

Laboratory Testing Research Engineering and Technological Services (TREATS),
14, Ramnath Pal Road, Kidderpore, Kolkata, West Bengal

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-7597 (in lieu of T-0120, T-0230)

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Validity 21.07.2018 to 20.07.2020

Last Amended on 25.07.2018

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

I.	METALS & ALLOYS			
1.	Plain Carbon & Alloy Steels	Carbon	IS 228 (Part 1)- 1987/ RA 2018	0.05 % to 2.5%
		Manganese	IS 228 (Part 2)- 1987/ RA 2018 ASTM E350-2012	0.1 % to 1.5%
		Silicon	IS 228 (Part 8)- 1989/ RA 2014 ASTM E350-2012 ASTM E352-2013	0.05 % to 5.0%
		Sulphur	IS 228 (Part 9)- 1989/ RA 2014 ASTM E350-2012 ASTM E352-2013	0.01 % to 0.25%
		Phosphorus	IS 228 (Part 3) -1987/ RA 2018 ASTM E350-2012 ASTM E352-2013	0.01 % to 0.15%
		Nickel	IS 228 (Part 5)- 1987/ RA 2014 ASTM E350-2012 ASTM E352-2013	0.10 % to 30.0%
		Chromium	IS 228 (Part 6)- 1987/ RA 2014 ASTM E350-2012 ASTM E352-2013	0.10 % to 20.0%
		Copper	IS 228 (Part 15)- 1992/ RA 2014 ASTM E350-2012 ASTM E352-2013	0.05 % to 5.0%

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		Molybdenum	IS 228 (Part 7)- 1990/ RA 2018 IS 228 (Part 10)- 1989/ RA 2014	1.0 % to 10.0% 0.01 % to 1.50 %
2.	Pig Iron, Cast Iron & S.G. Iron	Carbon	IS 12308 (Part 11)- 1991/ RA 2018	1.5 % to 4.5%
		TC, GC & CC	IS: 12308 (Part 4)- 1988/ R.A. 2014	1.5 % to 4.5%
		Manganese	IS 12308 (Part 10)- 1991/ R.A. 2018	0.05 % to 7.0%
		Silicon	IS 12308 (Part 6)- 1991/ R.A. 2018 ASTM E351-2013	0.10 % to 6.0%
		Sulphur	IS 12308 (Part 2)- 1987/ RA 2018	0.005 % to 0.25%
		Phosphorus	IS 12308 (Part 5) –1991/ RA 2018 ASTM E351-2013	0.01 % to 0.5%
		Nickel	IS 12308 (Part 7)- 1991/ RA 2018 ASTM E351-2013	0.50 % to 36.0%
		Chromium	IS 12308 (Part 8)- 1997/ RA 2018 ASTM E351-2013	0.10 % to 28.0%
3.	Copper & Copper-Base Alloys	Copper	IS 440- 1964/ RA 2018 IS 3685- 1966/ RA 2018	Cu: 1.0 % to 99.98%
		Lead	IS 4027- (Part 1)- 1987/ RA 2018 IS 3187- 1965/ RA 2018 IS 7212- 1974/ RA 2015	Pb: 0.01 % to 25.0%
		Zinc	IS 3685- 1966/ RA 2018 IS 4027- (Part 6)- 1987/ RA 2018 IS 3187- 1965/ RA 2018	0.05 % to 45.0%

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		Tin	IS 4027- (Part 5)- 1987/ RA 2018 IS 3685- 1966/ RA 2018 IS 440- 1964/ RA 2018	0.05 % to 15.0%
		Manganese	IS 3187- 1965/ RA 2018 IS 3685- 1966/ RA 2018	0.05 % to 4.0%
		Nickel	IS 440- 1964/ RA 2018 IS 3685- 1966/ RA 2018 IS 3187- 1965/ RA 2018	0.05 % to 10.0%
		Iron	IS 440- 1964/ RA 2018 IS 4027- (Part 8)- 1991/ RA 2018 IS 3685- 1966/ RA 2018 IS 3187- 1965/ RA 2018	0.10 % to 6.0%
		Silicon	IS 3685- 1966/ RA 2018 IS 4027- (Part 10)- 2000/ RA 2018	0.02 % to 5.0%
		Phosphorus	IS 440- 1964/ RA 2018 IS 4027- (Part 3)- 1987/ RA 2018	0.01 % to 10.0%
4.	Aluminium & Aluminium Alloys	Silicon & Lead	IS 504 (Part 1) - 2002/ RA 2018	0.30 % to 13.0% 0.02 % to 0.5%
		Iron	IS 504 (Part 2) - 2002/ RA 2018	0.10 % to 2.0%
		Copper	IS 504 (Part 3) - 2002/ RA 2018	0.10 % to 7.0%
		Zinc	IS 504 (Part 4) - 2002/ RA 2018	0.10 % to 4.0%
		Manganese	IS 504 (Part 5) - 2002/ RA 2018	0.10 % to 1.5%
		Nickel	IS 504 (Part 7) - 2002/ RA 2018	0.02 % to 4.0%
		Chromium	IS 504 (Part 8) - 2002/ RA 2018	0.03 % to 2.0%

