Laboratory	**Raghavendra Spectro Metallurgical Laboratory, Plot No. 326, IX Cross, 4th Phase, Peenya Industrial Area, Bangalore, Karnataka**
Accreditation Standard	**ISO/IEC 17025: 2005**
Certificate Number	**TC-6806** **Page 1 of 15**
Validity	**31.01.2018 to 30.01.2020** **Last Amended on 26.09.2018**

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.	**METALS AND ALLOYS**			
1.	**Low and Medium Carbon Steel**	Carbon	IS 8811 ASTM E 415	0.017 % to 1.60 %
		Manganese		0.07 % to 2.0 %
		Phosphorous		0.001 % to 0.1 %
		Sulphur		0.001 % to 0.35 %
		Silicon		0.005 % to 2.00 %
		Copper		0.004 % to 1.00 %
		Nickel		0.006 % to 5.00 %
		Chromium		0.007 % to 5.00 %
		Molybdenum		0.002 % to 1.50 %
		Vanadium		0.003 % to 1.00 %
		Titanium		0.005 % to 0.25 %
		Aluminium		0.005 % to 1.50 %
		Cobalt		0.006 % to 0.40 %
		Niobium		0.003 % to 0.12 %
		Lead		0.003 % to 0.34 %
		Boron		0.0001 % to 0.10 %
		Tungsten		0.01 % to 0.25 %
		Tin		0.003 % to 1.00 %
2.	**Iron & Its Alloys – Low and Medium carbon Steel**	Manganese	RSML/SOP/ ICP-OES/01 Rev.00/Issue date 12.06.2018	0.07 % to 2.0 %
		Phosphorous		0.01 % to 0.20 %
		Sulphur		0.01 % to 0.40 %
		Copper		0.005 % to 4.0 %
		Nickel		0.01 % to 5.0 %
		Chromium		0.01 % to 5.0 %
		Molybdenum		0.005 % to 0.40%

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Silicon		0.005 % to 2.0%
		Molybdenum	IS:8811 ASTM E 415	0.002 % to 1.50%
		Vanadium		0.003% to 1.00%
		Aluminium		0.003 % to 1.5%
		Niobium		0.003 % to 0.12%
		Carbon		0.005 % to 1.60%
3.	**Stainless Steel and HSS**	Carbon	IS 9879 ASTM E 1086	0.017 % to 4.0 %
		Manganese		0.07 % to 10.0 %
		Phosphorous		0.001 % to 0.15 %
		Sulphur		0.001 % to 0.34 %
		Silicon		0.005 % to 3.50 %
		Copper		0.004 % to 4.00 %
		Nickel		0.007 % to 40.00 %
		Chromium		0.019 % to 28.00 %
		Molybdenum		0.002 % to 10.0 %
		Vanadium		0.003 % to 4.0 %
		Titanium		0.002 % to 0.8 %
		Aluminum		0.005 % to 1.20 %
		Cobalt		0.05 % to 1.50 %
		Niobium		0.001 % to 1.10 %
		Lead		0.003 % to 0.15 %
		Boron		0.0001 % to 0.050 %
		Tungsten		0.01 % to 10.0 %
		Phosphorus	IS 9879 ASTM E 1086	0.001 % to 0.15%
		Manganese	RSML/SOP/ ICP-OES/02 Rev.00/Issue date 12.06.2018	0.07 % to 10.0 %
		Phosphorous		0.01 % to 0.20 %
		Sulphur		0.01 % to 0.40 %
		Copper		0.005 % to 4.0 %
		Nickel		0.01 % to 40.0 %
		Chromium		0.01 % to 30.0 %

