

Laboratory **Hyderabad Engineering Labs, # 5-9-16/10, Prashanthi Nagar, Indl. Estate, Kukatpally, Hyderabad, Telangana**

Accreditation Standard **ISO/IEC 17025: 2005**

Certificate Number **TC-7641**

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Last Amended on **11.09.2018**

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**

<b>I. METALS AND ALLOYS</b>				
1.	<b>Ferrous Alloys Carbon &amp; Low Alloy Steel</b>	Carbon	IS 8811:1998 (RA 2012)	0.03 % to 1.00 %
		Manganese		0.20 % to 1.40 %
		Phosphorus		0.001 % to 0.07 %
		Sulphur		0.002 % to 0.07 %
		Silicon		0.03 % to 0.75 %
		Copper		0.020 % to 0.30 %
		Nickel		0.010 % to 3.30 %
		Chromium		0.020 % to 2.30 %
		Molybdenum		0.005 % to 0.80 %
		Vanadium		0.003 % to 0.30 %
		Aluminum		0.010 % to 1.20 %
		Cobalt		0.003 % to 0.70 %
		Niobium/Columbium		0.020 % to 0.35 %
		Tungsten		0.10 % to 0.35 %
Titanium	0.002 % to 0.30 %			
2.	<b>Ferrous Alloy Cast Iron/SG Iron</b>	Carbon	ASTM E1999:2011	2.50 % to 3.30 %
		Manganese		0.40 % to 1.00 %
		Phosphorus		0.20 % to 0.80 %
		Sulphur		0.020 % to 0.10 %
		Silicon		0.50 % to 2.60 %
3.	<b>Ferrous Alloys Stainless steel</b>	Carbon	ASTM E 1086:2014 ASTM E 353:2014 IS 9879:1998 (RA 2015)	0.01 % to 0.10 %
		Manganese		0.60 % to 1.30 %
		Phosphorus		0.015 % to 0.045 %
		Sulphur		0.001 % to 0.030 %
		Silicon		0.20 % to 0.70 %
		Copper		0.20 % to 2.00 %
		Nickel		5.00 % to 20.0 %
		Molybdenum		1.50 % to 3.00 %
Chromium	14.0 % to 25.0 %			

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4.	<b>Aluminum &amp; Aluminum Alloys</b>	Niobium	ASTM E1251-2011	0.025 % to 1.00 %
		Cobalt		0.050 % to 0.25 %
		Aluminum		0.005 % to 0.015 %
		Tin		0.005 % to 0.015 %
		Arsenic		0.003 % to 0.005 %
		Magnesium		0.50 % to 2.10 %
		Silicon		0.35 % to 16.0 %
		Copper		0.030 % to 5.00 %
		Nickel		0.10 % to 0.60 %
		Chromium		0.050 % to 0.25 %
		Titanium		0.05 % to 0.20 %
		Tin		0.050 % to 0.20 %
		Lead		0.020 % to 0.30 %
		Manganese		0.010 % to 0.25 %
		Zinc		0.0 to 0.50 %
5.	<b>Copper &amp; Copper Alloys</b>	Vanadium	HEL-C.LDM-057 Issue, 01 Issue Dated: 03.03.2014 Spectrometric method	0.015 % to 0.060 %
		Iron		0.020 % to 0.80 %
		Tin		0.60 % to 5.30 %
		Lead		0.010 % to 5.20 %
		Zinc		0.15 % to 35.0 %
		Nickel		1.0 % to 8.00 %
		Iron		0.050 % to 4.50 %
		Silicon		0.002 % to 0.25 %
		Manganese		0.001 % to 0.35 %
		Aluminum		0.003 % to 10.10 %
		Phosphorus		0.010 % to 0.030 %
		Arsenic		0.010 % to 0.060 %
6.	<b>Ferrous &amp; Non-Ferrous Alloys</b>	Chromium	ASTM E 1476-2014 (XRF)	0.0003 % to 0.10 %
		Cobalt		0.050 % to 0.30 %
		Chromium		Qualitative
		Nickel		
		Molybdenum		
		Vanadium		
		Tungsten		

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		Cobalt		
		Titanium		
		Niobium/Columbium		
		Copper		
7.	<b>Nickel, Titanium &amp; Cobalt Alloys</b>	Chromium	ASTM E 1476-2014 (XRF)	Qualitative
		Nickel		
		Molybdenum		
		Vanadium		
		Tungsten		
		Cobalt		
		Titanium		
		Niobium/Columbium		
		Copper		
8.	<b>Galvanized Parts</b>	Mass of Zinc Coating	IS 6745:1972 (RA 2010)	50 g/m <sup>2</sup> to 1000 g/m <sup>2</sup> (15 µm to 150 µm)