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		Tin	IS 504 (Part 9) - 2002/ RA 2018	0.02 % to 0.5%
5.	WHITE METAL	Tin	IS 1409- 1959/ RA 2016	4.50 % to 93.0%
		Antimony	IS 1409- 1959/ RA 2016	6.50 % to 16.0%
		Lead	IS 1409- 1959/ RA 2016	0.10 % to 80.0%
		Copper	IS 1409- 1959/ RA 2016	0.10 % to 6.0%
6.	Ferro-Silicon	Silicon	IS 1559 (Part 1)- 1988/ RA 2014	15.0 % to 85.0%
		Carbon	IS 1559 (Part 2)- 1982/ RA 2018	0.03 % to 2.5%
		Sulphur	IS 1559 (Part 3)- 1982/ RA 2018	0.01 % to 0.05%
		Phosphorus	IS 1559 (Part 4)- 1982/ RA 2018	0.02 % to 0.15%
7.	Low Carbon Ferro – Chromium	Chromium	IS 13452 (Part 6)- 1997/ RA 2018	60.0 % to 70.0%
		Carbon	IS 1559- 1961 (Sec I)/ RA 2018	0.05 % to 1.0%
		Sulphur	IS 13452 (Part 4)- 1992/ RA 2018	0.01 % to 0.05%
		Phosphorus	IS 13452 (Part 7)- 2003/ RA 2014	0.01 % to 0.06%
8.	High Carbon Ferro–Chromium & Charge – Chrome	Chromium	IS 13452 (Part 5)- 2003/ RA 2018	50.0 % to 70.0%
		Carbon	IS 1559- 1961 (Sec I)/ RA 2018	0.05 % to 8.0%
		Sulphur	IS 13452 (Part 4)- 1992/ RA 2018	0.01 % to 0.05%
		Phosphorus	IS 13452 (Part 7)- 2003/ RA 2014	0.01 % to 0.06%
9.	Ferro-Manganese	Manganese	IS 1559- 1961 (Sec III)/ RA 2007	15.0 % to 75.0%
		Carbon	IS 1559- 1961 (Sec III)/ RA 2007	0.05 % to 8.0%

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		Silicon	IS 13938 (Part 1)- 1994/ RA 2014 IS 1559- 1961(Sec III)/ RA 2018	0.01 % to 2.0%
		Sulphur	IS 1559 - 1961 (Sec. III)/ RA 2018	0.01 % to 0.05%
		Phosphorus	IS 13938 (Part 3)- 1993/ RA 2014	0.01 % to 0.50%
10.	Silico – Manganese/ Speigeleisen	Manganese	IS 1559- 1961 (Sec IV)/ RA 2007	15.0 % to 75.0%
		Carbon	IS 1559- 1961 (Sec IV)/ RA 2007	0.05 % to 8.0%
		Silicon	IS 1559- 1961(Sec IV)/ RA 2018	0.01 % to 2.0%
		Sulphur	IS 1559 - 1961 (Sec. IV)/ RA 2018	0.01 % to 0.05%
		Phosphorus	IS 1559- 1961(Sec IV)/ RA 2018	0.01 % to 0.50%
(OES/ Portable OES)				
11.	Plain Carbon & Low Alloy Steel	C	IS 8811 : 1998/ RA 2018	0.0027 % to 1.40%
		Mn	IS 228 (Pt. 23)- 2003/ RA 2014	0.004 % to 2.0%
		Si	RA 2014	0.004 % to 2.0%
		S	ASTM E 415- 2017	0.0004 % to 0.10%
		P	JIS G- 1253/ 2013	0.0005 % to 0.10%
		Ni		0.002 % to 5.0%
		Cr		0.004 % to 4.60%
		Mo		0.002 % to 2.0%
		Cu		0.005 % to 1.0%
		Co		0.0008 % to 0.50%
		V		0.0008 % to 0.50%
		W		0.009 % to 0.50%
		Nb		0.0003 % to 1.0%
Sn		0.001 % to 0.10%		
Al		0.004 % to 2.0%		

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		As		0.0004 % to 0.01%
		Ca		0.0002 % to 0.01%
		Ti		0.0003 % to 0.02%
		N		0.0003 % to 0.05%
		B		0.0001 % to 0.01%
12.	CR – CR / ni – steels/ stainless steels	C	IS 9879 : 1998/ RA 2015 IS 228 (Pt. 23)- 2003/ RA 2014 ASTM E1086- 2014 JIS G- 1253/ 2013	0.0007 % to 1.50%
		Mn		0.007 % to 8.0%
		Si		0.003 % to 2.0%
		S		0.0004 % to 0.050%
		P		0.0008 % to 0.050%
		Ni		0.03 % to 35.0%
		Cr		0.03 % to 25.0%
		Mo		0.002 % to 11.0%
		Cu		0.002 % to 1.0%
		Co		0.003 % to 10.5%
		V		0.001 % to 2.0%
		W		0.001 % to 4.0%
		Nb		0.0009 % to 2.5%
		Ca		0.0002 % to 0.02%
		Sn		0.0005 % to 0.05%
		Ti		0.0003 % to 0.85%
	N	0.001 % to 0.30%		
	Al	0.0004 % to 0.60%		
13.	CAST IRON	C	IS 15338- 2003/ RA 2018 ASTM E 1999- 2011 JIS G- 1253/ 2002	0.015 % to 3.20%
		Mn		0.008 % to 1.60%
		Si		0.01 % to 3.0%
		S		0.0008 % to 0.08%
		P		0.002 % to 0.4%
		Ni		0.01 % to 6.3%
		Cr		0.002 % to 23.3%
		Mo		0.0005 % to 1.6%
		Cu		0.0008 % to 2.9%
		Co		0.0006 % to 0.10%
	V	0.002 % to 0.10%		

