO 3015 – 1992 IS 1448 (Part 10) – 1970 (RA 2012)	(-)18°C to (+)18°C
		Density@15°C	ASTM D 4052 – 2016	0.8000 g/cc to 0.8750 g/cc 800.0 kg/m ³ to 875.0 kg/m ³
		Sp. Gravity@15.56°C	ASTM D 4052 – 2016	0.8000 to 0.8750
		Cetane Index	ASTM D 4737 – 2016 ASTM D 976 – 2016	By Calculation
4.	Naphtha	Gross Calorific Value (GCV) / Net Calorific Value (NCV)	IS 1448 (Part 7) – 2004 ASTM D 4809 – 2013	10000 kcal/kg to 12000 kcal/kg
		Reid Vapour Pressure	ASTM D 323 – 2015a	0.5 psi to 15.0 psi

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Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Olefins	ASTM D 1319 – 2015	0.3 % to 55.0 %
		Aromatics		5.0 % to 99.0%
		Saturates		1.0 % to 95.0%
		Carbon & Hydrogen Ratio	IS 1448 (Part 7) – 2004	By Weight (Calculation)
		Oxygenates	GC-MLD/QS/CA-E/5.4/ 01 – 2017 Issue No. 02, Issue Date- 10/10/2017	1.0 mg/l to 100 mg/l
		Color, Saybolt	IS 1448 (Part 14) – 1960 (RA 2003) ASTM D 156 – 2015	(-)16 to (+)30
		Cu-Strip Corrosion	IS 1448 (Part 15) – 2004 (RA 2010) ASTM D 130 – 2012	1a to 4c unit
		Density@15°C	IS 1448 (Part 16) – 2014 ASTM D 1298 – 2017 ISO 3675 – 1998	0.6600 g/cc to 0.7300 g/cc 660.0 kg/m ³ to 730.0 kg/m ³
		Sp. Gravity@15.56°C	IS 1448 (Part 16) – 2014 ASTM D 1298 – 2017 ISO 3675 – 1998	0.6600 to 0.7300
		Distillation	IS 1448 (Part 18) – 1991 (RA 2010) ASTM D 86 – 2017	30 °C to 220°C
		Density @15°C	ASTM D 4052 – 2016	0.6400 g/cc to 0.7300 g/cc 640.0 kg/m ³ to 730.0 kg/m ³
		Sp. Gravity @15.56°C	ASTM D 4052 – 2016	0.6400 to 0.7300
		Carbon Di-Sulphide	Ref: ASTM D 6228-2010	0.20 mg/l to 20.0 mg/l
		Sulphur	ASTM D 3120 – 2014	1.0 mg/l to 1000 mg/l
5.	Solvents	Color, Saybolt	IS 1448 (Part 14) – 1960 (RA 2003) ASTM D 156 – 2015	(-)16 to (+)30
		Flash Point (Abel)	IS 1448 (Part 20) – 1998 IP 170 – 2013	(-)10 °C to (+)70°C

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		Density @15°C	IS 1448 (Part 16) – 2014 ASTM D 1298 – 2017 ISO 3675 – 1998	0.66 g/cc to 1.000 g/cc 660.0 kg/m ³ to 100.0 kg/m ³
		Sp. Gravity@15.56°C	IS 1448 (Part 16) – 2014 ASTM D 1298 – 2017 ISO 3675 – 1998	0.66-1.000
		Density @15°C	ASTM D 4052-2016	0.66 kg/m ³ to 1.000 g/cc 660.0 kg/m ³ to 100.0 kg/m ³
		Sp. ravity@15.56°C	ASTM D 4052 – 2016	0.66-1.000
		Moisture By KF	ASTM E 203 – 2016	100-1000 mg/kg
6.	Jet Fuel	Color, Saybolt	IS 1448 (Part 14) – 1960 (RA 2003) ASTM D 156 – 2015	(-)16 to (+)30
		Total Sulfur	ASTM D 4294 – 2016 ISO 8754 – 2003	0.0017 % to 4.6%
		Flash Point (Abel)	IS 1448 (Part 20) – 1998 IP 170 – 2013	26 °C to (+)70 °C
		Density @15°C	IS 1448 (Part 16) – 2014 ASTM D 1298 – 2017 ISO 3675 – 1998	0.7400 g/cc to 0.8300 g/cc 740.0 kg/m ³ to 830.0 kg/m ³
		Sp. Gravity@15.56°C	IS 1448 (Part 16) – 2014 ASTM D 1298 – 2017 ISO 3675 – 1998	0.7400 to 0.8300
		Distillation	IS 1448 (Part 18) – 1991 (RA 2010) ASTM D 86 – 2017	100°C to 300°C
		Kinematic Viscosity at 40°C	IS 1448 (Part 25) – 1976 (RA 2002) ASTM D 445 – 2017 ISO 3104 – 1994	0.5 cSt to 5.0 cSt
		Density @15°C	ASTM D 4052 – 2016	0.7400 g/cc to 0.8300 g/cc 740.0 kg/m ³ to 830.0 kg/m ³
		Sp. Gravity@15.56°C	ASTM D 4052 – 2016	0.7400 to 0.8300

