

Laboratory Divine Metallurgical Services Pvt. Ltd., No. 14, Gopal Industrial Estate, Odhav, Ahmedabad, Gujarat

Accreditation Standard ISO/IEC 17025: 2017

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Validity 16.11.2018 to 15.11.2020 **Last Amended on** 10.01.2019

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.	CORROSION TEST			
1.	Copper alloys with Zinc more than 15%	Determination of dezincification resistance of copper alloys with zinc	ISO 6509 -1 & 2 2017	Qualitative
2.	Cast, Wrought & welded stainless steel and related alloys	Stress-Corrosion-Cracking Resistance in Boiling Magnesium Chloride solution	ASTM G36 - 94(RA2013) ASTM G 30-97(RA 2016)	Qualitative
3.	Nickel-Rich, Chromium-Bearing Alloys	Susceptibility to Inter granular Corrosion Method A - Ferric Sulfate - Sulfuric Acid Test	ASTM G28 - 02(RA2015)	Qualitative-60MPY
4.	Pipes and pressure vessel Steel Products- pipes, plates, fittings flanges	Resistance to Hydrogen Induced Cracking	NACE TM0284 - 2016	Qualitative
5.	Duplex Stainless Steel/ Ferritic stainless steel Products	Detecting Detrimental Intermetallic Phase Method A - Sodium Hydroxide Etch Test	ASTM A923 - 14 Method A	Qualitative
	Duplex Stainless Steel/ Ferritic stainless steel Products	Detecting Detrimental Intermetallic Phase Method B - Charpy Impact Test at sub Zero temp.	ASTM A923 - 14 Method B	1.0Joules to 300 Joules
	Duplex Stainless Steel/ Ferritic stainless steel Products	Detrimental Intermetallic Phase Method C - Ferric Chloride Test	ASTM A923 - 14 Method C	1 mdd to 100 mdd
6.	Austenitic Stainless Steel (Pipe, Tube,	Susceptibility to Inter granular Attack in Austenitic Stainless	ASTM A262 - 15 Practice A	Qualitative

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	Plate), Cast Sample, Weld Metal samples	Steels Practice A - Oxalic Acid Etch Test		
7.	Austenitic Stainless Steel (Pipe, Tube, Plate), Cast Sample, Weld Metal samples	Susceptibility to Intergranular Attack in Austenitic Stainless Steels Practice B - Ferric Sulfate-Sulfuric Acid Test	ASTM A262 - 15 Practice B	(1Cycle = 24 Hours), 1 - 5 Cycles test (Customer Specific). Corrosion Rate given in Mils/Year (MPY).
	Austenitic Stainless Steel (Pipe, Tube, Plate), Cast Sample, Weld Metal samples	Susceptibility to Intergranular Attack in Austenitic Stainless Steels Practice C - Nitric Acid Test	ASTM A262 - 15 Practice C	Qualitative Test, 5 Cycles Test (240 Hours). Corrosion Rate given in Mils/Year (MPY).
8.	Austenitic Stainless Steel (Pipe, Tube, Plate), Cast Sample, Weld Metal samples	Susceptibility to Intergranular Attack in Austenitic Stainless Steels Practice E - Copper - Copper Sulfate - Sulfuric Acid Test	ASTM A262 - 15 Practice E	Qualitative
	Austenitic Stainless Steel (Pipe, Tube, Plate), Cast Sample, Weld Metal samples	Susceptibility to Intergranular Attack in Austenitic Stainless Steels Practice F - Copper - Copper Sulfate - 50% Sulfuric Acid Test	ASTM A262 - 15 Practice F	Qualitative
9.	Ferritic Stainless Steels	Susceptibility to Intergranular Attack in Ferritic Stainless Steels Method W - Oxalic acid etch Test	ASTM 763 - 15 Practice W	Qualitative
		Susceptibility to Intergranular Attack in Ferritic Stainless Steels Method X - Ferric Sulfate	ASTM 763 - 15 Practice X	Qualitative

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		- Sulfuric acid test		
		Susceptibility to Intergranular Attack in Ferritic Stainless Steels Method Y - Copper - copper Sulfate - 50% Sulfuric acid test	ASTM 763 - 15 Practice Y	Qualitative
		Susceptibility to Intergranular Attack in Ferritic Stainless Steels Method Z - Copper - copper sulfate - 16% Sulfuric acid test	ASTM 763 - 15 Practice Z	Qualitative
10.	Stainless Steels and Duplex Stainless steel	Resistance to intergranular corrosion	ISO 3651 - 2005	Qualitative
11.	Copper Alloys	Mercurous Nitrate Test	ASTM B154 - 16	Qualitative
12.	Stainless Steels and Related alloys	Pitting and Crevice Corrosion Resistance	ASTM G48 - 11(RA2105) ASTM G46-94(RA2018)	Qualitative
13.	Cast, Wrought & welded stainless steel and related alloys	Resistance to Sulfide Stress Cracking and Stress Corrosion Cracking	NACE TM0177 - 2016	Qualitative
14.	Welded Austenitic Stainless Steel (Boiler, Heat - Exchanger, and Condenser Tubes)	Weld Decay Test	ASTM A249/A249M - 18	Qualitative
15.	Copper Alloys	Ammonia test	ISO 6957 - 1988	Qualitative
16.	Metallic Materials with Metallic Coatings and Metallic Materials with Non-Metallic Coatings	Salt Spray Test	ASTM B117 - 18, IS11864 - 1986 (RA2016), ISO 9227 - 2017	Qualitative

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II.	METALS & ALLOYS			
1.	Alloy Steels, Tool Steel, Stainless, Heat Resisting, Maraging and Chromium - Nickel - Iron Alloys	Aluminum	LDM 16 – 2018 ICP-OES	1mg/l to 100mg/l
		Antimony	LDM 16 – 2018 ICP-OES	1mg/l to 10mg/l
		Arsenic	LDM 16 – 2018 ICP-OES	1mg/l to 10mg/l
		Chromium	LDM 16 - 2018 ICP-OES	1mg/l to 250mg/l
		Cobalt	LDM 16 – 2018 ICP-OES	1mg/l to 100mg/l
		Copper	LDM 16 – 2018 ICP-OES	1mg/l to 250mg/l
		Lead	LDM 16 – 2018 ICP-OES	1mg/l to 100mg/l
		Manganese	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
		Molybdenum	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
		Nickel	LDM 16 - 2018 ICP-OES	1mg/l to 250mg/l
		Niobium	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
		Phosphorous	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
		Silicon	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
		Sulphur	LDM 16 - 2018 ICP-OES	1mg/l to 50mg/l
		Tin	LDM 16 - 2018 ICP-OES	1mg/l to 50mg/l
		Titanium	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
		Tungsten	LDM 16 - 2018 ICP-OES	1mg/l to 50mg/l
		Vanadium	LDM 16 - 2018 ICP-OES	1mg/l to 50mg/l
		Zinc	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
		Zirconium	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
		Aluminum	LDM 09 - 2018	0.001% to 2%
		Carbon Total,	ASTM E352 - 2018, ASTM E353 - 2014, IS 228 Part 1 - 1987 (RA2018)	0.01% to 1%
		Chromium	ASTM E352 - 2018, ASTM E353 - 2014, IS 228 Part 6 - 1987 (RA2014)	0.05% to 50%
		Cobalt	ASTM E352 - 2018, ASTM E353 - 2014	0.01% to 15%
		Copper	ASTM E352 - 2018, ASTM E353 - 2014, IS 228 Part 15 - 1992 (RA2014)	0.005% to 5%