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14.	Aluminium & Aluminium Alloys	Si	ASTM E 1251- 2017- a	0.013 % to 16.10%
		Fe		0.004 % to 2.0%
		Cu		0.003 % to 6.30%
		Mn		0.003 % to 2.0%
		Mg		0.003 % to 2.0%
		Cr		0.001 % to 0.20%
		Ni		0.002 % to 0.50%
		Zn		0.002 % to 0.30%
		Ti		0.002 % to 0.40%
		Ag		0.001 % to 0.40%
		Bi		0.002 % to 0.40%
		Cd		0.002 % to 0.40%
		Co		0.002 % to 0.25%
		Pb		0.002 % to 0.20%
Sn	0.0007 % to 0.06%			
V	0.0006 % to 0.02%			
B				
15.	Copper & Copper alloys	Zn	BS EN15079 : 2015	0.002 % to 40.0%
		Pb		0.04 % to 10.0%
		Sn		0.001 % to 15.70%
		P		0.001 % to 0.60%
		Mn		0.0002 % to 2.0%
		Fe		0.002 % to 6.0%
		Ni		0.002 % to 5.80%
		Si		0.0005 % to 0.50%
		Cr		0.004 % to 0.02%
		As		0.002 % to 0.07%
		Sb		0.003 % to 0.40%
		Bi		0.001 % to 0.03%
		Ag		0.0005 % to 0.01%
		Co		0.001 % to 0.10%
Al	0.006 % to 11.2%			
S	0.001 % to 0.10%			
C	0.001 % to 0.10%			

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(PMI – XRF)				
16.	Stainless Steels	Mn	ASTM E 1476- 2014	0.10 % to 10.00%
		Cr		6.00 % to 28.00%
		Ni		1.0 % to 32.0%
		Mo		1.0 % to 5.00%
		Ti		0.10 % to 5.00%
		Nb		0.10 % to 2.00%
		Cu		0.10 % to 2.00%
17.	Low Alloy Steels	Mn	ASTM E 1476- 2014	0.10 % to 2.00%
		Cr		0.10 % to 6.00%
		Ni		0.10% to 6.00%
		Mo		0.10 % to 2.00%
		Cu		0.10 % to 2.00%
		V		0.10 % to 0.50%
		Ti		0.10 % to 0.50%
18.	High Alloy Steels	Mn	ASTM E 1476- 2014	0.50 % to 15.00%
		Cr		3.00 % to 35.00%
		Mo		0.10 % to 12.00%
		V		0.50 % to 8.00%
		W		0.50 % to 20.00%
		Co		0.10 % to 12.00%
		II. METALLIC COATING		
1.	Copper & ITS Alloys	Mercurous Nitrate Test for Surface Crack determination	IS 2305- 1988/ RA 2015	Dia. Up% to 75 mm; L:150mm Dia. >75 mm; L : as agreed between purchaser & supplier
2.	Zinc – Coated Iron And Steel Articles	Determination of Mass of Zinc Coating	IS 6745- 1972, Cl. 3.1/ RA 2016 BS EN ISO : 1461 - 2009 ASTM : A153 M-16A	10 g % to 1800 g/m ²

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			IS 1573- 1986 (RA 2016) ASTM A90 M-13	
3.	Zinc – Coated Iron And Steel Articles	Uniformity of Zinc Coating	IS 2633- 1986, Cl. 2/ RA 2015 ASTM : A239- 2014	Visual Qualitative
4.	Zinc – Coated Iron And Steel Articles	Adhesion Test	IS 2629- 1985, Cl. 6.4/ RA 2016	Visual Qualitative
5.	TIN – Coating On Iron, Steel, Nickel Alloys, Copper And Copper Alloys	Determination of Thickness of Tin Coating by Mass method	IS 1359- 1992/ RA 2016	1 micron to 100 microns thick
6.	Phosphate coating on Iron and steel	Determination of Mass of Phosphate Coating	IS 3618- 1966/ RA 2016	1 micron to 100 microns thick
7.	Corrosion Tests In Artificial Atmosphere	Salt Spray Test	ISO : 9227- 2006 ASTM B- 117- 2011 ASTM D- 1654- 2011	Qualitative Test
III.	WATER			
1.	Drinking Water/ Potable Water	Colour	IS:3025/Pt.4/1983/ RA- 2017 APHA 23 rd EDN./2120 B	1 Hz to 500 Hz
		Odour	IS:3025/Pt.5/2018 APHA 23 rd EDN./2150 C	Qualitative
		pH	IS:3025/Pt.11/1983/ RA –2017 APHA 23 rd EDN./4500H ⁺ B	2 to 12
		Turbidity	IS:3025/Pt.10/1984/ RA –2017 APHA 23 rd EDN./2130 B	1 NTU to 500 NTU
		Total Dissolved Solids (TDS)	IS:3025/Pt.16/1984/RA – 2017 APHA 23 rd EDN./2540 C	10 mg/l to 500 mg/l