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		Molybdenum		0.005 % to 5.0%
4.	**Tool Steel**	Carbon	RSML/SOP/Chem/02 Rev. 01/ Issue Date. 15.06.2014	0.65 % to 1.35 %
		Manganese		0.10 % to 0.80 %
		Phosphorous		0.001 % to 0.10 %
		Sulphur		0.001 % to 0.04 %
		Silicon		0.04 % to 0.35 %
		Chromium		2.9 % to 5.00 %
		Molybdenum		0.10 % to 10.00 %
		Vanadium		0.20 % to 3.00 %
		Cobalt		0.05 % to 10.0 %
		Tungsten		1.50 % to 18.0 %
5.	**Cast Iron**	Carbon	IS 15338 ASTM E 1999	1.50 % to 4.00 %
			IS 12308 (Part 11)	1.5 % to 4.5 %
		Manganese	IS 15338 ASTM E 1999	0.03 % to 2.00 %
		Magnesium	IS 15338 ASTM E 1999	0.001 % to 0.10 %
		Phosphorous	IS 15338 ASTM E 1999	0.01 % to 0.40 %
		Phosphorus	IS 12308 (Part 5)	0.01 % to 0.5 %
		Sulphur	IS 15338 ASTM E 1999	0.001 % to 0.15 %
		Sulphur	IS 12308 (Part 2)	0.012 % to 0.25 %
		Silicon	IS 15338 ASTM E 1999	0.15 % to 3.00 %
			IS 12308 (Part 6)	0.1 % to 6.0 %
		Copper	IS 15338 ASTM E 1999	0.015 % to 0.50 %
		Nickel	IS 15338 ASTM E 1999	0.02 % to 2.00 %

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
			IS 12308 (Part 7)	0.2 % to 5.0 %
		Chromium	IS 15338 ASTM E 1999	0.01 % to 2.00 %
			IS 12308 (Part 8)	0.02 % to 8.0 %
		Molybdenum	IS 15338 ASTM E 1999	0.010 % to 1.20 %
		Vanadium	IS 15338 ASTM E 1999	0.008 % to 0.60 %
		Titanium	IS 15338 ASTM E 1999	0.003 % to 0.15 %
		Aluminium	IS 15338 ASTM E 1999	0.003 % to 0.15 %
		Cobalt	IS 15338 ASTM E 1999	0.05 % to 0.30 %
		Niobium	IS 15338 ASTM E 1999	0.001 % to 0.080 %
		Lead	IS 15338 ASTM E 1999	0.003 % to 0.03 %
		Boron	IS 15338 ASTM E 1999	0.0001 % to 0.050 %
		Tungsten	IS 15338 ASTM E 1999	0.01 % to 0.50 %
		Manganese	IS 12308 (Part 10)	0.1 % to 2.5 %
		Silicon	IS:15338 ASTM E 1999	0.15 % to 3.00%
		Copper		0.015 % to 1.00%
6.	**Aluminium & Its Alloys**	Manganese	ASTM E 1251	0.015 % to 3.0 %
		Silicon	ASTM E 1251	0.001 % to 20.0 %
			IS 504 (Part 1)	0.02 % to 0.3 %
		Copper	ASTM E 1251	0.01 % to 10.0 %
			IS 504 (Part 3)	0.01 % to 3.58 %
		Nickel	ASTM E 1251	0.03 % to 2.5 %
		Chromium	ASTM E 1251	0.001 % to 1.00 %
		Titanium	ASTM E 1251	0.005 % to 0.250 %

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Tin	ASTM E 1251	0.01 % to 1.0 %
		Lead	ASTM E 1251	0.001 % to 1.0 %
		Magnesium	ASTM E 1251	0.01 % to 5.0 %
			IS 504 (Part 6)	0.1 % to 1.0 %
		Zinc	ASTM E 1251	0.002 % to 8.00 %
		Nickel	IS 504 (Part 7)	0.1 % to 1.00 %
		Iron	IS 504 (Part 2)	0.03 % to 1.0 %
		Manganese	IS 504 (Part 5)	0.1 % to 1.5 %
		Manganese	ASTM E 3061	0.003% to 1.41%
		Copper		0.005% to 7.0%
		Titanium		0.009% to 0.20%
		Iron		0.02% to 3.06%
		Magnesium		0.006% to 8.2%
		Zinc		0.02% to 9.65%
		Tin		0.008% to 6.28%
		Lead		0.009% to 0.51%
		Nickel		0.004% to 2.71%
7.	**Copper & Its Alloys**	Phosphorus	BS EN 15079	0.002 % to 1.0 %
			IS 440	0.01 % to 0.5 %
		Sulphur	BS EN 15079	0.005 % to 0.60 %
		Silicon	BS EN 15079	0.005 % to 6.0 %
			IS 3685	0.01 % to 2.00 %
		Nickel	BS EN 15079	0.01 % to 30.00 %
			IS 440	0.1 % to 8.00 %
			IS 3685	0.01 % to 0.5 %
		Aluminium	BS EN 15079	0.001 % to 12.0 %
		Tin	BS EN 15079	0.01 % to 20.0 %
		Lead	BS EN 15079	0.001 % to 20.0 %
		Manganese	BS EN 15079	0.001 % to 5.00 %
		Zinc	BS EN 15079	0.001 % to 5.0 %
		Iron	BS EN 15079	0.001 % to 5.0 %