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		Iron	ASTM E352 - 2018, ASTM E353 - 2014, LDM 06 - 2018	50% to 90%
		Manganese	ASTM E352 - 2018, ASTM E353 - 2014, IS 228 Part 2 - 1987 (RA2018) LDM 4 - 2018	0.01% to 18%
		Molybdenum	ASTM E352 - 2018, ASTM E353 - 2014, IS 228 Part 10 - 1989 (RA2014), LDM 3 - 2018	0.2% to 16%
		Nickel	ASTM E352 - 2018, ASTM E353 - 2014, IS 228 Part 5 - 1987 (RA2014) LDM 1 - 2018	0.05% to 40%
		Niobium	LDM 05 - 2018	0.02% to 5%
		Phosphorous	ASTM E352 - 2018, ASTM E353 - 2014, IS 228 Part 3 - 1987 (RA2018)	0.005% to 0.05%
		Silicon	ASTM E352 - 2018, ASTM E353 - 2014, IS 228 Part 8 - 1989 (RA2014)	0.05% to 2.5%
		Sulfur	ASTM E352 - 2018, ASTM E353 - 2014, IS 228 Part 9 - 1989 (RA2014)	0.001 - 0.6%
		Titanium	ASTM E352 - 2018, ASTM E353 - 2014,	0.05% to 2%
		Tungsten	LDM 18 - 2018	0.1% to 5%
		Vanadium	LDM 17 - 2018	0.05% to 5.5%
2.	Aluminum & its Alloys	Aluminum	ASTM E1251 - 17a LDM 16 - 2018 IS 504 2002 (RA2018)	50% to 99.95% 50% to 99.99% 50% to 99.90 %
		Antimony	ASTM E1251 - 17a	0.001% to 0.5%
		Bismuth	ASTM E1251 - 17a	0.003% to 0.1%

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		Boron	LDM 16 – 2018 ICP-OES	1mg/l to 50mg/l
		Cadmium	LDM 16 - 2018 ICP-OES	1mg/l to 50mg/l
			ASTM E1251 - 17a	0.002% to 0.2%
			LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
		Chromium	ASTM E1251 - 17a	0.005% to 3%
			ASTM E34 - 11e1	0.05% - 1%
		Cobalt	ASTM E1251 - 17a	0.001% to 0.5%
		Copper	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
			IS 504 2002 (Ra2018)	0.05% to 10%
			ASTM E1251 - 17a	0.002% to 15%
		Iron	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
			ASTM E34 - 11e1	0.01% to 5%
			IS 504 2002 (Ra2018)	0.005% to 2%
			LDM 6 - 2018	
			ASTM E1251 - 17a	
		Lead	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
			ASTM E1251 - 17a	0.005% to 2%
		Magnesium	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
			IS 504 2002 (Ra2018)	0.1% to 12%
			ASTM E1251 - 17a	0.002% to 15%
		Manganese	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
			ASTM E34 - 11e1	0.05% to 2%
			IS 504 2002 (Ra2018)	0.005% to 15%
			ASTM E1251 - 17a	
		Nickel	LDM 16 – 2018 ICP-OES	1mg/l to 100mg/l
			ASTM E1251 - 17a	0.002% to 5%
			ASTM E34 - 11e1	0.05% to 4%
			IS 504 2002 (Ra2018)	
			LDM 1 - 2018	
		Phosphorous	ASTM E1251 - 17a	0.001% to 0.1%
		Silicon	LDM 16 – 2018 ICP-OES	1mg/l to 100mg/l
			ASTM E1251 - 17a	0.001% to 25%
			ASTM E34 - 11e1	0.05% to 20%
		Tin	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
			ASTM E34 - 11e1	0.05% to 1%

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			IS 504 2002 (Ra2018) ASTM E1251 - 17a	0.005% to 20%
		Titanium	LDM 16 - 2018 ICP-OES ASTM E1251 - 17a ASTM E34 - 11e1	1mg/l to 50mg/l 0.002% to 1% 0.02% to 0.5%
		Vanadium	LDM 16 - 2018 ICP-OES ASTM E1251 - 17a	1mg/l to 50mg/l 0.005% to 0.5%
		Zinc	LDM 16 - 2018 ICP-OES ASTM E1251 - 17a	1mg/l to 100mg/l 0.01% to 10%
		Zirconium	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
3..	Carbon Steel (Low Carbon, Medium Carbon & High Carbon Steel)			
a.	Silicon Electrical Steel, Ingot Iron, and Wrought Iron	Iron	ASTM E350 -18, LDM 06 - 2018	50% to 90%
		Aluminum	LDM 16 - 2018 ICP-OES ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013) LDM 09 - 2018	1mg/l to 100mg/l 0.002% to 2% 0.001% to 2%
		Antimony	ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.001% to 0.3%
		Arsenic	LDM 16 - 2018 ICP-OES ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	1mg/l to 10 mg/l 0.001% to 0.3%
		Bismuth	ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.001% to 0.3%
		Boron	ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.0001% to 1%
		Cadmium	ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.001% to 0.01%

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		Calcium	ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.001% to 0.1%
		Carbon	ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.002% to 4.5%
		Carbon Total	ASTM E350 - 18, IS 228 Part 1 - 1987 (RA2018)	0.01% to 1%
		Chromium	LDM 16 - 2018 ICP-OES	1mg/l to 250mg/l
		Chromium	ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013) ASTM E350 - 18, IS 228 Part 6 - 1987 (RA2014)	0.0015% to 5% 0.05% to 5 %
		Cobalt	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
			ASTM E350 - 2018	0.01% to 0.3%
			ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.001% to 25%
		Copper	LDM 16 - 2018 ICP-OES	1mg/l to 250mg/l
			ASTM E350 - 2018	0.005% to 0.2%
			IS 228 Part 21 - 1987 (RA2014) ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.005% to 0.7%
		Lead	ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.001% to 0.5%
		Magnesium	ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.002% to 0.4%
		Manganese	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
			ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.001% to 5%
				0.01% to 5%