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		Aluminium (as Al)	IS:3025/Pt.45/2003/ RA –2014 APHA 23 rd EDN./3500Al-B	0.02 mg/l to 0.3 mg/l
		Ammonia – Nitrogen	IS:3025/Pt.34/1988/ RA –2014	0.05 mg/l to 2 mg/l
		Conductivity	IS 3025/Pt.14/2017 & APHA 23 rd EDN. 2510B	10 µS/cm to 1500 µS/cm
		Calcium (as Ca)	IS:3025/Pt.40/1991/ RA –2014 APHA 23 rd EDN./3500Ca B	2 mg/l to 250 mg/l
		Chloramines	APHA 23 rd EDN./4500-CI G	0.01 mg/l to 5.0 mg/l
		Chloride	IS:3025/Pt.32/1988/ RA –2014 APHA 23 rd EDN./4500Cl B	2 mg/l to 2000 mg/l
		Copper (as Cu)	IS:3025/Pt.42/1992/ RA –2014 APHA 23 rd EDN./3500Cu-B	0.05 mg/l to 5 mg/l
		Phosphate	IS:3025/Pt.31/1988/ RA –2014 APHA 23 rd EDN./4500P-C	0.5 mg/l to 20 mg/l
		Fluoride	APHA 23 rd EDN./4500F D	0.05 mg/l to 5 mg/l
		Total Silica	IS:3025/Pt.35/1988/ RA –2014 APHA 23 rd EDN./4500Si O ₂ C	2 mg/l to 50 mg/l
		Residual Chlorine	IS:3025/Pt.26/1986/ RA –2014 APHA 23 rd EDN./4500Cl B	0.05 mg/l to 0.5 mg/l
		Iron (as Fe)	IS:3025/Pt.53/2003/ RA –2014 APHA 23 rd EDN./3500Fe B	0.05 mg/l to 5 mg/l
		Magnesium (as Mg)	IS:3025/Pt.46/1994/ RA –2014 APHA 23 rd EDN./3500Mg B	2 mg/l to 100 mg/l

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Convenor

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		Manganese (as Mn)	IS:3025/Pt.59/2006/ RA-2017	0.01 mg/l to 1.0 mg/l
		Nitrate – Nitrogen	IS:3025/Pt.34/1988/ RA –2014 APHA 23 rd EDN./4500NO ₃ ⁻ E	2 mg/l to 50 mg/l
		Sulphate	IS:3025/Pt.24/1986/ RA –2014 APHA 23 rd EDN./4500SO ₄ ²⁻ E	5 mg/l to 400 mg/l
		Total Alkalinity	IS:3025/Pt.23/1986/ RA –2014 APHA 23 rd EDN./2320 B	5 mg/l to 600 mg/l
		Total Hardness (as CaCO ₃)	IS:3025/Pt.21/ 2014 APHA 23 rd EDN./2340 C	5 mg/l to 600 mg/l
		Zinc (as Zn)	IS:3025/Pt.49/1994/ RA-2014	0.01 mg/l to 10.0 mg/l
		Lead (as Pb)	IS:3025/Pt.47/1994/ RA –2014 APHA 23 rd EDN./3500Pb-B	0.3 mg/l to 2 mg/l
		Nickel (as Ni)	IS:3025/Pt.54/2003/ RA-2014	0.005 mg/l to 1.0 mg/l
		Total Arsenic (as As)	IS:3025/Pt.37/1988/ RA –2014 APHA 23 rd EDN./3500As-B	0.05 mg/l to 5.0 mg/l
		Total Chromium(as Cr)	IS:3025/Pt.52/2003/ RA –2014 APHA 23 rd EDN./3500Cr-B	0.03 mg/l to 20 mg/l
2.	Packaged Drinking Water	Colour	IS:3025/Pt.4/1983/ RA- 2017 APHA 23 rd EDN./2120 B	1 Hz to 500 Hz
		Odour	IS:3025/Pt.5/2018 APHA 23 rd EDN./2150 C	Qualitative
		pH	IS:3025/Pt.11/1983/ RA –2017	2 to 12

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		Turbidity	APHA 23 rd EDN./4500H ⁺ B IS:3025/Pt.10/1984/ RA –2017 APHA 23 rd EDN./2130 B	1 NTU to 500 NTU
		Total Dissolved Solids (TDS)	IS:3025/Pt.16/1984/ RA –2017 APHA 23 rd EDN./2540 C	10 mg/l to 500 mg/l
		Copper (as Cu)	IS:3025/Pt.42/1992/ RA –2014 APHA 23 rd EDN./3500Cu-B	0.05 mg/l to 5 mg/l
		Iron (as Fe)	IS:3025/Pt.53/2003/ RA –2014 APHA 23 rd EDN./3500Fe B	0.05 mg/l to 5 mg/l
		Manganese (as Mn)	IS:3025/Pt.59/2006/ RA-2017	0.01 mg/l to 1.0 mg/l
		Nitrate (as NO ₃)	IS:3025/Pt.34/1988/ RA –2014 APHA 23 rd EDN./4500NO ₃ E	2 mg/l to 50 mg/l
		Nitrite (as NO ₂)	IS:3025/Pt.34/1988/ RA –2014 APHA 23 rd EDN./4500NO ₂ B	0.01 mg/l to 0.3 mg/l
		Fluoride	APHA 23 rd EDN./4500F- D	0.05 mg/l to 5 mg/l
		Zinc (as Zn)	IS:3025/Pt.49/1994/ RA-2014	0.01 mg/l to 10.0 mg/l
		Aluminium (as Al)	IS:3025/Pt.45/2003/ RA –2014 APHA 23 rd EDN./3500Al-B	0.02 mg/l to 0.3 mg/l
		Chloride	IS:3025/Pt.32/1988/ RA –2014 APHA 23 rd EDN./4500Cl- B	2 mg/l to 2000 mg/l
		Sulphate	IS:3025/Pt.24/1986/ RA –2014 APHA 23 rd EDN./4500SO ₄ ²⁻ E	5 mg/l to 400 mg/l