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
			IS 4027 (Part 8) IS 3685	0.01 % to 1.0 %
		Copper	IS 7212 Cl. No. 5	50 % to 99 %
		Tin	IS 4027 (Part 5)	0.1 % to 13 %
		Copper	BS EN 15079	50.0 % to 93.0%
8.	**Zinc & Its Alloys**	Lead	ASTM E 634	0.001 % to 1.00 %
		Tin		0.001 % to 0.36 %
		Cadmium		0.001 % to 0.48 %
		Copper		0.001 % to 6.00 %
		Iron		0.001 % to 0.48 %
		Aluminium		0.001 % to 9.00 %
		Bismuth		0.001 % to 0.020 %
		Magnesium		0.001 % to 0.108 %
		Silver		0.001 % to 0.060 %
		Antimony		0.001 % to 0.240 %
		Silicon		0.001 % to 0.010 %
		Chromium		0.001 % to 0.055 %
		Nickel		0.001 % to 0.036 %
		Manganese		0.001 % to 0.010 %
		Titanium		0.001 % to 0.060 %
9.	**Nickel and Its Alloys**	Carbon	RSML/SOP/Chem/01 Rev. 00/Issue Date 15.10.2016	0.010 % to 0.200 %
		Silicon		0.020 % to 0.100 %
		Phosphorus		0.010 % to 0.040 %
		Copper		0.030 % to 31.00 %
		Iron		0.100 % to 40.00 %
		Aluminium		0.010 % to 6.00 %
		Cobalt		0.020 % to 20.00 %
		Titanium		0.001 % to 3.00 %
		Boron		0.002 % to 0.040 %
		Sulphur		0.001 % to 0.030 %
		Chromium		0.030 % to 21.00 %

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Manganese		0.020 % to 1.260 %
		Molybdenum		0.100 % to 6.00 %
		Niobium		0.070 % to 5.00 %
		Tungsten		0.020 % to 2.00 %
		Phosphorus	RSML/SOP/Chem/01 Rev. 00/Issue Date 15.10.2016	0.003 % to 0.06%
		Silicon		0.020 % to 1.50%
		Molybdenum		0.10 % to 20.0%
		Tungsten		0.02 % to 6.0%
10.	**Plain Carbon & Low Alloy Steel**	Carbon	IS 228-87 part 1	0.05 % to 2.5 %
		Silica	IS 228-89 part 8	0.05 % to 5.00 %
		Manganese	IS 228-87 part 2 ASTM E3s50	0.10 % to 1.5 % 0.10 % to 2.50 %
		Phosphorus	IS 228-87 (Part 3) ASTM E350-12	0.01 % to 0.25 % 0.02 % to 0.25 %
		Chromium	IS 228-87 (Part 6)	0.1 % to 5.0 %
		Nickel	IS 228-87 (Part 5) ASTM E 350-12	0.1 % to 5.0 %
		Molybdenum	IS 228 (Part 7) ASTM E 350 - 12	0.05 % to 2.5 % 0.01 % to 1.50 %
11.	**Stainless Steel**	Carbon	IS 228 (Part1)	0.05 % to 2.00 %
		Silicon	ASTM E 353 IS 228 (Part 8)	0.5 % to 1.00 %
		Manganese	IS 228 (Part 2)	0.10 % to 2.00 %
		Sulphur	IS 228 (Part 2)	0.01 % to 0.25 %
		Phosphorus	IS 228 (Part 3)	0.01 % to 0.25 %
		Chromium	IS 228 (Part 6)	5.0 % to 25.0 %
		Nickel	IS 228 (Part 5)	0.5 % to 10.0 %
		Molybdenum	IS 228 (Part 7)	0.1 % to 2.5 %
12.	**Tin Based Solder Alloys**	Lead		0.011% to 0.096%
		Cadmium		0.002% to 0.006%
		Anitmony		0.008% to 0.10%