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			ASTM E350 - 2018, IS 228 Part 2 - 1987 (RA2018), LDM 4 - 2018	
		Molybdenum	LDM 16 - 2018 ICP-OES	1mg/l to 250mg/l
			ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.001% to 5%
			ASTM E350 - 2018 IS 228 Part 10 - 1989 (RA2014) LDM 3 - 2018	0.2% to 0.6%
		Nickel	LDM 16 - 2018 ICP-OES	1mg/l to 250mg/l
			ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.002% to 10%
			ASTM E350 - 2018 IS 228 Part 5 - 1987 (RA2014) LDM 1 - 2018	0.05% to 4%
		Niobium	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
			ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.002% to 3%
			LDM 05 - 2018	0.02% to 1%
		Nitrogen	ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.001% to 0.05%
		Phosphorous	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
			ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.001% to 1.5%
			ASTM E350 - 2018 IS 228 Part 3 - 1987 (RA2018)	0.001% to 0.25%
		Selenium	ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.001% to 0.3%

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		Silicon	LDM 16 - 2018 ICP-OES ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	1mg/l to 250mg/l 0.0015% to 5%
			ASTM E350 - 2018 IS 228 Part 8 - 1989 (RA2014)	0.05% to 5%
		Sulphur	LDM 16 - 2018 ICP-OES ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	1mg/l to 100mg/l 0.001% to 0.4%
			ASTM E350 - 2018 IS 228 Part 9 - 1989 (RA2014)	0.001% to 0.6%
		Tantalum	ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.003% to 1%
		Tin	LDM 16 - 2018 ICP-OES ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	1mg/l to 50mg/l 0.001% to 0.5%
		Titanium	ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.001% to 2%
			ASTM E350 - 2018	0.05% to 0.5%
		Tungsten	ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.001% to 2%
			LDM 18 - 2018	0.1% to 1%
		Vanadium	ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.001% to 5%
			LDM 17 - 2018	0.05% to 0.5%
		Zinc	ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.001% to 0.5%

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		Zirconium	ASTM E415- 17, ASTM E1999 - 18, JIS G 1253 - 2002 (RA2013)	0.001% to 0.5%
4.	Cobalt & its Alloys	Aluminum	LDM 16 - 2018 ICP-OES LDM 20 - 2018	1mg/l to 250mg/l 0.002% to 1.5%
		Boron	LDM 16 - 2018 ICP-OES LDM 20 - 2018	1mg/l to 50mg/l 0.005% to 0.5%
		Carbon	LDM 20 - 2018	0.005% to 3%
		Carbon total	ASTM E1473 - 16, ASTM E1019 - 18	0.025% to 1.1%
		Chromium	LDM 16 - 2018 ICP-OES LDM 20 - 2018	1mg/l to 250mg/l 0.01% to 33%
			ASTM E1473 - 16	0.25% to 30%
		Cobalt	LDM 16 - 2018 ICP-OES LDM 20 - 2018	50% to 99.99% 50% to 99.90%
			ASTM E1473 - 16	0.2% to 65%
		Copper	LDM 16 - 2018 ICP-OES LDM 20 - 2018	1mg/l to 250mg/l 0.003% to 5%
		Iron	LDM 16 - 2018 ICP-OES LDM 20 - 2018	1mg/l to 100mg/l 0.001% to 45%
			LDM 6 - 2018	0.05% to 7%
		Lead	LDM 16 - 2018 ICP-OES LDM 20 - 2018	1mg/l to 250mg/l 0.001% to 0.2%
		Magnesium	LDM 16 - 2018 ICP-OES LDM 20 - 2018	1mg/l to 250mg/l 0.001% to 0.3%
		Manganese	LDM 16 - 2018 ICP-OES LDM 20 - 2018	1mg/l to 250mg/l 0.05% to 10%
			LDM 4 - 2018	0.05% to 1%
		Molybdenum	LDM 16-2018 ICP-OES LDM 20-2018/ASTM E1473-16, LDM 3- 2018	1mg/l to 250mg/l 0.005% to 15% 0.05% to 3%
		Nickel	LDM 16 - 2018 ICP-OES LDM 20 - 2018	1mg/l to 250mg/l 0.005% to 40%
			ASTM E1473 - 16, LDM 1 - 2018	0.1% to 35%

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		Niobium	LDM 16 - 2018 ICP-OES	1mg/l to 50mg/l
			LDM 20 - 2018	0.01% to 8%
		Nitrogen	LDM 20 - 2018	0.001% to 0.4%
		Paladium	LDM 20 - 2018	0.001% to 0.5%
			LDM 16 - 2018 ICP-OES	1mg/l to 250mg/l
		Phosphorous	LDM 20 - 2018	0.001% to 0.1%
		Silicon	LDM 16 - 2018 ICP-OES	1mg/l to 250mg/l
			LDM 20 - 2018	0.005% to 5%
			ASTM E1473 - 16	0.01% to 5%
		Sulphur	LDM 16 - 2018 ICP-OES	1mg/l to 250mg/l
			LDM 20 - 2018	0.005% to 0.4%
			ASTM E1473 - 16, ASTM E1019 - 18	0.001% to 0.08%
		Titanium	LDM 20 - 2018	0.005% to 3%
		Tantalum	LDM 16 - 2018 ICP-OES	1mg/l to 50mg/l
		Tin	LDM 16 - 2018 ICP-OES	1mg/l to 250mg/l
			LDM 20 - 2018	0.002% to 3%
		Titanium	LDM 16 - 2018 ICP-OES	1mg/l to 50mg/l
		Tantalum	LDM 20 - 2018	0.005% to 4%
		Tungsten	LDM 16 - 2018 ICP-OES	1mg/l to 250mg/l
			ASTM E1473 - 16	0.2% to 8%
			LDM 20 - 2018	0.01% to 20%
		Vanadium	LDM 16 - 2018 ICP-OES	1mg/l to 50mg/l
			LDM 20 - 2018	0.005% to 5%
5.	Copper & its Alloys	Aluminum	LDM 16 - 2018 ICP-OES	1 mg/l to 250 mg/l
			LDM 13 - 2018	0.001% to 20%
			BS EN 15079 - 2015	0.1% to 12%
		Antimony	LDM 09 - 2018	
			LDM 16 - 2018 ICP-OES	1 mg/l to 50 mg/l
			LDM 13 - 2018	0.003% to 2%
			BS EN 15079 - 2015	1% to 10%
		Arsenic	LDM 24 - 2018	
			LDM 16 - 2018 ICP-OES	1 mg/l to 10 mg/l
			LDM 13 - 2018	0.001% to 0.5%