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Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
7.	Superior Kerosene Oil (SKO)	Color, Saybolt	IS 1448 (Part 14) – 1960 (RA 2003) ASTM D 156 – 2015	(-)16 to (+)30 Saybolt
		Total Sulfur	ASTM D 4294 – 2016 ISO 8754 – 2003	17 % to 4.6 %
		Density @15°C	IS 1448 (Part 16) – 2014 ASTM D 1298 – 2017 ISO 3675 – 1998	0.7400 g/cc to 0.8300 g/cc 740.0 kg/m ³ to 830.0 kg/m ³
		Sp. Gravity@15.56°C	IS 1448 (Part 16) – 2014 ASTM D 1298 – 2017 ISO 3675 – 1998	0.7400 to 0.8300
		Distillation	IS 1448 (Part 18) – 1991 (RA 2010) ASTM D 86 – 2017	100 °C to 300°C
		Flash Point (Abel)	IS 1448 (Part 20) – 1998 IP 170 – 2013	26 °C to (+)70°C
		Kinematic Viscosity at 40°C	IS 1448 (Part 25) – 1976 (RA 2002) ASTM D 445 – 2017 ISO 3104 – 1994	0.5 cSt to 3.0 cSt
		Density @15°C	ASTM D 4052 – 2016	0.7400 g/cc to 0.8300 g/cc 740.0 kg/m ³ to 830.0 kg/m ³
		Specific Gravity@15.56°C	ASTM D 4052 – 2016	0.7400 to 0.8300
8.	Light Diesel Oil (LDO)	Color, ASTM	IS 1448 (Part 12) – 2013 ASTM D 1500 – 2012	0.5 to 8.0
		Ash Content	ASTM D 482 – 2013 IS 1448 (Part 4) – 1984 (RA 2002) ISO 6245 – 2001	0.001 % to 0.18%
		Micro Carbon Residue	ASTM D 4530 – 2015 ISO 10370 – 1993	0.01 % to 2.5%
		Conradson Carbon Residue	ASTM D 189 – 06 (RA2014)	0.01 % to 2.5 %

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		Water Content	ASTM D 95 – 2013e1 IS 1448 (Part 40) – 1987 (RA 2006) ISO 3733 – 1999	0.05 % to 10%
		Total Sulfur	ASTM D 4294 – 2016 ISO 8754 – 2003	0.1 % to 5.0%
		Sediments by Extraction	IS 1448 (Part 30) – 2013 ASTM D 473 – 07 (RA 2017)	0.01 % to 5.0%
		Cu-Strip Corrosion	IS 1448 (Part 15) – 2004 (RA 2010) ASTM D 130 – 2012	1a to 4c unit
		Density@15°C	IS 1448 (Part 16) – 2014 ASTM D 1298 – 2017 ISO 3675 – 1998	0.8500 g/cc to 0.9500 g/cc 850.0 kg/m ³ to 950.0 kg/m ³
		Sp. Gravity@15.56°C	IS 1448 (Part 16) – 2014 ASTM D 1298 – 2017 ISO 3675 – 1998	0.8500 to 0.9500
		Asphaltenes	IS 1448 (Part 22) – 1985 (RA 2007) ASTM D 6560 – 2012	0.5 % to 10.0%
		Flash Point (Pensky Marten)	IS 1448 (Part 21) – 2012 ASTM D 93 – 2016 ISO 2719 – 2002	40 °C to 300°C
		Kinematic Viscosity at 40°C	IS 1448 (Part 25) – 1976 (RA 2002) ASTM D 445 – 2017 ISO 3104 – 1994	0.5 cSt to 15.0 cSt
		Pour Point	IS 1448 (Part 10) – 1970 (RA 2012) ASTM D 97 – 2016 ISO 3016 – 1994	(-)30 °C to (+)15°C
		Cloud Point	ASTM D 2500 – 2017 ISO 3015 – 1992 IS 1448 (Part 10) – 1970 (RA 2012)	(-)18 °C to (+)18°C