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		Alkalinity (as HCO ₃)	IS:3025/Pt.23/1986/ RA –2014 APHA 23 rd EDN./2320 B	5 mg/l to 600 mg/l
		Calcium (as Ca)	IS:3025/Pt.40/1991/ RA –2014 APHA 23 rd EDN./3500Ca B	2 mg/l to 200 mg/l
		Magnesium (as Mg)	IS:3025/Pt.46/1994/ RA –2014 APHA 23 rd EDN./3500Mg B	2 mg/l to 100 mg/l
		Sodium (as Na)	IS:3025/Pt.45/1993/ RA –2014 APHA 23 rd EDN./3500Na B	5 mg/l to 50 mg/l
		Residual Free Chlorine	IS:3025/Pt.26/1986/ RA –2014 APHA 23 rd EDN./4500Cl B	0.05 mg/l to 0.5 mg/l
		Arsenic (as As)	IS:3025/Pt.37/1988/ RA –2014 APHA 23 rd EDN./3500As-B	0.05 mg/l to 5.0 mg/l
		Lead (as Pb)	IS:3025/Pt.47/1994/ RA –2014 APHA 23 rd EDN./3500Pb-B	0.3 mg/l to 2 mg/l
		Chromium (as Cr)	IS:3025/Pt.52/2003/ RA –2014 APHA 23 rd EDN./3500Cr-B	0.03 mg/l to 20 mg/l
		Nickel (as Ni)	IS:3025/Pt.54/2003/ RA-2014	0.005 mg/l to 1.0 mg/l
3.	Packaged Natural Mineral Water	Colour	IS:3025/Pt.4/1983/ RA- 2017 APHA 23 rd EDN./2120 B	1 Hz to 500 Hz
		Odour	IS:3025/Pt.5/2018 APHA 23 rd EDN./2150 C	Qualitative
		pH	IS:3025/Pt.11/1983/ RA –2017 APHA 23 rd EDN./4500H ⁺ B	2 to 12

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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
		Turbidity	IS:3025/Pt.10/1984/ RA –2017 APHA 23 rd EDN./2130 B	1 NTU to 500 NTU
		Total Dissolved Solids (TDS)	IS:3025/Pt.16/1984/ RA –2017 APHA 23 rd EDN./2540 C	10 mg/l to 500 mg/l
		Nitrate (as NO ₃)	IS:3025/Pt.34/1988/ RA –2014 APHA 23 rd EDN./4500NO ₃ ⁻ E	2 mg/l to 50 mg/l
		Nitrite (as NO ₂)	IS:3025/Pt.34/1988/ RA –2014 APHA 23 rd EDN./4500NO ₂ ⁻ B	0.01 mg/l to 0.3 mg/l
		Manganese (as Mn)	IS:3025/Pt.59/2006/ RA-2017	0.01 mg/l to 1.0 mg/l
		Copper (as Cu)	IS:3025/Pt.42/1992/ RA –2014 APHA 23 rd EDN./3500Cu-B	0.05 mg/l to 5 mg/l
		Zinc (as Zn)	IS:3025/Pt.49/1994/ RA-2014	0.01 mg/l to 10.0 mg/l
		Fluoride	APHA 23 rd EDN./4500F ⁻ D	0.05 mg/l to 5 mg/l
		Chloride	IS:3025/Pt.32/1988/ RA –2014 APHA 23 rd EDN./4500Cl ⁻ B	2 mg/l to 2000 mg/l
		Sulphate	IS:3025/Pt.24/1986/ RA –2014 APHA 23 rd EDN./4500SO ₄ ²⁻ E	5 mg/l to 400 mg/l
		Magnesium (as Mg)	IS:3025/Pt.46/1994/ RA –2014 APHA 23 rd EDN./3500Mg B	2 mg/l to 100 mg/l
		Calcium (as Ca)	IS:3025/Pt.40/1991/ RA –2014 APHA 23 rd EDN./3500Ca B	2 mg/l to 200 mg/l

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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
		Sodium (as Na)	IS:3025/Pt.45/1993/ RA –2014 APHA 23 rd EDN./3500Na B	5 mg/l to 50 mg/l
		Alkalinity (as HCO ₃)	IS:3025/Pt.23/1986/ RA –2014 APHA 23 rd EDN./2320 B	5 mg/l to 600 mg/l
		Arsenic (as As)	IS:3025/Pt.37/1988/ RA –2014 APHA 23 rd EDN./3500As-B	0.05 mg/l to 5.0 mg/l
		Chromium (as Cr)	IS:3025/Pt.52/2003/ RA –2014 APHA 23 rd EDN./3500Cr-B	0.03 mg/l to 20 mg/l
		Lead (as Pb)	IS:3025/Pt.47/1994/ RA –2014 APHA 23 rd EDN./3500Pb-B	0.3 mg/l to 2 mg/l
		Nickel (as Ni)	IS:3025/Pt.54/2003/ RA-2014	0.005 mg/l to 1.0 mg/l
4.	Effluent Water/ Waste Water	pH	IS:3025/Pt.11/1983/ RA –2017 APHA 23 rd EDN./4500H ⁺ B	2 to 12
		Total Suspended Solids (TSS)	IS:3025/Pt.17/1984/ RA –2017 APHA 23 rd EDN./2540 D	5 mg/l to 300 mg/l
		Total Solids (TS)	IS:3025/Pt.17/1984/ RA –2017 APHA 23 rd EDN./2540 D	5 mg/l to 500 mg/l
		Dissolved Oxygen	IS:3025/Pt.38/1989/ RA –2014 APHA 23 rd EDN./4500O C	0.5 mg/l to 20 mg/l
		Biochemical Oxygen Demand (BOD)	IS:3025/Pt.44/1993/ RA –2014 & APHA 23 rd EDN./5210 B	2 mg/l to 200 mg/l
		Chemical Oxygen Demand (COD)	IS:3025/Pt.58/2006/ RA –2017 APHA 23 rd EDN./5220 B	8 mg/l to 500 mg/l