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			BS EN 15079 - 2015 ASTM E62 - 89 (RA2004)	0.02% to 1%
		Berillium	LDM 13 - 2018 BS EN 15079 - 2015	0.01% to 4%
		Bismuth	LDM 16 - 2018 ICP-OES LDM 13 - 2018 BS EN 15079 - 2015	1 mg/l to 50 mg/l 0.001% to 4%
		Cadmium	LDM 16 - 2018 ICP-OES LDM 13 - 2018 BS EN 15079 - 2015	1 mg/l to 50 mg/l 0.001% to 0.3%
		Carbon	LDM 13 - 2018 BS EN 15079 - 2015	0.001% to 0.2%
		Chromium	LDM 13 - 2018 BS EN 15079 - 2015	0.001% to 3%
		Cobalt	LDM 16 - 2018 ICP-OES LDM 13 - 2018 BS EN 15079 - 2015	1 mg/l to 250 mg/l 0.001% to 3%
		Copper	LDM 16 - 2018 ICP-OES LDM 13 - 2018 BS EN 15079 - 2015 IS 440 - 1964 (RA2018) ASTM E478 - 08 (2017) IS 3685 - 1966 (RA2018) LDM 2 - 2018	50% to 99.95% 50% to 99.95% 60% to 99.95%
		Iron	LDM 16 - 2018 ICP-OES IS 440 - 1964 (RA2018) IS 3685 - 1966 (RA2018) LDM 7 - 2018 LDM 13 - 2018 BS EN 15079 - 2015	1 mg/l to 250 mg/l 0.1% to 6% 0.002% to 10%
		Lead	LDM 16 - 2018 ICP-OES LDM 13 - 2018 BS EN 15079 - 2015 LDM 11 - 2018	1 mg/l to 250 mg/l 0.002% to 20% 0.05 to 20%

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		Magnesium	LDM 13 - 2018 BS EN 15079 - 2015 LDM 13 - 2018 BS EN 15079 - 2015	0.05% to 3% 0.01% to 12%
		Manganese	ASTM E478 - 08 (2017) LDM 4 - 2018	0.01% to 15%
		Mercury	LDM 16 - 2018 ICP-OES	1 mg/l to 250 mg/l
		Nickel	LDM 16 - 2018 ICP-OES ASTM E478 - 08 (2017)	1 mg/l to 250 mg/l 0.05% to 50%
			IS 3685 - 1966 (RA2018) LDM 1 - 2018 LDM 13 - 2018 BS EN 15079 - 2015	0.002% to 50%
		Niobium	LDM 13 - 2018 BS EN 15079 - 2015	0.001% to 2%
		Phosphorous	LDM 16 - 2018 ICP-OES LDM 13 - 2018 BS EN 15079 - 2015	1 mg/l to 250 mg/l 0.002% to 0.07%
		Phosphorous	IS 440 - 1964 (RA2018) ASTM 478 - 08 (RA2017)	0.02% to 0.44%
		Selenium	LDM 16 - 2018 ICP-OES	1 mg/l to 50 mg/l
		Silicon	LDM 16 - 2018 ICP-OES LDM 13 - 2018 BS EN 15079 - 2015	1 mg/l to 250 mg/l 0.001% to 8% 0.05% to 8%
			ASTM E478 - 08 (2017) IS 3685 - 1966 (RA2018)	
		Silver	LDM 16 - 2018 ICP-OES LDM 13 - 2018 BS EN 15079 - 2015 LDM 23 - 2018	1 mg/l to 250 mg/l 0.01% to 10% 0.05% to 5%
		Sulphur	LDM 13 - 2018 BS EN 15079 - 2015	0.001% to 0.4%
		Telurium	LDM 16 - 2018 LDM 13 - 2018 BS EN 15079 - 2015	1 mg/l to 50 mg/l 0.002% to 1.5%

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		Tin	LDM 16 - 2018 ICP-OES LDM 10 - 2018 LDM 13 - 2018 BS EN 15079 - 2015	1 mg/l to 50 mg/l 0.05% to 20% 0.01% to 20%
		Titanium	LDM 13 - 2018 BS EN 15079 - 2015	0.002% to 1%
		Zinc	LDM 16 - 2018 ICP-OES LDM 8 - 2018	1 mg/l to 250 mg/l 0.2% to 50%
		Zinc by OES	LDM 13 - 2018 BS EN 15079 - 2015	0.003% to 50%
		Zirconium	LDM 13 - 2018 BS EN 15079 - 2015	0.001% to 0.4%
6.	Ferro Alloys			
a.	Ferro Chrome (High/Low) Carbon	Chromium	ASTM E-1621-13,ASTM E-363-16:2016	40 % to 70 %
		Manganese	ASTM E-1621-13,ASTM E-363-16:2016	0.1 % to 5 %
		Phosphorous	ASTM E-1621-13,ASTM E-363-16:2016	0.02 % to 0.1 %
		Silicon	ASTM E-1621-13,ASTM E-363-16:2016	0.1 % to 10 %
		Sulphur	ASTM E-1621-13,ASTM E-363-16:2016	0.02 % to 0.1 %
		Carbon	IS 228 (Part 1)-2007: 2007	0.015 % to 6.5 %
		Manganese	ASTM E-1621-13: 2013	45 % to 80 %
		Phosphorous	ASTM E-1621-13: 2013	0.05 % to 1 %
		Silicon	ASTM E-1621-13: 2013	0.1 % to 5 %
		Sulphur	ASTM E-1621-13: 2013	0.03 % to 0.5 %
		Manganese	ASTM E-1621-13: 2013	45 % to 80 %
		Phosphorous	ASTM E-1621-13: 2013	0.05 % to 1 %
		Silicon	ASTM E-1621-13: 2013	0.1 % to 25 %
b.	Ferro Molybdenum	Molybdenum	ASTM E-1621-13: 2013	45 % to 70 %
		Silicon	ASTM E-1621-13: 2013	0.1 % to 5 %
c.	Ferro Niobium	Aluminium	ASTM E-1621-13,ASTM E-367-16:2016	0.1 % to 3 %