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		Cold Filter Plugging Point (CFPP)	IP 309 – 2004 IS 1448 (Part 110) – 1981 (RA 2003)	(-)24 °C to (+)15°C
		Hydrogen Sulphide	IP 570 – 2013	0.40 mg/kg to 15.0 mg/kg
		Sp. Gravity@ 15.56°C	ASTM D 4052 – 2016	0.8000 to 0.9250
		Density@15°C	ASTM D 4052 – 2016	0.8000 g/cc to 0.9250g/cc 800.0 kg/m ³ to 925.0 kg/m ³
9.	Motor Spirit (MS)	Cu-Strip Corrosion	IS 1448 (Part 15) – 2004 (RA 2010) ASTM D 130 – 2012	1a to 4c unit
		Olefins	ASTM D 1319 – 2015	0.3 % to 55.0 %
		Aromatics		5.0 % to 99.0%
		Saturates		1.0 % to 95.0%
		Density @15°C	IS 1448 (Part 16) – 2014 ASTM D 1298 – 2017 ISO 3675 – 1998	0.6700 g/cc to 0.7800 g/cc 670.0 kg/m ³ to 780.0 kg/m ³
		Sp. Gravity@15.56°C	IS 1448 (Part 16) – 2014 ASTM D 1298 – 2017 ISO 3675 – 1998	0.6700 % to 0.7800
		Reid Vapour Pressure	ASTM D 323 – 2015a	0.5 psi to 15.0 psi
		Distillation	IS 1448 (Part 18) – 1991 (RA 2010) ASTM D 86 – 2017	30°C to 300°C
		Density @15°C	ASTM D 4052 – 2016	0.6700 g/cc to 0.7800 g/cc 670.0 kg/m ³ to 780.0 kg/m ³
		Sp. Gravity @15.56°C	ASTM D 4052 – 2016	0.6700 to 0.7800
		Sulphur	ASTM D 3120 – 2014	1.0 mg/l to 1000 mg/l
10.	Furnace Oil (FO) / Light Diesel Oil (LDO)	TRACE ELEMENTS Sodium (Na) Potassium (K) Calcium (Ca) Vanadium (V) Aluminum (Al) Silicon (Si) Nickel (Ni)	IP 501 – 2005 ASTM D 5184 – 2012	0.1 mg/l to 250 mg/l

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		Magnesium (Mg) Iron (Fe) Chromium (Cr) Copper (Cu) Tin (Sn) Zinc (Zn) Phosphorus (P)		
11.	Naphtha / Motor Spirit (MS)	Paraffins	ASTM D 6839 – 2017	20.0 % to 90.0% .
		Olefins		Upto 1.0%
		Aromatics		1.0 % to 30.0%
		Naphthenes		5.0 % to 40.0%
		Chloride	ASTM D 4929 – 2016	1.0 mg/l to 10 mg/l
		Sodium (Na)	GC-MLD/QS/CA-I/5.4/56 –	100 µg/l to 1000 µg/l
		Vanadium (V)	ICP – 2017 Issue No. 02,	100 µg/l to 1000 µg/l
		Potassium (K)	Issue Date- 10/10/2017	100 µg/l to 1000 µg/l
		Calcium (Ca)		100 µg/l to 1000 µg/l
		Lead (Pb)		10 µg/l to 1000 µg/l
		Arsenic (As)		1 µg/l to 1000 µg/l
		Mercury (Hg)		1 µg/l to 1000 µg/l
12.	Transformer Oil	Appearance	Qualitative (Visual)	
		Density	IS 1448(P:16):2014	0.80 g/cc to 0.95 g/cc
		Sp. Gravity	ASTM D 1298 – 2017 ASTM D4052-2011	
		Kinematic Viscosity@40°C	IS 1448(P:25):2002 ASTM D 445 – 2017a	1 cSt to 50 cSt
		PMCC Flash Point	IS 1448(P:21):2012 ASTM D 93 – 2016	40 °C to 400°C
		Pour Point	IS 1448(P:10):2012 ASTM D 97 – 2016	+27 to (-)51°C
		Total Acidity	IS 1448(P:2):2007 ASTM D 974 – 2014 e1	0.1 to 1.0 mgKOH/g
		In-Organic Acidity	IS 1448(P:2):2007 ASTM D 974 – 2014 e1	0.1 to 0.5 mgKOH/g