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Bismuth		0.008% to 0.021%
		Copper	ASTM F 3139	0.30% to 3.06%
		Nickel		0.0005 % to 0.015%
		Silver		0.40% to 4.20%
		Zinc		0.0002% to 0.016%
		Iron		0.0015% to 0.011%
13.	**Titanium and Titanium Alloys**	Alumnium		0.0009% to 8.0%
		Cobalt		0.006% to 0.10%
		Copper		0.004% to 0.50%
		Chromium	ASTM E 2371	0.005% to 4.0%
		Iron		0.004% to 3.0%
		Nickel		0.001% to 1.0%
II.	**HAZARDOUS & RESSTRICTED CHEMICAL**			
1.	**RoHS Metals**	Lead	IEC62321 Edition1.0 ICP – OES	10 mg/kg to 40000 mg/kg
		Cadmium		10 mg/kg to 500 mg/kg
		Mercury		10 mg/kg to 2000 mg/kg
		Chromium		10 mg/kg to 2000 mg/kg
III.	**WATER**			
1.	**Effluent Water**	Suspended Solids	APHA-2540D 20th Edition	5 mg/l to 1000 mg/l
		Dissolved Solids	APHA-2540C 20th Edition	10 mg/l to 3000 mg/l
		Temperature	IS3025(Part 9)	10 ºC to 60 ºC
		pH Value	IS 3025 (Part 11)	1 to12
		Oil and Grease	IS 3025 (Part 39)	1 mg/l to 50 mg/l
		Tottal residual chlorine	IS3025 (Part26)	0.1 mg/l to 5 mg/l
		Chemical Oxygen demand	ASTM D 1252	5 mg/l to 50 mg/l 50 mg/l to 500 mg/l
		Arsenic (as As)	ASTM D 1976	0.005 mg/l to 20 mg/l
		Mercury	ASTM D 1976	0.001 mg/l to 10 mg/l

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Lead	ASTM D 1976	0.1 mg/l to 100 mg/l
		Cadmium	ASTM D 1976	0.02 mg/l to 100 mg/l
		Hexavalent Chromium	IS 3025 (Part 52)	0.005 mg/l to 20 mg/l
		Total Chromium	ASTM D 1976	0.1 mg/l to 100 mg/l
		Copper	ASTM D 1976	0.01 mg/l to 100 mg/l
		Zinc	ASTM D 1976	0.1 mg/l to 100 mg/l
		Nickel	ASTM D 1976	0.1 mg/l to 100 mg/l
		Boron	ASTM D 1976	0.1 mg/l to 100 mg/l
		Cyanide	IS 3025 (Part27)	0.1 mg/l to 10 mg/l
		Chloride	IS 3025 (Part32)	0.5 mg/l to 1500 mg/l
		Fluoride	IS 3025 (Part60)	0.1 mg/l to 50 mg/l
		Dissolved Phospates	ASTM D6508	0.5 mg/l to 50 mg/l
		Sulphate	IS 3025 (Part24)	1.0 mg/l to 1200 mg/l
		Sulphide	IS 3025 (Part29)	0.01 mg/l to 50 mg/l
		Selenium	ASTM D 1976	0.05 mg/l to 10 mg/l
2.	**Potable Water**	Colour	IS 3025 (Part 4)	0.2 Hazen Units to 500 Hazen Units
		Odour	IS 3025 (Part 5)	Qualitative (Agreeable/Disagreeable)
		Hexavalent Chromium Cr+6	IS 3025 (Part 52)	0.005 mg/l to 20.0 mg/l
		Fluoride	IS 3025 (Part 60)	0.1 mg/l to 50 mg/l
		pH	IS 3025 (Part 11)	1 to 12
		Turbidity	IS 3025 (Part 10)	Upto 100 NTU
		Total Hardness	IS 3025 (Part 21)	1 mg/l to 1000 mg/l
		Iron	ASTM D 1976	0.01 mg/l to 100 mg/l
		Chloride	IS 3025 (Part 32)	0.5 mg/l to 1500 mg/l
		Residual Chlorine	IS 3025 (Part 26)	0.05 mg/l to 5 mg/l
		Total Dissolved Solids	IS 3025 (Part 16)	10 mg/l to 3000 mg/l
		Calcium	IS 3025 (Part 40)	1 mg/l to 500 mg/l
		Copper	ASTM D 1976	0.01 mg/l to 100 mg/l
		Manganese	ASTM D 1976	0.05 mg/l to 100 mg/l