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		Niobium	ASTM E-1621-13, ASTM E-367-16:2016	40 % to 80 %
		Silicon	ASTM E-1621-13, ASTM E-367-16:2016	0.1 % to 5 %
		Titanium	ASTM E-1621-13, ASTM E-367-16:2016	0.1 % to 5 %
d.	Ferro Silicon	Aluminium	ASTM E-1621-13: 2013	0.1 % to 10 %
		Calcium	ASTM E-1621-13: 2013	0.1 % to 10 %
		Phosphorous	ASTM E-1621-13: 2013	0.05 % to 0.2 %
		Silicon	ASTM E-1621-13: 2013	35 % to 80 %
e.	Ferro Titanium	Nickel	ASTM E-1621-13: 2013	0.1 % to 1 %
		Aluminium	ASTM E-1621-13: 2013	0.1 % to 15 %
		Calcium	ASTM E-1621-13: 2013	0.1 % to 5 %
		Chromium	ASTM E-1621-13: 2013	0.1 % to 5 %
		Copper	ASTM E-1621-13: 2013	0.1 % to 1 %
		Manganese	ASTM E-1621-13: 2013	0.1 % to 10 %
		Molybdenum	ASTM E-1621-13: 2013	0.1 % to 1 %
		Niobium	ASTM E-1621-13: 2013	0.1 % to 3 %
		Phosphorous	ASTM E-1621-13: 2013	0.02 % to 0.1 %
		Silicon	ASTM E-1621-13: 2013	0.1 % to 5 %
		Sulphur	ASTM E-1621-13: 2013	0.02 % to 0.1 %
		Titanium	ASTM E-1621-13, IS 13840 (Part 6)-1998: 2013	19 % to 55 %
f.	Ferro Tungsten	Copper	ASTM E-1621-13: 2013	0.1 % to 0.2 %
		Manganese	ASTM E-1621-13: 2013	0.1 % to 3 %
		Molybdenum	ASTM E-1621-13: 2013	0.1 % to 3 %
		Silicon	ASTM E-1621-13: 2013	0.1 % to 5 %
		Tungsten b	ASTM E-1621-13: 2013	50 % to 80 %
g.	Ferro Vanadium	Chromium	ASTM E-1621-13: 2013	0.1 % to 10 %
		Copper	ASTM E-1621-13: 2013	0.1 % to 1 %
		Manganese	ASTM E-1621-13: 2013	0.1 % to 5 %
		Molybdenum	ASTM E-1621-13: 2013	0.1 % to 1 %
		Nickel	ASTM E-1621-13: 2013	0.1 % to 2 %
		Phosphorous	ASTM E-1621-13: 2013	0.02 % to 0.1 %
		Silicon	ASTM E-1621-13: 2013	0.1 % to 5 %

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		Sulphur	ASTM E-1621-13: 2013	0.02 % to 0.1 %
		Titanium	ASTM E-1621-13: 2013	0.1 % to 1 %
		Vanadium	ASTM E-1621-13: 2013	30 % to 55 %
7.	Nickel & its Alloys	Aluminum	LDM 16 - 2018 ICP-OES	1mg/l to 250mg/l
		Aluminum	LDM 12 - 2018	0.002% to 6%
		Aluminum	LDM 9 - 2018	0.05% to 6%
		Antimony	LDM 16 - 2018 ICP-OES	1mg/l to 50mg/l
			LDM 12 - 2018	0.002% to 0.5%
		Arsenic	LDM 16 - 2018 ICP-OES	1mg/l to 10mg/l
			LDM 12 - 2018	0.002% to 0.1%
		Bismuth	LDM 16 - 2018 ICP-OES	1mg/l to 250mg/l
			LDM 12 - 2018	0.002% to 0.3%
		Boron	LDM 16 - 2018 ICP-OES	1mg/l to 50mg/l
			LDM 12 - 2018	0.0001 to 1%
		Carbon	LDM 12 - 2018	0.005% to 3%
			ASTM E1473 - 16, ASTM E1019 - 18	0.01% to 1.1%
		Chromium	LDM 16 - 2018 ICP-OES	1mg/l to 250mg/l
			ASTM E1473 - 16	0.1% to 33%
			LDM 12 - 2018	0.0015% to 25%
		Cobalt	LDM 16 - 2018 ICP-OES	1mg/l to 250mg/l
			ASTM E1473 - 16	0.1% to 33%
			LDM 12 - 2018	0.002% to 30%
		Copper	LDM 16 - 2018 ICP-OES	1mg/l to 250mg/l
			ASTM E1473 - 16	0.01% to 33%
			LDM 12 - 2018	0.001% to 33%
		Iron	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
			LDM 6 - 2018	0.1% to 15%
			LDM 12 - 2018	0.002% to 50%
		Lead	LDM 16 - 2018 ICP-OES	1mg/l to 250mg/l
			LDM 12 - 2018	0.001% to 0.5%
		Magnesium	LDM 16 - 2018 ICP-OES	1mg/l to 100mg/l
		Manganese	LDM 16 - 2018 ICP-OES	1mg/l to 250mg/l
			LDM 12 - 2018	0.001% to 25%
		Manganese	LDM 4 - 2018	0.1% to 3%

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		Molybdenum	ASTM E1473 - 16, LDM 3 - 2018 LDM 12 - 2018 LDM 16 - 2018 ICP-OES	0.01% to 25% 0.001% to 33% 1mg/l to 250mg/l
		Nickel	LDM 16 - 2018 ICP-OES ASTM E1473 - 16, LDM 1 - 2018	50% to 99.99% 50% to 99.90%
		Niobium	LDM 16 - 2018 ICP-OES LDM 12 - 2018 ASTM E1473 - 16, LDM 5 - 2018	1mg/l to 250mg/l 0.002% to 6% 0.02% to 4.5%
		Nitrogen	LDM 12 - 2018	0.001% to 0.1%
		Phosphorous	LDM 12 - 2018 LDM 16 - 2018 ICP-OES ASTM E1473 - 16, ASTM E1917 - 13(2018)	0.001% to 0.1% 1mg/l to 250mg/l 0.001% to 0.08%
		Silicon	LDM 16 - 2018 ICP-OES LDM 12 - 2018 ASTM E1473 - 16	1mg/l to 250mg/l 0.002% to 5% 0.012% to 5%
		Sulphur	LDM 16 - 2018 ICP-OES LDM 12 - 2018 ASTM E1473 - 16, ASTM E1019 - 18	1mg/l to 250mg/l 0.001% to 0.4% 0.001% to 0.1%
		Tantalum	LDM 16 - 2018 ICP-OES LDM 12 - 2018	1mg/l to 250mg/l 0.005% to 3%
		Tin	LDM 16 - 2018 ICP-OES LDM 12 - 2018	1mg/l to 250mg/l 0.001% to 0.5%
		Titanium	LDM 16 - 2018 ICP-OES LDM 12 - 2018 ASTM E1473 - 16	1mg/l to 250mg/l 0.001% to 5% 0.05% to 4.5%
		Tungsten	LDM 16 - 2018 ICP-OES LDM 12 - 2018 ASTM E1473 - 16	1mg/l to 250mg/l 0.02% to 20% 0.1% to 5%
		Vanadium	LDM 16 - 2018 ICP-OES LDM 12 - 2018	1mg/l to 50mg/l 0.01% to 0.5%