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		Water Content	ASTM E203-16	50 mg/kg to 500 mg/kg
		Corrosive Sulphur @ 140°C for 19 Hrs	Annexure B of IS 335	Observation (Corrosion/non Corrosion)
		Oxidation Stability @ 120 °C		
		A. Neutralization Value	IS 12422/ Annexure C of IS 335	0.01 mg KOH/g to 0.90 mg KOH/g
		B. Sludge Content	IS 12422/ Annexure C of IS 335	0.01% to 0.90%wt
		Oxidation Stability (RPVOT)	IS 12958	1 to 600 Minutes
IX.	LUBRICANTS			
1.	Lubricants, Lube Oil	Color, ASTM	IS 1448 (Part 12) – 2013 ASTM D 1500 – 2012	0.5 to 8.0
		Ash Content	ASTM D 482 – 2013 IS 1448 (Part 4) – 1984 (RA 2002) ISO 6245 – 2001	0.001 % to 0.18%
		Sulphated Ash	ASTM D 874 – 2013a IS 1448 (Part 4) – 1984 (RA 2002)	0.005 % to 5.00%
		Water Content	ASTM D 95 – 2013e1 IS 1448 (Part 40) – 1987 (RA 2006) ISO 3733 – 1999	0.05 % to 10.0%
		Total Base Number (TBN)	ASTM D 974 – 2014e1 IS 1448 (Part 86) – 1977 (RA 2006)	0.1 mgKOH/g to 40.0 mgKOH/g
		Viscosity Index	ASTM D 2270 – 2016	50 to 200
		Total Acid Number (TAN)	ASTM D 664 – 2017 IS 1448 (Part 1; Sec 1) – 2007 ASTM D 974 – 2014e1	0.1 mgKOH/g to 40.0 mgKOH/g

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		Total Sulfur	ASTM D 4294 – 2017 ISO 8754 – 2003	0.05 % to 5.0%
		Sediments by Extraction	IS 1448 (Part 30) – 2013 ASTM D 473 – 07 (RA 2017)	0.01 % to 10.0%
		Cu-Strip Corrosion	IS 1448 (Part 15) – 2004 (RA 2010) ASTM D 130 – 2012	1a to 4c unit
		Density@15°C	IS 1448 (Part 16) – 2014 ASTM D 1298 – 2017 ISO 3675 – 1998	0.8000 g/cc to 0.9500 g/cc 800.0 kg/m ³ to 950.0 kg/m ³
		Sp. Gravity@15.56°C	IS 1448 (Part 16) – 2014 ASTM D 1298 – 2017 ISO 3675 – 1998	0.8000 to 0.9500
		Flash Point (COC)	ASTM D 92 – 2016b IS 1448 (Part 69) – 2013	79 ° to 400°C
		Flash Point (Pensky Marten)	IS 1448 (Part 21) – 2012 ASTM D 93 – 2016a ISO 2719 – 2002	50 ° to 400°C
		Insolubles (Pentane & Toluene)	ASTM D 893 – 2014	0.01 % to 5.0%
		Kinematic Viscosity at 100°C	IS 1448 (Part 25) – 1976 (RA 2002) ASTM D 445 – 2017 ISO 3104 – 1994	2 cSt to 40 cSt
		Kinematic Viscosity at 40°C	IS 1448 (Part 25) – 1976 (RA 2002) ASTM D 445 – 2017	0.5 cSt to 250 cSt
		Pour Point	IS 1448 (Part 10) – 1970 (RA 2012) ASTM D 97 – 2016 ISO 3016 – 1994	(-)39°C to (+)15°C
		Chlorine	ASTM D 808 – 2016	0.1 % to 5.0%
		Moisture By KF	ASTM E 203 – 2016	50 mg/kg to 1000 mg/kg
		Hydrogen Sulphide	IP 570 – 2013	0.40 mg/kg to 15.0 mg/kg
		Sp. Gravity@15°C	ASTM D 4052 – 2016	0.8000 to 0.9500