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**MECHANICAL TESTING**

<b>I. MECHANICAL PROPERTIES OF METALS</b>				
1.	<b>Ferrous &amp; Non-Ferrous Alloys</b>	<b>Tensile Test</b>	IS 1608:2005, ASTM A 370:2017a, ASTM B 557:2015, ASTM E8/E8M:2016a, ISO 6892-1:2016, IS 1786:2008	<b>Load Range</b> 20 kN to 390 kN 20 kN to 800 kN
		Longitudinal & Transverse Tensile Strength		
		0.2% Proof Stress		
		Yield Strength		
		% of Elongation		
% of Reduction in Area	2.0 % to 60 %			
2.	<b>Ferrous Materials Carbon Steel</b>	Through-Thickness tension testing of steel plates	ASTM A 770:2003, DIN EN 10164:2016.	Reduction Area Upto 65 %
3.	<b>Ferrous &amp; Non-Ferrous Alloys(Plates, Bars, Strips/ Sheet, Sections)</b>	Bend Test	IS 1599:2012, ASTM A 370:2017a	Bend Angle:180° & Closed (Upto 28 mm)
4.	<b>TMT Bars</b>	Bend Test	IS 1786:2008, IS 1599:2012	Bend Angle:180°
		Re-Bend Test		Bend Angles: 135°&157.5°
5.	<b>Cladding Plates</b>	Shear Test	ASME Sec-II Part-A SA 263,264,265:2017	Upto 800 kN
6.	<b>Ferrous Alloys (Pipes &amp; Tubes)</b>	Flattening Test	IS 2328:2005, ASTM A 370:2017a, ASME Sec-II Part-A SA 450:2017	Upto OD 300 mm
		Flaring Test	IS 2335:2005, ASTM A 370:2017a, ASME Sec-II Part-A SA 450:2017	Upto ID 60 mm

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7.	<b>Washers (Spring Washers)</b>	Twist Test	IS 3063:1994	Nominal Size Ø4 mm to Ø36 mm
		Permanent Set Test		
		Permanent Load Test		
8.	<b>Ferrous &amp; Non-Ferrous Alloys</b>	Rockwell Hardness Test	IS 1586 (Part-1):2012, ASTM A 370:2017a, ASTM E 18:2017.	20 HRB to 90 HRB 20 HRC to 70 HRC
		Brinell Hardness Test	IS 1500:2005, ASTM E 10:2017, ASTM A370:2017a.	45 HBW to 460 HBW
		Vickers Hardness Test	ASTM A370:2017a, ASTM E384:2016, IS 1501 (Part-1):2013, ISO 6507-1:2018.	HV5: 31 to 700 HV10: 50 to 700 HV20: 97 to 700 HV30: 128 to 700
		<b>Impact Test</b> Charpy Test - Room Temperature to -70 °C	IS 1757 (Part-1):2014, EN ISO 148-1:2016.	0 to 300 Joules
		Izod Test - Room Temperature	IS 1598:1998	0 to 160 Joules
9.	<b>Fusion Weld Joints in Metals</b>	Tensile Strength (Transverse and All Weld)	ASME Sec.IX:2017 BS EN ISO 15614-1:2017 IS 2825-1969 IBR:2017 AWS D 1.1 D1.1M:2015	4 kN to 800 kN
		Root Bend Test, Face Bend Test & Side Bend Test	ASME Sec.IX:2017, IS 2825-1969, IBR:2017, ASTM E 190:2014, AWS D 1.1 D1.1M:2015.	4 kN to 800 kN
		Fillet Weld Fracture Test	ASME Sec.IX:2017, IS 2825-1969, BS EN 9606-1:2017.	4 kN to 800 kN
		All Weld Test	ASME Sec.IX:2017, IS 2825-1969, IBR:2017	4 kN to 800 kN