Pooja Singh
Convenor

Jitendra B. Vispute
Program Manager

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		Vanadium	ASTM E1473 - 16	0.01% to 3.25%
		Zirconium	LDM 16 - 2018 ICP-OES LDM 12 - 2018	1mg/l to 100mg/l 0.001% to 2%
8.	Cast Iron- (Grey Cast Iron, Spheroidal Graphite Cast Iron, Malleable Iron)	Carbon, Total	ASTM E351 - 2018 IS 12308 Part 11 - 1991 (RA2018)	1% to 4.5%
		Chromium	ASTM E351 - 2018 ASTM 12308 Part 8 - 1997 (RA2018)	0.05% to 5%
		Cobalt	ASTM E351 - 2018	0.01% to 1%
		Copper	ASTM E351 - 2018 IS 228 Part 21 - 1987 (RA2014)	0.01% to 1%
		Iron	LDM 06 - 2018,	50% to 90%
		Manganese	ASTM E351 - 2018	0.1% to 18%
		Molybdenum	ASTM E351 - 2018 IS 12308 Part 9 - 1993 (RA2014) LDM 3 -2018	0.02% to 3%
		Nickel	ASTM E351 - 2018 IS 12308 Part 7 - 1991 (RA2018) LDM 1 - 2018	0.05% to 25%
		Phosphorous	ASTM E351 - 2018 IS 12308 Part 5 - 1991 (RA2018)	0.05% to 1%
		Silicon	ASTM E351 - 2018 IS 12308 Part 6 - 1991 (RA2018)	0.3% to 5%
		Sulfur	ASTM E351 - 2018 IS 12308 Part 8 - 1997 (RA2018)	0.005% to 0.5%
		Titanium	IS 12308 Part 14 - 1993 (RA2014)	0.05% to 0.5%
		Tungsten	IS 228 Part 16 - 1992 (RA2014)	0.5% to 0.25%

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Program Manager

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9.	Stainless Steel	Vanadium	LDM 17 - 2018	0.05% to 0.5%
	Alloy Steels, Tool Steel, Stainless, Heat Resisting, Maraging and Chromium - Nickel - Iron Alloys	Tin	ASTM E1086 - 14	0.001% to 0.5%
a.		Aluminum	LDM 16 - 2018 ICP-OES ASTM E1086 - 14	1mg/L - 250mg/L 0.012% to 2%
		Antimony	ASTM E1086 - 14	0.002% to 0.5%
		Arsenic	ASTM E1086 - 14 LDM 16 - 2018 ICP-OES	0.001% to 0.3% 1mg/L - 100mg/L
		Bismuth	ASTM E1086 - 14 LDM 16 - 2018 ICP-OES	0.001% to 0.3% 1mg/L - 250mg/L
		Boron	ASTM E1086 - 14	0.0001% to 1%
		Cadmium	ASTM E1086 - 14 LDM 16 - 2018 ICP-OES	0.001% to 0.01% 1mg/L - 100mg/L
		Calcium	ASTM E1086 - 14	0.001% to 0.1%
		Carbon	ASTM E1086 - 14	0.004% to 4.5%
		Chromium	ASTM E1086 - 14	0.0015% to 35%
		Cobalt	LDM 16 - 2018 ICP-OES ASTM E1086 - 14	1mg/L - 250mg/L 0.001% to 25%
		Copper	ASTM E1086 - 14	0.001% to 10%
		Lead	ASTM E1086 - 14	0.001% to 0.5%
		Magnesium	ASTM E1086 - 14	0.002% to 0.4%
		Manganese	ASTM E1086 - 14	0.001% to 25%
		Molybdenum	ASTM E1086 - 14	0.001% to 15%
		Nickel	ASTM E1086 - 14	0.002% to 40%
		Niobium	ASTM E1086 - 14 LDM 16 - 2018 ICP-OES	0.002% to 4% 1mg/L - 250mg/L
		Nitrogen	ASTM E1086 - 14	0.01% to 1%
		Phosphorous	ASTM E1086 - 14	0.001% to 1.5%
		Selenium	ASTM E1086 - 14	0.001% to 0.3%
		Silicon	ASTM E1086 - 14	0.0015% to 8%
		Sulphur	ASTM E1086 - 14	0.001% to 0.4%
		Tantalum	ASTM E1086 - 14	0.003% to 1%
		Titanium	ASTM E1086 - 14	0.002% to 3%
		Tungsten	ASTM E1086 - 14	0.003% to 25%
		Vanadium	ASTM E1086 - 14	0.001% to 10%

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10.	Titanium & Titanium Alloys	Zinc	ASTM E1086 - 14	0.001% to 0.5%
		Zirconium	ASTM E1086 - 14	0.001% to 0.5%
		Aluminum	LDM 14 - 2018	0.002% to 15%
		Boron	LDM 14 - 2018	0.0001% to 0.1%
		Carbon	LDM 14 - 2018	0.002% to 1%
		Chromium	LDM 14 - 2018	0.005% to 20%
		Copper	LDM 14 - 2018	0.003% to 4%
		Iron	LDM 14 - 2018	0.005% to 2.5%
		Manganese	LDM 14 - 2018	0.005% to 15%
		Molybdenum	LDM 14 - 2018	0.002% to 6%
		Nickel	LDM 14 - 2018	0.002% to 0.5%
		Niobium	LDM 14 - 2018	0.01% to 8%
		Nitrogen	LDM 14 - 2018	0.001% to 0.4%
		Palladium	LDM 14 - 2018	0.001% to 0.5%
		Silicon	LDM 14 - 2018	0.005% to 2%
		Tungsten	LDM 14 - 2018	0.01% to 10%
		Tin	LDM 14 - 2018	0.002% to 3%
		Titanium	LDM 14 - 2018	50% to 99.99%
		Vanadium	LDM 14 - 2018	0.1% to 10%
11.	Zinc and its Alloys	Zirconium	LDM 14 - 2018	0.002% to 5%
		Aluminum	LDM 16 - 2018 ICP-OES LDM 9 - 2018 ASTM E634 - 18	1 mg/l to 250 mg/l 0.1% to 30% 0.001% to 10%
		Antimony	LDM 16 - 2018 ICP-OES ASTM E634 - 18 IS 406 - 1964 (RA2016)	1 mg/l to 50 mg/l 0.003% to 0.5% 0.02% to 1%
		Arsenic	LDM 16 - 2018 ICP-OES ASTM E634 - 18 IS 406 - 1964 (RA2016)	1 mg/l to 50 mg/l 0.001 to 0.5% 0.02% to 1%
		Cadmium	IS 406 - 1964 (RA2016) LDM 16 - 2018 ICP-OES ASTM E634 - 18	0.05% to 15% 1 mg/l to 50 mg/l 0.001% to 0.2%
		Copper	LDM 16 - 2018 ICP-OES LDM 02 - 2018 ASTM E634 - 18	1 mg/l to 250 mg/l 0.1% to 10% 0.001% to 10%