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		Density @15°C	ASTM D 4052 – 2016	0.8000 g/cc to 0.9500 g/cc 800.0 kg/m ³ to 950.0 kg/m ³
		TRACE ELEMENTS		
		Aluminium (Al)	ASTM D 5185-2013E1	1 mg/kg to 250 mg/kg
		Barium (Ba)		1 mg/kg to 250 mg/kg
		Boron (B)		1 mg/kg to 250 mg/kg
		Calcium (Ca)		1 mg/kg to 250 mg/kg
		Chromium (Cr)		1 mg/kg to 250 mg/kg
		Copper (Cu)		1 mg/kg to 250 mg/kg
		Iron (Fe)		1 mg/kg to 250 mg/kg
		Lead (Pb)		1 mg/kg to 250 mg/kg
		Magnesium (Mg)		1 mg/kg to 250 mg/kg
		Manganese (Mn)		1 mg/kg to 250 mg/kg
		Molybdenum (Mo)		1 mg/kg to 250 mg/kg
		Nickel (Ni)		1 mg/kg to 250 mg/kg
		Phosphorus (P)		1 mg/kg to 250 mg/kg
		Potassium (K)		1 mg/l to 250 mg/l
		Silicon (Si)		1 mg/l to 250 mg/l
		Silver (Ag)		1 mg/l to 250 mg/l
		Sodium (Na)		1 mg/l to 250 mg/l
		Tin (Sn)		1 mg/l to 250 mg/l
		Titanium (Ti)		1 mg/l to 250 mg/l
		Vanadium (V)		1 mg/l to 250 mg/l
		Zinc (Zn)		1 mg/l to 250 mg/l

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AT SITE:

I	METAL & ALLOYS			
1.	Ferrous			
a.	Low alloy Steel	Manganese (Mn)	ASTM E 1476 – 2014	Qualitative
	Mild steel	Chromium (Cr)	API 578 – 2010	
	Stainless steel	Nickel (Ni)		
	Tool steel	Molybdenum (Mo)		
		Copper (Cu)		
		Vanadium (V)		
		Niobium (Nb)		
		Titanium (Ti)		
2.	Non Ferrous			
a.	Nickel and Its Alloys	Manganese (Mn)	ASTM E 1476 – 2014	Qualitative
		Chromium (Cr)	API 578 – 2010	
		Nickel (Ni)		
		Molybdenum (Mo)		
		Copper (Cu)		
		Vanadium (V)		
		Niobium (Nb)		
		Titanium (Ti)		

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<u>MECHANICAL TESTING</u>				
I.	MECHANICAL PROPERTIES OF METALS			
	Ferrous and Non-Ferrous, Metals and Alloys (Carbon steel, Alloy steel, Stainless Steel, Duplex Steel, Martensitic Steel, Copper & Copper Alloy, Titanium Alloy, Monel, Inconel, Incoloy, Hastelloy)	Tensile Test U.T.S Y.S. Proof Stress (0.2%, 1%) %Elongation %R.A.	IS 1608 - 2005 (RA: 2017) ISO 6892 -1-2016 ASTM A 370 – 2017 ASTM E 8/E 8 M – 2016a ASME Sec. IX – 2017	100 to 3000 Mpa 100 to 2500 Mpa 100-2500 Mpa 2 to 80% 2 to 80 %
		Hardness Rockwell Hardness (B & C Scale)	IS 1586- 2012 (Part-I) ASTM A 370 – 2017 ASTM E 18 – 2017e1	20 HRC to 70 HRC 60 HRB to 100 HRBW
		Brinell Hardness	IS 1500 – 2013 (Part - I) ASTM A 370 – 2017 ASTM E 10 – 2017	100 HBW to 450 HBW (2.5 mm/187.5 kgf load)
		Vickers Hardness	IS 1501- 2013 (Part- I) ASTM E 384 – 2017	50 HV 5/HV - 10 to 600HV 5/HV 10
		Bend Test Plate	IS 1599 – 2012 (RA 2017) ASTM A 370 – 2017 ASME Sec. IX – 2017	Qualitative (Mandrel Dia: 6,10,14,16,18,20,22,25,30, 32,36,44,48,50,54,56,60,6 4,75,85,90,100 mm)
		Tube	ASTM A 370 – 2017	Qualitative (Mandrel Dia: 140,180,260 mm)
		Flaring Test / Drift Expansion Test	ASTM A 370 – 2017 ASTM A 450 / A 450 M – 2015 ASTM A 1016 / 1016 M – 2017a IS 2335 – 2005 (RA 2017) ASTM B 153 – 2011	Qualitative (OD: 8 to 90 mm)