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		Oil & Grease	IS:3025/Pt.39/1991/ RA-2014 APHA 23 rd EDN./5520 D	1 mg/l to 20 mg/l
		Conductivity	IS 3025/Pt.14/2017 & APHA 23 rd EDN. 2510B	10µS/cm to 1500 µS/cm
		Salinity	APHA 23 rd EDN./2520 B	2 to 45
		Temperature	IS:3025/Pt.9/1984/ RA-2017 APHA 23 rd EDN./2550 A/B	5°C to 50°C
		Acidity	IS:3025/Pt.22/1986/ RA-2014 APHA 23 rd EDN./2310 B	2 mg/l to 100 mg/l
		Kjeldhal – Nitrogen	IS:3025/Pt.34/1988/ RA-2014 APHA 23 rd EDN./4500 N B org	5 mg/l to 20 mg/l
		Phosphate	IS:3025/Pt.31/1988/ RA-2014 APHA 23 rd EDN./4500P-C	0.5 mg/l to 20 mg/l
		Total Silica	IS:3025/Pt.35/1988/ RA-2014 APHA 23 rd EDN./4500Si O ₂ C	2 mg/l to 50 mg/l

***NOTE:** The Laboratory has demonstrated competence for the stated scope for **WATER**. This however **does not fully cover** the specification requirements of **BIS for the Packaged Drinking Water as per IS:14543 and the Packaged Natural Mineral Water IS:13428.**

Battal Singh
Convenor

N. Venkateswaran
Program Manager

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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
<u>MECHANICAL TESTING</u>				
I.	MECHANICAL PROPERTIES OF METALS			
1.	Ferrous & Non – ferrous materials	Tensile Test (Y.S., 0.1, 0.2 & 0.5% P.S., T.S., % Elongation & % R.A.) Breaking Load Test	ASTM : A370 - 2017 a ASTM : E8/E8M - 2016 BS:EN: 6892 - 1: 2016 IS : 1608 - 2005/ RA 2010 ISO : 6892-1 - 2016	10 kN to 600 kN Load Least count 100 N
2.	Ferrous & non-ferrous materials Spring washer	Compressive Strength Compression Test Permanent Set Test Twist Test	ASTM : E9 - 2009 BS: 4464:1969 IS : 3063 - 1994/ RA 2010 GOST: 6402 - 70	Maximum Load 600 kN
3.	Ferrous & Non – ferrous materials	Bend Test	ASTM : A 370 - 2017a ASTM : E 190 - 2014 ASTM : E 290 - 2014 IS : 1599 - 2012 IS 277 - 2003, RA 2013 ISO 5173-2009	Max. Load 600 kN (Mandrel Dia 3 mm to 256 mm and close)
4.	FERROUS & NON – FERROUS MATERIALS	Brinell Hardness Test	ASTM : A 370 - 2017a ASTM : E10 - 2017 IS 1500 (Pt-1) - 2013 ISO : 6506 - 1: 2014	Hard metal ball indenter.-10/3000 kg Ferrous :140 HBW to 650 HBW Non-Ferrous: 35 HBW to 300 HBW
5.	Ferrous & Non – ferrous materials Hard Materials	Rockwell Hardness Test	ASTM : A 370 - 2017a ASTM: E18 - 2017 IS 1586 (Pt-1) - 2012 ISO:6508-1:2016 IS 5652 (Pt - 1) - 1993/ RA 2009	HRB: 20 to 100 HRC: 20 to 70 HRA : 20 to 88

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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
6.	Ferrous & Non – ferrous materials Hard materials	Vickers Hardness Test	ASTM : E 92 - 2017 IS : 1501 - 2002/ RA 2007 ISO : 6507 - 1 - 2018 IS 12783-89, RA 2009	Scales : HV ₁ ,HV ₅ ,HV ₁₀ ,HV ₃₀ Range :30 HV to 800 HV
7.	Metallic Materials	Izod Impact Test Charpy Impact Test Lateral Expansion Test Shear % Test	IS : 1598 - 1977/ RA 2009 ASTM E23-2016 AWS: B4.0M-2016 ISO : 148 - 1 - 2016 ISO 9016 - 2012 IS : 1757 -1988 - 'V' Notch/RA 2009 IS : 1499 -1977 - 'U' Notch/RA 2009 ASTM E23-2016 ISO : 148 - 1 - 2016	0 to 168 J 0 to 300 J Test Temperatures: Minus 196 °C and room temperature to Minus 110 °C.
8.	Ferrous Bolts Ferrous Rivets Ferrous Bolts	Shear Test Head Soundness Test Head Soundness Test	IS : 5242 - 1979/ RA 2010 IS 6639 - 1972/ RA 2005 IS 12427 - 2001/ RA 2007 IS : 10102 - 1982/ RA 2010 IS 1367 (PART - 3) - 2002, RA 2007 ISO : 898 - 1 - 2013	3mm to 25 mm dia