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Sulphate	IS 3025 (Part 24)	1 mg/l to 50 mg/l 40 mg/l to 1000 mg/l
		Nitrate	IS 3025 (Part 34)	1 mg/l to 1000 mg/l
		Mercury	ASTM D 1976	0.001 mg/l to 10 mg/l
		Cadmium	ASTM D 1976	0.02 mg/l to 10 mg/l
		Arsenic	ASTM D 1976	0.005 mg/l to 100 mg/l
		Cyanide	IS 3025 (Part 27)	Upto10 mg/l
		Magnesium	IS 3025 (Part 46)	5 mg/l to 500 mg/l
		Phenolic Compounds	ASTM D 1783-01	0.001 mg/l to 0.50 mg/l
		Lead	ASTM D 1976	0.1 mg/l to 10 mg/l
		Zinc	ASTM D 1976	0.1 mg/l to 100 mg/l
		Alkalinity	IS 3025 (Part 23)	2 mg/l to 1000 mg/l
		Aluminium	ASTM D 1976	0.01 mg/l to 100 mg/l
		Boron	ASTM D 1976	0.05 mg/l to 100 mg/l
		Selenium	ASTM D 1976	0.005 mg/l to 10 mg/l
IV.	**LUBRICANTS**			
1.	**Lube Oil**	Color	RSML/OIL/SOP-11	Qualitative (Brown/Dark Brown/Yellow)
		Flash Point by COC	ASTM D 92	40 ºC to 360 ºC
		Pour Point	ASTM D 97	(-)45 ºC to 0 ºC
		TBN	ASTM D 2896	1 mgKOH/g to 500 mgKOH/g
		TAN	ASTM D 664	0.1 mgKOH/g to 10 mg KOH/g
		Kin.Viscosity@ 40°C	ASTM D 445	5 cst to 400 cst
		Kin.Viscosity@ 100°C	ASTM D 445	5 cst to 400 cst
		Viscosity Index	ASTM D 2270	50 to 250
		Sulphated Ash	ASTM D 874	0.1 % to 1%
		Water Content	ASTM D 6304 (KF Method)	10 mg/kg to 5000 mg/kg
		Salt Spray Test	ASTM B117	Qualitative