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		IMPACT TEST	ASTM E 23 – 2016b ASTM A 370 – 2017	2 J to 280 J [(Temp.upto (-) 196°C]
		IZOD	IS 1598-1977(RA 2015)	2 J to 168 J
	Ferrous and Non-Ferrous, Metals and Alloys (Pipes & Tubes)	Flattening Test	ASTM A 370 – 2017 ASTM A 450 / 450 M – 2015 ASTM A 530 / 530 M – 2012 ASTM A 999 / 999 M – 2017 ASTM A 1016/ A 1016 M – 2017a IS 2328 – 2005 (RA: 2017)	Qualitative (OD: 6.0mm od to 28)
	Welded Tubes	Mock up Pull Out Test	ASME SEC 8 Div 1 -2017/ ASME Sec. IX – 2017	1 kN to 600kN
	Clad (S S & Nickel Alloys) Steel Plate	SHEAR TEST	ASTM A 263 – 2012 ASTM A 264 – 2012 ASTM A 265 – 2012	10 kN to 600 kN
	Welded Austenitic Stainless Steel Tube	Reverse Bend Test	ASTM A 249 / 249 M – 2016a	Qualitative (Mandrel Dia : 6, 10, 12mm)
	High Strength Deformed Steel Bars	Re-bend test	IS 1786 – 2008 (RA 2013)	Qualitative (Dia of mandrel 25,30,32,36,44,48,50,54,56,60,64,75,85,90,100, 140,180)unit
		Weight per Meter	IS 1786: 2008, (RA 2013)	0.200 kg/m to 100.0 kg/m
	Welded Steel Tube	Reverse Flattening Test	ASTM A 450 / A 450 M - 2015	Qualitative (5 mm – 12.7 mm - OD x 100 mm long)
	Ferrous Fastener	Proof Load Test on Nut	ASTM A 962 / 962 M – 2017 IS 1367 (Part VI) –1994 (RA 2015)	Qualitative (12kN to 600kN M6 to M27)

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II.	METALLOGRAPHY TEST			
1.	Ferrous & Non Ferrous, Metals and Alloys	Grain Size Measurement By (Comparison Method)	ASTM E 112 – 2013 IS 4748 – 2009(RA 2017)	ASTM Grain Size No. 1 to 10 (100x)
	Ferrous Alloys	Non-Metallic inclusion rating	ASTM E 45 – 2013 (Method A) IS 4163 – 2004(RA 2017)	Thin & Heavy (A,B,C&D): 0.5 to 3 (100x)
	Ferrous & Non-Ferrous Metals and Alloys	Micro Structure Examination	ASM handbook - Microstructure Vol. 9 (1998) /Atlas of Microstructures of Industrial Alloys Vol 7 - 1972	50 X to 1000 X
	Duplex Stainless Steel	Detrimental Intermetallic Phase	ASTM A 923 – 2014 METHOD A	400X to 500X
	Ferrous Alloys	Case Depth (By Microscope)	IS 6416 – 1988 (RA: 2012)	0.01 mm to 1.0 mm (100x)
	Ferrous Alloys	Depth Of Decrabused Layer (By Microscope)	IS 6396 – 2000(RA: 2012)	1mm to 1.0 mm (100x)
	Ferrous Alloys	Macroetch Test	ASTM E 340 – 2015 ASTM E 381 – 2017 IS 13015 – 1991(RA 2012)	Qualitative (5X to 20X)
	Stainless Steel	Volume Fraction by Systematic Manual Point Count (Ferrite Content)	ASTM E 562 - 2011	20% to 80%