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9.	Ferrous & Non – ferrous Tubes	Flattening Test	ASTM A370 - 2017a ASTM A450 - 2010 ASTM A530 - 2012 ASTM A 1016-2014 IS : 2328 - 2005/ RA 2010 ISO : 8492 - 1998	Steel : 70mm to 400mm dia & 60mm thick Non-ferrous metals : 10 mm to 100 mm dia & 10 mm thick
10.	Ferrous & Non – ferrous tubes	Drift Expansion Test	IS : 2335 - 2005/ RA 2010 IS : 1239 (Part 2) - 2011 ISO : 8493 - 1998	Steel Tubes : 15mm to 150 mm dia Light Metals : 10mm to 100 mm dia Thickness - 10mm max.
11.	Non – ferrous Tubes (copper)	Doubling-Over Test	IS : 2501 - 1995/ RA 2006	10mm to 100mm dia
12.	Steel fasteners Bolts/ screws	Tensile / Proof Load Tests / Wedge Load Test	ASTM : A193M - 2014 AS/NZS/1559 - 1997 IS : 1367 (Part 3) - 2002/ RA 2007 IS 1367 (Part 14) - 2002 ISO : 898 - 1 - 2013	Max. load 600 kN (M8 to M27 Metric coarse thread)
13.	Steel fasteners Nuts	Proof Load Test	ASTM : A194M - 2014 AS/NZS/1559 - 1997 IS : 1367 (Part 6) -1994/ RA 2010 ISO : 898 - 2 - 2012	Max. load 600 kN (M8 to M27 Metric coarse thread)
14.	Deformed Steel Bars	Mass Per Meter Run Bend Test Re-Bend Test	IS : 1786 - 2008 / RA 2013 IS : 1786 - 2008/ RA 2013 IS 1599 - 2012 IS : 1786 - 2008/ RA 2013	0.08 to 11.0 kg/M Mandrel Dia 8 mm to 192 mm Mandrel Dia 8 mm to 256 mm

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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
15.	Ferrous & Non – ferrous welded test coupons	Tensile Test Bend Test Hardness Test Flattening Test Nick-Break Test Fracture Test Impact Test Micro Examination Macro Examination Visual Examination	ASME Sec. IX - 2017 ASME Sec II, Part C-2017 ASME B 31.3:2016 AWS : D1.1 - 2015 AWS : B4.0M - 2016 API : 5L - 2013 API : 1104 - 2013, Addendum 2, 2016 API - 6A - 2010	Max. load 600 kN Max. 300 J Test Temperatures: Minus 196°C to room temperature 50x to 1000x (Qualitative) 1 to 20 magnification (Qualitative)
			BS EN ISO :15614 -1 -2017 BS EN ISO : 4136 - 2012 BS EN ISO : 5173 - 2017 BS EN ISO : 9015-1-2011 BS EN ISO : 17639 - 2013 BS EN ISO : 9016 - 2012 BS EN : 970 - 1997 BS EN : 287-1-2011 BS EN : 10025-1-2004(E) BS EN : 10025-2-2004(E) IS : 2825 - 1969 (RA 2012) IS : 7307 (Part 1) - 1974(RA 2008) IS : 7310 (Part 1) - 1974(RA 2010) IS : 7318 (Part I) - 1974(R. A.. 2008) IS : 7318 (Part II) - 1974(RA 2008) IS 3600- (Part 9) - 1985 (RA 2008) IS 814 - 2004 (RA 2010)	

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			ISO: 4136 - 2012 ISO: 9606 -1: 2017 ISO: 9017 - 2017 ISO:5173-2009	
16.	Metal And Insulator Fittings For Overhead Powerlines Upto And Above 1000V	Visual Examination Tensile Strength Test Slip Strength Test Load Test Bend Test Nominal Dimension	BS : 3288 (Part 1) - 1973 IS : 2486 (Part 1) - 1 993/ RA 2008 IS : 7935 - 1975/ RA 2011 IS 10810 (Part 2) - 1984/ RA 2011 IS : 5561 - 1970/ RA 2007	Maximum Load 600 kN
	Cable, aluminium wire Electric power connector Conductor & earth wire accessories for overhead power line		IS : 2486 (Part 2) - 1989 / RA 2009 IS : 2121 (Part 1) - 1981/ RA 2007 IS : 2121 (Part 2) - 1981/ RA 2007 IS : 2121 (Part 3) - 1992/ RA 2007 Relevant Drawings	
17.	Rolled steel Products	Nominal Dimensions Weight/Meter (Mass) Sectional Area	IS : 808 - 1989/ RA 2009 IS : 1730 - 1989/ RA 2009 IS : 1732 - 1989/ RA 2009 IS : 1852 - 1985/ RA 2013	As per specification.
II.	METALLOGRAPHY			
1.	Ferrous & Non – ferrous metals	Microstructure examination In-Situ Metallography – production and evaluation of metallographic replicas	ASTM E 2567-2016 ASM Metals Handbook - Vol.7, 8 th Edition, 1973 ASME: E3 - 2011/ RA 2017 ASTM: E407 - 2007/ RA 2015 ASTM: E1351 - 2001/ RA 2012	50, 75, 100, 200, 250 & 500 magnifications (only Qualitative) 40 to 300 magnifications (only Qualitatively)