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		Nick Break Test	IS 2825-1969	4 kN to 800 kN
		Pull Out/Push Out Test	ASME SEC VIII Div1:2017	4 kN to 800 kN
10.	<b>Bolts M10, M12, M16, M20 &amp; M24 Coarse Thread</b>	Proof Load Test	IS 1367 (Part 3):2017, ASTM F606/F606M:2016.	<b>Load Range</b> 20kN to 390kN 20kN to 800kN
		Tensile Test		
		Wedge Load Test		
11.	<b>Bolts M12, M16, M20 &amp; M24</b>	Shear Test	IS 12427:2001 (RA 2016)	<b>Load Range</b> 20kN to 390kN 20kN to 800kN
12.	<b>Bolts M5, M6, M8&amp;M10</b>	Head Sound Test	IS 1367 (Part 3):2017	<b>Load Range</b> 20kN to 390kN 20kN to 800kN
13.	<b>Nuts M10, M12, M16, M20 &amp; M24 Coarse Thread</b>	Proof Load Test	IS 1367 (Part 6):1994 (RA 2015)	<b>Load Range</b> 20kN to 390kN 20kN to 800kN
<b>II. METALLOGRAPHY TEST</b>				
1.	<b>Ferrous Materials</b>	Decarburization depth Microscopics Method	ISO 3887:2017(E), IS 6396:2000 (RA 2018), ASTM E 1077:2014.	Upto 0.01 mm
2.	<b>Ferrous &amp; Non-Ferrous Alloys</b>	Macro Etch Test	ASTM E 340:2015	Qualitative
3.	<b>Ferrous &amp; Non- Ferrous Materials</b>	Corrosion Resistance Testing (Salt Spray)	ASTM B 117:2016.	Qualitative
4.	<b>Ferrous Materials</b>	Avg. Grain Size (Linear Intercept Method)	IS 4748:2009, ASTM E 112:2013.	ASTM No: 1 to 10
		Inclusion Content in steel by Microscopic Method	IS 4163:2004(RA 2017), ASTM E 45:2018.	Group A, B, C, D (Magnification 100X)
		Grey & SG Cast Iron micro Graphic Type, Size & Distribution	IS 7754:1975(RA 2018), ASTM A 247:2017, IS 1865:1991(RA 2014)	Qualitative
		Phase Analysis	ASM Vol 9	Qualitative

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5.	<b>Non-Ferrous Materials Al &amp; its Alloys, Cu &amp; its Alloys</b>	Phase Analysis	ASM Vol 9	Qualitative
6.	<b>Austenitic Stainless Steels</b>	IGC Practice-'A'	ASTM A 262:2015.	Qualitative (IGC Practice 'A' Mag. 400X)
		IGC Practice-'E'	ASTM A 262:2015.	Qualitative IGC Practice 'E' Former Dia-1t
<b>III.</b>	<b>BUILDING MATERIAL</b>			
1.	<b>Cement Concrete (Cubes)</b>	Compressive Strength	IS 516-1959 (RA 2013)	2 MPa to 75 MPa
2.	<b>Cement</b>	Specific gravity	IS 4031(Part 11) 1988 (RA 2014)	2.6 to 3.20
		Consistency	IS 4031(Part 4) 1988 (RA 2014)	15 % to 50 %
		Initial Setting Time	IS 4031(Part 5) 1988 (RA 2014)	15 Minutes to 500 Minutes
		Final Setting Time	IS 4031(Part 5) 1988 (RA 2014)	15 Minutes to 600 Minutes
		Fineness by Blain's Air Permeability Method	IS 4031(Part 2)1999 (RA 2013)	100 m <sup>2</sup> /kg to 600 m <sup>2</sup> /kg
		Soundness by Lechatlier Expansion	IS 4031(Part 3)1988 (RA 2014)	0.01 mm to 15mm
		Soundness by Autoclave Expansion	IS 4031(Part 3)1988 (RA 2014)	0.002 % to 2 %
		Compressive Strength	IS 4031(Part 6)1988 (RA 2014)	1 MPa to 80MPa
		Drying Shrinkage	IS 4031(Part 10)1988 (RA 2014)	0.002 % to 2 %

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3.	Fly Ash	Fineness by Blain's Air Permeability Method	IS 1727-1967 (RA 2013)	100 m <sup>2</sup> /kg to 600 m <sup>2</sup> /kg
		Particle Retained on 45 microns IS Sieve	IS 1727-1967 (RA 2013)	Upto 80 %
		Lime Reactivity	IS 1727-1967 (RA 2013)	0.5 kN to 100 kN
		Comparative Compressive Strength-28days	IS 1727-1967 (RA 2013)	5 % to 100 %
		Soundness by Autoclave Expansion	IS 1727-1967 (RA 2013)	0.01 mm to 30 mm
4.	Burnt Clay Bricks/ Fly ash Bricks	Compressive Strength	IS 3495(Part 1)1992 (RA 2016)	2 MPa to 20 MPa
		Water Absorption	IS 3495(Part 2)1992 (RA 2016)	1.0 % to 25 %
		Efflorescence	IS 3495(Part 3)1992 (RA 2016)	Qualitative
		Dimensions	IS 1077-1992 (RA 2016)	3720 mm to 4680 mm
		Length	IS 12894-2002 (RA 2017)	1760 mm to 2160 mm
		Width		1360 mm to 1840 mm
		Height		
5.	Coarse Aggregate	Sieve Analysis	IS 2386(Part 1)1963 (RA 2016)	80 mm to 4.75 mm
		Bulk Density	IS 2386(Part 3)1963 (RA 2016)	500 kg/L to 3500 kg/L
		Specific Gravity	IS 2386(Part 3)1963 (RA 2016)	1.0 to 3.5
		Water Absorption	IS 2386(Part 3)1963 (RA 2016)	0.1 % to 4.5 %
		Impact Value	IS 2386(Part 4)1963 (RA 2016)	5 % to 50 %
		Crushing Value	IS 2386(Part 4)1963 (RA 2016)	5 % to 40 %
		Elongation Index	IS 2386(Part 1)1963 (RA 2016)	5 % to 40 %