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		Iron	LDM 16 - 2018 ICP-OES ASTM E634 - 18 IS 406 - 1964 (RA2016)	1 mg/l to 250 mg/l 0.0025% to 1.3% 0.1% to 1.3%
		Lead	LDM 16 - 2018 ICP-OES ASTM E634 - 18 IS 406 - 1964 (RA2016)	1 mg/l to 250 mg/l 0.0025% to 0.5% 0.01% to 0.5%
		Magnesium	LDM 16 - 2018 ICP-OES LDM 19 - 2018 ASTM E634 - 18	1 mg/l to 250 mg/l 0.01% to 3% 0.001% to 3%
		Manganese	LDM 16 - 2018 ICP-OES LDM 4 - 2018 ASTM E634 - 18	1 mg/l to 250 mg/l 0.01% to 0.5% 0.001% to 0.5%
		Nickel	LDM 16 - 2018 ICP-OES ASTM E634 - 18 LDM 1 - 2018	1 mg/l to 250 mg/l 0.01% to 1% 0.05% to 1%
		Silicon	ASTM E634 - 18	0.001% to 0.5%
		Tin	LDM 16 - 2018 ICP-OES ASTM E634 - 18 IS 406 - 1964 (RA2016)	1 mg/l to 250 mg/l 0.025% to 0.5% 0.01% to 0.5%
		Zinc	LDM 16 - 2018 ASTM E634 - 18 LDM 8 - 2018	50% to 99.99% 50% to 99.90% 50% to 99.90%

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MECHANICAL TESTING

I.	MECHANICAL PROPERTIES OF METALS			
1.	Copper Materials, Alloys & Products			
a.	Wrought Plate, Bar, Pipe, Tube and Cast Specimen	Ultimate Tensile Strength	IS 1608 - Part 1 2018, ASTM E8/E8M - 16a, ISO 6892-1:2016	2 kN to 1450 kN
		Modulus of Elasticity & Yield Strength	IS 1608 - Part 1 2018, ASTM E8/E8M - 16a, ISO 6892-1:2016	2 kN to 1450 kN
		Bend Testing	IS 1599 - 2012(RA2017)	Qualitative 8 mm to 240 mm Mandrel Dia
		% Elongation	IS 1608 - Part 1 2018, ASTM E8/E8M - 16a, ISO 6892-1:2016	2 % to 80 %
		% Reduction Area	IS 1608 - Part 1 2018, ASTM E8/E8M - 16a, ISO 6892-1:2016	5 % to 80 %
2.	Ferrous Materials, Alloys & Products			
a.	Nut, Bolt, Screw, Stud and Fasteners	Proof Load Test	ASTM A370 - 17a, ASTM A194/A194M - 17a, A193/A193M - 17a IS 1367 Part 6 - 1994 (RA2017), IS 1367 Part 3 - 2017	Qualitative Threaded Bolt / Screw / Nut from M6 to M39
b.	Plate, Bar, Pipe, Tube, Cast and Welded Specimen	Bend Testing	API 1104 - 2016, ASME BPVC IX - 2017, ASTM E370 - 17a, ASTM E190 - 14, ASTM E290 - 14, IS 1599 - 2012 (RA 2017), BS EN ISO 5173 - 2009, IS 3600 Part 5 - 2018, IS 3600 Part 7 - 1985 (RA2013)	Qualitative Mandrel Dia - 8, 12, 13, 16, 18, 20, 24, 28, 32, 35, 40, 44, 50, 55, 60, 75, 80, 85, 90, 100, 110, 125, 160, 225 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
	Plate, Bar, Pipe, Tube, Cast and Welded specimen	Charpy Impact Testing	ASTM 370 - 17a, ASTM E23 - 18, BS EN ISO 148 - 1 - 2016, BS EN ISO 9016 -12, IS 1757 Part 1 - 2014, IS 1598 - 1977 (RA2015), IS 3600 Part 2 - 1985 (RA2013)	Qualitative 10 to 240 Joules (KV8), 2 to 240 Joules (KV2) @ -70 to 35 and -196 Degree Temperature.
c.	Pipes and Tubes	Flaring Test / Tube Drift Expansion Test	ASTM 450/A450M - 15, ASTM A999/A999M - 18, ASTM 1016/A1016M - 18, BS EN ISO 8493 - 2004, IS 2335 - 2005 (RA2017), ISO 8492 - 2005 (RA2017)	Qualitative 6 mm to 180 mm Dia Cone angle 60 degree
d.	TMT Bars / Reinforcement Bars Bend / Rebend Test	Rebend Test of TMT Bar / Reinforcement Bar	IS 1786 - 2008 (RA2013)	Qualitative Mandrel Dia 8, 12, 13, 16, 18, 20, 24, 28, 32, 35, 40, 44, 50, 55, 60, 75, 80, 85, 90, 100, 110, 125, 160, 225 mm
e.	Metallic Materials	Rockwell Hardness Testing (HRC)	ASTM E18 - 17e1, IS 1586 Part 1 - 2018, ASTM A370 - 17a, ISO 6506 - 1 - 2014, ISO 6508 - 1 - 2016	20 HRC to 70 HRC
		Vickers Hardness Testing (HV)	ASTM E-384-2017, ASTM A-370-2017, IS 1501-Part-1-2002, ISO 9015-1:2011	100 HV1 to 800 HV1 100 HV2 to 800 HV2 100 HV5 to 800 HV5 100 HV10 to 800 HV10 100 HV30 to 800 HV30
f.	Metallic and Non Metallic coating on Metallic Materials	Pull off Adhesion Testing (Dolly Test), Coatings Adhesion Testing by Portable Adhesion Tester	ASTM B571 - 18, ASTM D4541 - 17	0 Mpa to 80 Mpa
g.	Magnetic Electrically Conductive Substrate Metals	Coating Thickness Measurements by Eddy Current Method	ASTM – B244 – 09 (RA2014), ASTM – B499 – 09 (RA2014), ISO 2178 – 2016, ISO 2360 – 2017,	10 µm to 830 µm

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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
h.	Plate, Bar, Pipe, Tube, Wire, Cast and Welded Specimen	Ultimate Tensile Strength	API 1104 - 16 - Sec 5.6.2, ASME - IX - 2017 - QW - 150, ASTM A370 - 17a, ASTM A1061/A1061M - 16, ASTM E8/E8M - 16, IS 1608 - Part 1 - 2018, ASTM A:370- (2017a), ISO 4136 - 2012, ISO 6892 - 1 - 2016, IS 14268 - 2017, IS 16172 - 2014, IS 1786 - 2008 (RA2013)	2 kN to 1450 kN
i.	Pipes and Tubes	Flattening Test	IS 2328 - 2005 (RA2017), ASTM A1016/A1016M - 18, ASTM A450/A450M - 15, ASTM A999/A999M - 18, ASTM A530/A530M - 12, ISO 8494 - 2013	Qualitative OD 6 mm to 250 mm
j.	Plate, Bar, Pipe, Tube, Wire, Cast and Welded Specimen	% Elongation	ASTM A370 - 17a, IS 1608 - Part 1 - 2018, ISO 4136- 2012, ISO 6892 - 1 - 2016, ASTM E8/E8M - 17	2 % to 80 %
		% Reduction Area	ASTM A370 - 17a, IS 1608 - Part 1 - 2018, ISO 4136- 2012, ISO 6892 - 1 - 2016, ASTM E8/E8M - 17	5 % to 80 %
		0.2 % Proof Stress	ASTM A370 - 17a, IS 1608 - Part 1 - 2018, ISO 4136- 2012, ISO 6892 - 1 - 2016, ASTM E8/E8M - 17	2 kN to 1450 kN
		Yield Strength	ASTM A370 - 17a, IS 1608 - Part 1 - 2018, ISO 4136- 2012, ISO 6892 - 1 - 2016, ASTM E8/E8M - 17	2 kN to 1450 kN
		Izod Impact Test	IS 1598 - 1977 (RA2015), ASTM E23 - 18	Qualitative 2 Joules to 170 Joules

