

Laboratory **ELCA Laboratories, Plot No. A-444, Road No. 37, MIDC, Wagle Indl. Area, Tal. & Dist. Thane, Maharashtra**
Location 1 : Plot No. A-444, Road No. 37, MIDC, Wagle Indl. Area, Tal. & Dist. Thane, Maharashtra
Location 2 : W-361, TTC Industrial Area, MIDC, Rabale, Navi Mumbai, Maharashtra

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

Discipline **Mechanical Testing** **Issue Date** **15.04.2015**

Certificate Number **T-0297** **Valid Until** **14.04.2017**

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| S.No. | Product / Material of Test | Specific Test Performed | Test Method Specification against which tests are performed | Range of Testing / Limits of Detection |
|--|---|-------------------------|--|---|
| Location: 1 | | | | |
| I. MECHANICAL PROPERTIES OF MATERIALS | | | | |
| 1. | Ferrous and Non Ferrous Products | Tensile test | IS 1608: 2005, | 10 kN to 400 kN |
| | | Yield Stress | DIN EN 10002 - 1: 2001 | |
| | | Ultimate Tensile Test | ASTM A 370: 2014 | LC = 0.1kN |
| | | Elongation | ASTM E8/8M: 2013a | |
| | | Reduction in area | ISO 6892-1: 2009 | 2 % to 70 % |
| | | Proof Stress | | 5 % to 70 % |
| | Welded Coupon Plate | Transverse Tensile Test | IS 2825-69 (RA 07) | Upto 400 kN max. |
| | | Nick Break Test | BS EN 895: 1995 IBR 1950: 2010, | Upto 400 kN max. |
| 2. | Ferrous / Non Ferrous plates | Bend Test | IS 1599: 2012 ASTM A 370: 2014 ASTM E 290: 14 | Qualitative (Upto 100 mm Mandrel Dia) |
| | Rods and Tor steel | Rebend Test | IS-1786: 2008 IS 1599: 2012 | Qualitative (5mm to 360mm Mandrel Dia) |
| 3. | Pipes | Drift Expansion Test | IS 2335: 05, ASTM A 1016/A1016M: 2014 ASTM A 370: 2014 | 90mm O/D max |
| | | Flattening Test | IS 2328: 05 ASTM A999 / A999M: 2014 ASTM A530 / A530M: 2012 ASTM A 1016/A1016M: 2014 ASTM A 370: 2014 ASTM B111 / B111M: 11 | Qualitative (400mm O/D max) |

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|--------------------|----------------------------|--|--|--|
| Location: 1 | | | | |
| | Pipes | Flanging Test | IS-2330: 11/A 370: 2014 | Qualitative (100 mm Max.) |
| 4. | Concrete Cubes | Compression Test | IS 516: 1959 (RA 2008) | 10 kN - 400 kN |
| 5. | Metallic Materials | Izod Impact Test | IS 1598: 1977 (RA 2009) | Upto 164 J |
| | | Charpy Impact Test | IS 1499: 1977 (RA 2009) IS 1757: 88 (RA 2009) BS EN/DIN EN 10045: 1991 BS EN ISO 148-1: 2010 BS EN 875: 1995 ASTM A 370: 2014 | Upto 300J Room temp to (-)196°C |
| | | Vickers Hardness Method including Micro Hardness | IS 1501: 2002 (RA 2007) ASTM A 370: 2014 ISO 6507-1: 2005 ASTM E384: 2011e1 | HV 5 - HV 30 700HV Max. HV 0.1 - HV 1 300 - 700 HV |
| | | Brinell Hardness Test | IS 1500 (Part 1): 2013 ISO 6506-1: 2005 ASTM A 370: 2014 ASTM E10: 14 | 2.5mm/187.5kgf 10mm/3000kgf 400 HBW max. |
| | | Rockwell Hardness Test | IS 1586: 2012 ASTM A 370: 2014 ISO-6508-1: 2005 ASTM E18: 2014 | A,B,C,T & N 20 to 88 HRA 20 to 100HRB 20 to 100HRBW 20 to 70HRC 67 to 93HR15T 70 to 94 HR15N 43 to 82 HR30T |