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		Flakiness Index	IS 2386(Part 1)1963 (RA 2016)	5 % to 50 %
		Material Finer than 75Micron IS Sieve	IS 2386(Part 1)1963 (RA 2016)	0.1 % to 50 %
		10% Fines Value	IS 2386(Part 4)1963 (RA 2016)	5 kN to 50 kN
<b>6.</b>	<b>Fine Aggregate</b>	Sieve Analysis	IS 2386(Part 1)1963 (RA 2016)	75 µm to 10 mm
		Bulk Density	IS 2386(Part 3)1963 (RA 2016)	500 kg/L to 3500 kg/L
		Specific Gravity	IS 2386(Part 3)1963 (RA 2016)	1.0 to 3.5
		Water Absorption	IS 2386(Part 3)1963 (RA 2016)	0.5 % to 4.5 %
		Material Finer than 75Micron IS Sieve	IS 2386(Part 1)1963 (RA 2016)	0.1 % to 50 %
		Silt Content	IS 2386(Part 2)1963 (RA 2016)	0.1 % to 20 %

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**NON - DESTRUCTIVE TESTING**

<b>I.</b>	<b>METALS &amp; ALLOYS</b>			
<b>1.</b>	<b>Penetrant Testing Facility</b>			
a.	<b>Plates, Forging, Casting (Ferrous and Non-Ferrous)</b>	Liquid Penetrant Testing (LPT) (Visible Penetrant/ Fluorescent Method)	ASME Sec-V Article 6 and 24:2017 ASTM E 165:2012 ASTM E 1417:1999 IS 3658:1999 (RA 2000)	Defects open to the surface
<b>2.</b>	<b>Magnetic Particle Testing</b>			
a.	Ferromagnetic Materials	Magnetic Particle Testing (MPT) (Yoke & Prod)-Wet & Dry, Fluorescent and Non-Fluorescent	ASME Sec-V Article 7 and 25:2017 ASTM E 709:2017 IS 3703:2004 IS 7743:2006 IS 5334:2003 AWS D1.1:2015	Surface & Sub Surface Defects (Upto 3 mm Depth)
<b>3.</b>	<b>Ultrasonic Testing Facility</b>			
a.	<b>Welded Joints (Steel and Aluminium), Forgings Castings Rolled Products (Ferrous &amp; Non-Ferrous)</b>	Ultrasonic Testing (UT)	ASME Sec-V Article 4,5 & 23:2017 SA-388/388M:2017 SA-435/435M:2017 SA-577/577M:2017 SA-578/578M:2017 SA-609/609M:2017 SB-548:2017 SE-213:2017 SA 745:2017  ASME Sec VIII Apprx-12-2017 IS 7666:1988 (RA 2005) IS 4225:2004	Steel Thickness:  6 mm to 800 mm (Forgings)  6 mm to 300 mm (Casting)  6 mm to 150 mm (Welding)  6 mm to 300 mm (Plates)

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			IS 4260:2004 IS 7343:1986 IS 3664:1981 SAE AMS 2630 B AWS D1.1:2015 ( Part-F) BS EN 10228-3:1998 API 1104:2013 EN 10160:1999	
<b>4.</b>	<b>Radiography Testing Facility</b>			
<b>a.</b>	<b>Plates, Welds, Pipes, Forgings, Castings (Ferrous &amp; Non-Ferrous)</b>	Radiography Testing (RT) [A] X-Ray  [B] Gamma Ray (Ir-192)	ASME Sec-V Article 2 & 22: 2017 ASTM E-94:2017 ASTM E-1030:2015 ASME Sec VIII Div-I- UW51:2017 ASME Sec-IX- QW-191: 2017  ASME Sec-III Div-I- NG2573:2017 IS 2595:2008 IS 1182:1983 IS 4853:1982 IS 2953:1985 BS EN 1435:1997  (Reference Radiographs) ASTM E-310 ASTM E-192 ASTM E-272 ASTM E-155 ASTM E-446 ASTM E-186	3 mm to 19 mm For X-Ray (Steel Thickness or Equivalent)  3 mm to 75 mm (Steel Thickness or Equivalent)