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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 : 7739 (Part I) - 1975 (RA 2010) IS 7739 (Parts - III & IV) - 1975/ RA 2007 IS : 7739 (Part V) - 1976/ RA 2007 IS : 7754 - 1975/ RA 2007	
2.	Steels	Measurement of Depth of Decarburization (Microscopic Method) Measurement of Case Depth (Microscopic Method) Determination of Non-metallic inclusion content by microscopic examination	ASTM E 1077 - 2014 IS : 6396 - 2000/ RA 2007 IS : 6416 - 1988/ RA 2007 IS : 4163 - 2004/ RA 2010 ISO : 4967 - 1998 ASTM : E45 - 2013, Method A	10 microns to 2000 microns 10 microns to 4000 microns Qualitative
3.	Ferrous & Non – ferrous metals	Macroscopic Examination	ASTM : E381 - 2017 ASTM : E340 - 2015 IS : 7739 (Parts III & IV) - 1975/ RA 2007 IS : 7739 (Part V) - 1976/ RA 2007 IS : 11371 - 1985/ RA 2007 IS 13015 - 1999/ RA 2007	Upto 20 magnification (Qualitative)
4.	Ferrous & Non-Ferrous Metals	Estimation of : a) Average grain size b) Austenitic grain size for steel (Comparison method)	ASTM : E112 - 2013 IS : 4748 - 2009 ISO : 643-2012	75 magnification for copper & 100 magnification for others ASTM grain size No. 1 to 10

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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
5.	Aluminium And Its Alloys	Thickness of Anodic Coatings (Microscopic Method)	IS : 5523 - 1983/ R.A.2010	Coating thickness > 1 micron
6.	Electro-Plated Coatings	Testing local thickness by microscopic method	IS : 3203 - 1982/ RA 2010 IS : 1573 - 1986/ RA 2010	Coating thickness > 2 microns
7.	Austenitic Stainless Steels	Detecting susceptibility to intergranular attack	ASTM : A 262 - 2015 IS:10461(Part 1 & 2)-1994/ RA 2010 & 2007 Practice - A Practice - B Practice - C Practice - E	2 microns to 1000 microns per year for Practice "B" & Practice "C" 50X to 1000X 2 micron to 1000 micron 2 micron to 1000 micron

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<u>NON DESTRUCTIVE-TESTING</u>				
I.	RADIOGRAPHY TESTING			
1.	Weldments And metallic castings/ forgings (ferrous and Non – ferrous)	Radiography Testing by X-Ray and Gamma Ray (Ir -192)	ASTM E-94-2004/ RA 2010 ASTM E-155 (Vol.1) ASTM E-272 /2015 ASTM E-446 (up to 51mm) ASTM E 1030-2011 ASME Sec. V Art 2 – 2017 ASME Sec. V Art 3-2017 ASME Sec. IX – 2017 ASME-390 -2015 API- 1104-2016 AWS D1.1/ 2015 BS EN ISO 9606-2017 /(Cl.10) BS EN ISO 15614-2017 /(Cl.7.3) BS EN ISO 17636 (Part- 1 & 2)-2013 IS 1182-1983 IS 2825-1969 IS 4853-1982	X- Ray 1 mm to 25mm Ir – 92 6 mm to 60 mm equivalent Steel
II.	ULTRASONIC TESTING			
1.	Detection of Internal flaws	Flaw Detection by A Scan Contact Method	IS 3664 - 81/ RA 2008 ASME Sec- V/ 2017	10 mm to 5000 mm
2.	Casting	Flaw Detection by A-Scan Contact Method	IS 7666 : 88/ RA 2010 IS 9565: 95/ RA 2010 ASTM-A 609:17/ SA 609:17 EN 10160-1999	10 mm to 5000 mm

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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
3.	Forging	Flaw Detection by A-Scan Contact Method	IS 8791:78/ RA 2008 IS 11626:17 ASTM-A388: 17/SA 388:17 A745:17 ASTM E114:17	10 mm to 5000 mm
4.	Plate	Flaw Detection by A-Scan contact Method	IS 11630:05/ RA 2010 IS 4225:04/ RA 2010) ASTM A435:17/SA 435:17 EN 10160-1999 ASTM A578:17/SA 578:17 ASTM A577:2017	5 mm to 5000 mm
5.	Pipe/Tube product	Flaw Detection by A-Scan contact Method	IS 6394:06 ASTM E273:2017 ASTM E213: 2014 ASME SE213:2015	5 mm to 5000 mm
6.	Weld	Flaw Detection by A-Scan contact Method	IS 4260:04/ RA 2010 IS 7343:86/ RA 2010 ASTM E164:2013 ASTM E587:2015 BS EN ISO 15614-2017 / (Cl.7.3) ASME Sec V Art. 4 /2017 AWS D1.1 – 2015	10 mm to 5000 mm
7.	Structural Welds	Ultrasonic Testing	AWS.D.1.1 – 2015	Upto 120 mm in Steel
8.	Thickness Measurement	Flaw Detection by A-Scan contact Method	ASTM E797/2015	1 mm to 200 mm
III.	MAGNETIC PARTICAL TESTING			
1.	Examination of casting Examination of Forging	Magnetic particle testing (Yoke Type) (Visible)	IS 7743: 2006 ASTM A275:2015 IS 3703: 04/ RA 2010 ASME Sec. V Art 25 – 2017 ASTM-E-709:2015 ISO 17638 / 2003 BS EN ISO 15614-2017/ (Cl.7.3)	Surface & Sub-surface discontinuity (Upto 3mm depth)

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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
2.	Examination Pipe/Tube Examination of Weld		IS 6752:91/ RA 2010 IS 5334:03 (RA 2008)	
IV.	LIQUID PENETRANT TESTING			
1.	Liquid Penetrant Testing of Materials	Liquid Penetrant test by Solvent Removable type (Visible)	IS 3658:99/ RA 2010 ASTM E165:2017 ASME Sec. V & VII - 2017 BS : 6443 – 1984 ASTM E1220:92 ASTM E1417:2005 BS EN ISO 15614-2017 (Cl.7.3)	Discontinuities open to surface only