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	Corrosion Tests			
	Austenitic Stainless Steel	Inter Granular Corrosion Test IGC Test Practice "A" IGC Test Practice "B" IGC Test Practice "C" IGC Test Practice "E"	ASTM A 262 – 2015	Qualitative (250x/500x) 2mpy to 100mpy 2mpy to 100mpy Qualitative (Bend/Flattening – 1T & 2T/180°)
	Stainless Steel	Ferric Chloride Pitting Test	ASTM G 48 Method A-2011(2015)	Qualitative (0.05gms/ m ² -50gms/ m ²)
	Nickel Chrome Alloys	Ferric Sulfate – Sulfuric Acid Test	ASTM G 28 Method A – 2002(2015)	1 mpy to 100 mpy
	Austenitic Stainless Steel	Inter Granular Corrosion Test	EN/ISO 3651 – 2 (1998) - Method A	Qualitative (Bend/Flattening – 1T & 2T/180°)
	Duplex Stainless Steel	Ferric Chloride Corrosion Test for Determination of Intermetallic Phase	ASTM A 923 – 2014 Method 'C'	0.1 mdd to 50 mdd
	Copper Base Alloys	Mercurous Nitrate Test	IS 2305 – 1988 (RA 2015) BS 2874 – 1986 ASTM B 154 – 2012	Qualitative
III.	BUILDING MATERIALS			
1.	Coarse Aggregate	Sieve Analysis	IS 2386 (Part 1): 1963 RA 2016	63 mm to 4.75 mm (0 to 100%)
		Elongation Index	IS 2386 (Part 1): 1963 RA 2016	5 % to 50 %
		Flakiness Index	IS 2386 (Part 1): 1963 RA 2016	5 % to 50 %
		Specific Gravity	IS 2386 (Part 3): 1963, RA 2016	1 to 4

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SI.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Water Absorption	IS 2386 (Part 3): 1963 RA 2016	0.1 to 10 %
		Bulk Density (Loose/Rodded)	IS 2386 (Part 3): 1963, RA 2016	1 kg/L to 3 kg/L
		Ten Percent Fines Value.	IS 2386 (Part 4): 1963, RA 2016	40 kN to 400 kN
		Aggregate Abrasion value	IS 2386 (Part 4): 1963, RA 2016	5 % to 50 %
		Impact Value	IS 2386 (Part 4) : 1963 RA 2016	5 % to 50 %
		Crushing Value	IS 2386 (Part 4): 1963 RA 2016	5 % to 50 %
		Soundness by Na ₂ SO ₄	IS 2386 (Part 5) : 1963 RA 2016	1 % to 18 %
2.	Fine Aggregate	Sieve Analysis	IS 2386 (Part 1): 1963 RA 2016	4.75 mm to 150 µm (0 to100%)
		Materials Finer than 75 Micron.	IS 2386 (Part 1): 1963 RA 2016	0.1 % to 25 %
		Specific Gravity.	IS 2386 (Part 3): 1963 RA 2016	1 to 4
		Water Absorption	IS 2386 (Part 3): 1963 RA 2016	0.1 % to 10 %
		Bulking of Fine Aggregate	IS 2386 (Part 3): 1963 RA 2016	1 % to 50 %
		Bulk Density (Loose/Rodded)	IS 2386 (Part 3): 1963 RA 2016	1 kg/L to 3 kg/L
		Soundness by Na ₂ SO ₄	IS 2386 (Part 5): 1963 RA 2016	1 % to 18 %
3.	Hardened Concrete			
a.	Concrete Cube	Compressive Strength	IS 516-1959, RA 2011 RA- 2013	5 N/mm ² to 50 N/mm ²
b.	Beam	Flexural Strength	IS 516-1959, RA 2011 RA-2013	2 N/mm ² to 17 N/mm ²

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4.	Concrete Tiles	Water Absorption	IS 13801 - 2013 & IS 1237 - 2012	0.1% to 25 %
5.	Bricks	Water Absorption	IS 3495 (Part 2): 1992 (RA 2011)	4 % to 40 %
		Compressive Strength	IS 3495 (Part 1): 1992 (RA 2011)	2.5 N/mm ² to 40 N/mm ²
		Efflorescence	IS 3495 (Part 3): 1992 (RA 2011)	Qualitative
6.	Paver BLocks	Water Absorption	IS 15658 : 2006 (RA2011)	0.1 % to 25 %
		Compressive Strength	IS 15658 : 2006 (RA2011)	5 N/mm ² to 70 N/mm ²
7.	Cement	Normal Consistency	IS 4031 (Part4): 1988 (RA2014)	20 % to 45 %
		Initial Setting Time	IS 4031 (Part5): 1988 (RA2014)	5 Min. to 300 Min.
		Final Setting Time	IS 4031 (Part5): 1988 (RA2014)	30 Min. to 700 Min.
		Soundness by Le Chetelier Method	IS 4031 (Part3):1988 (RA2014)	0.01 mm to 10 mm
		Density	IS 4031 (Part11): 1988 (RA2014)	2 g/cc to 4 g/cc
		Fineness by dry sieving	IS 4031 (Part1):1996 (RA2014)	1 % to 10 %