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
2.	**Diesel Fuel, Light Diesel Fuel**	Density	ASTM D 1298 Hydrometer Method	700 kgm^3 to 900 kgm^3
		Water Content	ASTM D 6304 KF Method	0.05 % to 1.0 %
		Calorific Value by Bomb Calorimeter	ASTM D 240	8.000 calg to 12000 cal/g
		Kin.Viscosity @ 40 ºC	ASTM D 445	1.0 cSt to 20.0 cSt
		Flash Point by PMCC	ASTM D 93	30.0 ºC to 100.0 ºC
3.	**Furnace Oil**	Density	ASTM D 1298 Hydrometer Method	0.75 g/cc to 1.20 g/cc
		Water Content	ASTM D 6304 KF Method	0.1 % to 50 %
		Calorific Value by Bomb Calorimeter	ASTM D 240	5000 cal/g to 13000 cal/g
		Kin.Viscosity @ 40 ºC	ASTM D 445	10 cSt to 500 cSt
		Flash Point by PMCC	ASTM D 93	50 ºC to 300 ºC
4.	**Wear Metals in Lube Oils**	Aluminium	ASTM D 5185	6.0 mg/kg to 40 mg/kg
		Barium	ASTM D 5185	0.5 mg/kg to 4.0 mg/kg
		Boron	ASTM D 5185	4.0 mg/kg to 30.0 mg/kg
		Calcium	ASTM D 5185	40 mg/kg to 9000 mg/kg
		Chromium	ASTM D 5185	1.0 mg/kg to 40.0 mg/kg
		Copper	ASTM D 5185	2.0 mg/kg to140 mg/kg
		Iron	ASTM D 5185	2.0 mg/kg to 140 mg/kg
		Lead	ASTM D 5185	10.0 mg/kg to 160.0 mg/kg
		Magnesium	ASTM D 5185	5.0 mg/kg to 1700 mg/kg
		Manganese	ASTM D 5185	5.0 mg/kg to 700 mg/kg
		Molybdenum	ASTM D 5185	5.0 mg/kg to 200.0 mg/kg
		Nickel	ASTM D 5185	5.0 mg/kg to 40 mg/kg
		Phosphorus	ASTM D 5185	10.0 mg/kg to 1000 mg/kg
		Potassium	ASTM D 5185	40.0 mg/kg to 1200 mg/kg
		Silicon	ASTM D 5185	8.0 mg/kg to 50.0 mg/kg
		Silver	ASTM D 5185	0.5 mg/kg to 50 mg/kg
		Sodium	ASTM D 5185	7.0 mg/kg to70.0 mg/kg
		Sulphur	ASTM D 5185	900 mg/kg to 6000 mg/kg

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Tin	ASTM D 5185	10.0 mg/kg to 40.0 mg/kg
		Titanium	ASTM D 5185	5.0 mg/kg to 40.0 mg/kg
		Vanadium	ASTM D 5185	1.0 mg/kg to 50.0 mg/kg
		Zinc	ASTM D 5185	10.0 mg/kg to1600.0 mg/kg

MECHANICAL TESTING

I.	MECHANICAL PROPERTIES OF METALS			
1.	**Ferrous and Non-Ferrous Material**	Tensile Strength Yield Stress, 0.1 to 0.5% Proof Stress	IS 1608 ASTM E8/E8M	0.012 kN to 20 kN 12 kN to 600 kN 20 kN to 1000 kN
		% Elongation %Reduction	ASTM A370 ASTM B557	5 % to 80 % 5 % to 80 %
		Brinell Hardness	IS 1500 (Part 1) ASTM E-10	100 to 575 HBW 10 mm / 3000 kgf 90 to 255 HBW 10 mm/1000 kgf 90 to 575 HBW 5 mm/750 kgf 100 to 400 HBW 2.5 mm/187.5 kgf