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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
k.	Metallic Materials	Rockwell Hardness (HRBW)	ASTM E18 - 17e1, IS 1586 Part 1 - 2018, ASTM A370 - 17a, ISO 6506 - 1 - 2014, ISO 6508 - 1 - 2016	20 HRBW to 100 HRBW
		Micro Vickers Hardness Testing	ASTM E384 - 17, ISO 9015 - 2 - 2016	195 HV0.1, 0.2, 0.3, 0.5, 1 to 710 HV 0.1, 0.2, 0.3, 0.5, 1
		Surface Roughness Measurement	IS 3073 - 2010, ASTM D7127 - 17	2 µm to 350 µm
l.	Metallic Sheets	Cupping Test	ASTM E643 - 2015	Qualitative 0.1 mm to 2 mm Thickness Sheet and Ball Dia 20 mm
3.	Non-Ferrous Metals, Alloys & Products			
a.	Aluminum and its Alloys, Magnesium and its Alloys, Titanium and its Alloys, Zinc and its Alloys, Tin and its Alloys, Lead and its Alloys, Titanium and its Alloys	Ultimate Tensile Strength	IS 1608 Part1 - 2018, ASTM E8/E8M - 16a, ASTM B557 - 15	2 kN to 1450 kN
		Yield Strength	IS 1608 Part1 - 2018, ASTM E8/E8M - 16a, ASTM B557 - 15	2 kN to 1450 kN
		% Elongation	IS 1608 Part1 - 2018, ASTM E8/E8M - 16a, ASTM B557 - 15	2 % to 80 %
		% Reduction Area	IS 1608 Part1 - 2018, ASTM E8/E8M - 16a, ASTM B557 - 15	0.1 % to 80 %
		Bend - Rebend Test	IS 1599 - 2012	Qualitative 8 mm to 240 mm Mandrel Dia
		Vickers Hardness (HV)	STM E92 - 17, IS 1501 Part1 - 2013, ISO 9015 Part1 - 2001	100 HV1, 2, 5, 10, 30 to 800 HV1, 2, 5, 10, 30
b.	Anodic Coatings on Aluminum Substrate	Coating Thickness Measurements by Eddy Current Method	ASTM - B244 - 09 (RA2014), ASTM - B499 - 09 (RA2014), ISO 2178 - 2016, ISO 2360 - 2017,	24 µm to 830 µm

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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
4.	Welds & Welded Test Specimens			
a.	Ferrous & Non Ferrous Welded Pipe, Plate and Bar	Rockwell Hardness (HRBW)	ASTM E18 - 17e1, IS 1586 Part 1 - 2018, ASTM A370 - 17a, ISO 6506 - 1 - 2014, ISO 6508 - 1 - 2016	20 HRBW to 100 HRBW
		Rockwell Hardness (HRC)	ASTM E18 - 17e1, IS 1586 Part 1 - 2018, ASTM A370 - 17a, ISO 6506 - 1 - 2014, ISO 6508 - 1 - 2016	20 HRC to 70 HRC
		Vickers Hardness (HV)	ASTM E-384-2017, ASTM A-370-2017, IS 1501-Part-1-2002, ISO 9015-1:2011	100 HV1, 2, 5, 10, 30 to 800 HV1, 2, 5, 10, 30
		Yield Stress	ISO 15614 (Part-1) - 2017, ASME Section IX - 2017, ISO 6892 - 1 - 2016, API 1104 - 2016, ASTM A 370 - 17a	0.1 kN to 1450 kN
		Bend Test	ASTM A370 - 17a, ASME Section IX - 2017, API 1104 - 2016	Qualitative 8 mm to 240 mm Mandrel Dia.
		Charpy V-notch Impact Test	ASTM E23 - 18, IS 1757 Part1 - 2014, ASTM A370 - 17a, ASTM A923 Method B -2014, ISO 148 -1- 2016	Range: 10 to 240 Joules, Temp. 35 to -70 and -196 deg C Temp
		Tear Test	ASME Sec-IX-2017	Qualitative
		Ultimate Tensile Strength	ISO 15614 (Part-1) - 2017, ASME Section IX - 2017, ISO 6892-1-2016,API 1104-2016, ASTM A 370-17a	2 kN to 1450 kN
II.	METALLOGRPHY TEST			
1.	Copper Materials, Alloys & Products	Mercurous Nitrate Test	ASTM B154 - 16	Qualitative
2.	Ferrous Materials, Alloys & Products			
a.	Case Hardened Steel	Case Depth Measurement	IS 6416 - 1988(RA 2018) Microscopic Method	10 µm to 2000 µm

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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
b.	Metallic Materials	Grain Size Measurement	ASTM E112 - 13	Qualitative Grain Size: 1 to 10, Un twinned grain, ASTM Plate-I, Comparison Method
		Qualitative Metallography/ Volume Fraction Measurement	ASTM E562 - 11, ASTM E1245 - 03(2016)	30 to 70 %
c.	Cast Iron	Microstructure of Graphite & Nodularity	IS 7754 1975 (RA2018), ASTM A247 - 17	Qualitative Form: I to VI Distribution : A to E Size: 1 To 8
	Metallic Materials	Coating Thickness Measurement by Microscopic Method	ASTM B487 - 85 (RA2013)	10 µm to 2000 µm
d.	Duplex Stainless-Steel Products	Detecting Inter Metallic Phase	ASTM A923 Method A - 14	Qualitative
e.	Steel Casting, Austenitic Alloys, Duplex Stainless-Steel Weld Products	Ferrite Measurement in Weld metal By Feritoscope	ASTM A800/A800M-2014, ISO 8249 - 18	0.5 % to 85 %
f.	Ferrous and Non-Ferrous Metallic Materials	Micro Structure	ASTM E-407(2015 e.1) (ASM Handbook Vol-9-2004)	Qualitative: Magnification : 50 X to 1000 X
g.	Ferrous Metals and Alloys	Decaburization Depth measurement	ASTM E-1077-2014, IS 6396-2000	10 µm to 2000 µm
h.	Ferrous Metals and Non Ferrous Metals, Weld Specimens	Macro Etch Test	ASTM E340 - 15, ASTM E381 - 17	Qualitative
i.	Steel Metal	Inclusion Rating	ASTM E45 - 18a Method-A (Worst Field), IS 4163 - 2004 (RA2017)	Qualitative: Type-A,B,C,D- nil to 3.5