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
				50 to 250 HBW 5 mm/250 kgf
		Rockwell Hardness	IS 1586 (Part 1) ASTM E18	60 HRA to 90 HRA 10 HRB to 100 HRB 2 0HRC to 68 HRC
		Vickers Hardness	IS 1501 (Part 1) ASTM E92	80 to 1500 HV10 80 to 1500 HV30
		Micro Vickers Hardness	IS 1501 (Part 1) ASTM E384	40 to 1500 HV 0.1 40 to 1500 HV 0.2 40 to 1500 HV 0.3 40 to 1500 HV 0.5 40 to 1500 HV 1
		Bend test	IS 1599	Qualitative (Mandrel Dia: 13, 16, 20, 24, 32, 40, 50, 60, 64, 80, 140, 175, 240, 280, 320 mm)
		Charpy U Notch Charpy V Notch (RT to -60 °C & -196 °C)	IS 1499 IS 1757 Part 1 ASTM E23	Upto 300J Upto 300 J 5 J to 240 J
		Izod	IS 1598	Upto 168 J
2.	**Weld in Metals**	Transverse Tensile	IS 7307 ASME SEC IX ISO 5173	Load 0.012 to20, 12to 600 and 20 to 1000 kN.
		Root Bend Face Bend	IS 7307 ASME SEC IX ISO 5173	Qualitative (Mandrel Dia: 13, 16, 20, 24, 32, 40, 50, 60, 64, 80, 140, 175, 240, 280, 320 mm)
		Hardness Test on Arc Welded Joints	ISO 9015 (Part 1)	Qualitative
3.	**TMT Bar**	Tensile Strength Yield Strength	IS 1786 IS 1608 IS 1599	0.012 kN to 20 kN 12 kN to 600 kN 20 kN to 1000 kN

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
				6 mm to 32 mm
		% Elongation	IS 1786 IS 1608 IS 1599	5 % to 80 %
		Bend Test	IS 1786 IS 1608 IS 1599	Qualitative (Mandrel Dia: 13, 16, 20, 24, 32, 40, 50, 60, 64, 80, 140, 175, 240, 280, 320 mm)
		Re-Bend	Re-Bend	Qualitative
II.	**METALLOGRAPHY TEST**			
1.	**Steels**	Macro-etch	IS 11371 IS 13015 ASTM E340 ASTM E381 ASTM A604/A604M	Qualitative (Magnification 1X- 40X)
		Inclusion rating	IS 4163 ASTM E45	Qualitative (Magnification100X)
		Grain Size (Untwined Grains): Ferritic grain size in low carbon steel, Austenitic grain size in HT steel & austenitic stainless steel	IS 4748 ASTM E 112	Grain Size No. ASTM 1-10
		Case Depth	IS 6416 (Microscopic Method Micro hardness Method) IS 6396 (Decarburization depth)	0.01 mm to 2 mm (Magnification 50x, 100x) 0.02 mm to 10 mm 0.01 to 2 mm (Magnification 50x, 100x)
2.	**Steel, Al-Base & Cu-Base Alloys**	Microstructure	ASM Metals Hand Book Volume-9	Qualitative (Magnification 50x , 100x, 200x, 500x & 1000x)

Laboratory	**Raghavendra Spectro Metallurgical Laboratory, Plot No. 326, IX Cross, 4th Phase, Peenya Industrial Area, Bangalore, Karnataka**	
Accreditation Standard	**ISO/IEC 17025: 2005**	
Certificate Number	**TC-6806**	**Page 15 of 15**
Validity	**31.01.2018 to 30.01.2020**	**Last Amended on 26.09.2018**

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
3.	**Weld in Metals**	Fracture	ISO 9017	Qualitative
		Macroscopic & Microscopic examination	ASME SEC IX ISO 17639	Qualitative
		Micro Hardness Testing of Welded Joints	ISO 9015 (Part 2)	Qualitative
		Hardness Test on Arc Welded Joints	ISO 9015 (Part 1)	Qualitative
4.	**Cast Iron**	Graphite flake type & size Nodularity	IS 7754	Qualitative (Magnification 100X)
5.	**Electro Plated Coating on Metals**	Coating thickness	IS 13677 IS 3203	0.01 mm to 2.0 mm (Magnification 50X , 100X, 200X)
6.	**Paints Surface on Metals**	Adhesion	ASTM D 3359 (Method A and B)	Qualitative
7.	**Austenitic Stainless Steel**	IGC Test - Practice A, B, C, E and F	ASTM A 262	Qualitative
8.	**Heat Treatable Aluminum Alloys**	IGC Practice-G	ASTM G110	Qualitative
9.	**Duplex Stainless Steel**	Detection of Inter Metallic Phases Method-C	ASTM A 923	Qualitative
10.	**Duplex Stainless Steel**	Ferrite Content	ASTM E 562 (Manual Count)	Qualitative

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