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|--------------------|------------------------------|-------------------------|---|--|
| Location: 1 | | | | |
| 6. | Hooks | Proof Load Test | IS 15560: 2005 | Upto 10000 kg |
| 7. | Cladded Plates & Rods | Shear Test Plates | ASTM A 263: 12, ASTM A 264: 12 ASTM A 265: 12 | 400 kN |
| 8. | Steel Plate | Through Thickness Test | ASTM A 770: 2012 BS EN 10164: 2004 | 25.00 mm-200 mm Thk |
| 9. | Nuts & Fabricated Components | Proof Load Test | IS 1367 (Part 6): 94 (RA 2004) ASTM A 370: 2014 ISO 898-2: 2012 | Upto M 24 size |
| 10. | Coated Samples | Hammer Test | IS 2629: 1985(RA 2001) | Qualitative |
| | | Bend Test | ASTM B 571: 97 | Qualitative |
| | | Burnishing Test | ASTM B 571: 97 | Qualitative |
| | | Chisel Knife Test | ASTM B 571-97 | Qualitative |
| | | Draw Test | ASTM B 571: 97 | Qualitative |
| | | File Test | ASTM B 571: 97 | Qualitative |
| | | Grind Saw Test | ASTM B 571: 97 | Qualitative |
| | | Heat-Quench Test | ASTM B 571: 97 | Qualitative |
| | | Impact Test | ASTM B 571-97 | Qualitative |

Rajeshwar Kumar
Convenor

N. Venkateswaran
Program Manager

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|-------------------------------|--|--------------------------|--|--|
| Location: 1 | | | | |
| | Coated Samples | Peel Test | ASTM B 571-97 | Qualitative |
| | | Push Test | ASTM B 571: 97 | Qualitative |
| | | Scribe Grid Test | ASTM B 571: 97 | Qualitative |
| II. METALLOGRAPHY TEST | | | | |
| 1. | Ferrous Metals, (Bars Billets, Blooms, Forgings and Casting of Carbon & Low Alloy Steel Castings) | Macro Structure Analysis | ASTM E-381-01: 2012 IS11371: 85 (RA 2007) IS12037: 1987 (RA 2007) IS13015: 91 (RA 2007) | Qualitative (Visual Inspection and Comparison Chart) |
| 2. | Weldments | Macro Structure Analysis | ASME (Sec IX): 2010 ASTM E 340: 2000 (RA 2013) | Visual Inspection |
| 3. | Ferrous & Non Ferrous Metals & Alloys | Microstructure Analysis | IS 7739-75 (RA 2003) ASM Handbook Vol 9 ASTM E407: 2007 | Magnification 1000x Max. |
| 4. | Cast Irons | Microstructure Analysis | IS 7754: 1975 (RA 2007) ASM Handbook Vol 9 ASTM E1951- 02: 2007 ASTM A247: 2010 ASTM E 562: 2011 | Qualitative (Magnification 1000x Max.) |

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|--------------------|---|---|---|---|
| Location: 1 | | | | |
| 5. | Ferrous, Non ferrous Metals & Alloys | Estimation of Grain Size by Microscopic Method | IS 4748: 2009 ASTM E 112: 2013 EN-ISO-643: 2003 ASTM E 930-99: 2007 ASTM E1951 - 02: 2007 | Qualitative (Magnification Max 100x) ASTM G.S. 00 to 10 |
| 6. | Steels | Inclusion Rating Method A & D | ASTM, E 45: 2013 IS 4163: 2012 ASTM E1951 - 02: 2007 | Qualitative (Magnification Max 100x) |
| | | Method K | DIN-50602: 1985-09 | |
| | | Effective Case Depth by Micro Hardness Travers Method | IS 1501: 2002 (RA 2007) | 0.01mm to 3mm |
| | | Microscopic Method | IS 6416: 1988 (07) | |
| | | Determination of Decarburised Layer | ASTM E 1077-01:2005 IS 6396: 2000 (RA 2007) ASTM E1951 - 02: 2007 | 0.005 mm min. |
| 7. | Bearing Steels | Carbide Morphology | Stahl-Eisen-SEP1520: 1998 | Qualitative (Magnification Max 1000x) |
| 8. | Multiphase Metals/ Alloys | Determination of Volume Fraction of Phases | ASTM E 562: 2011 ASTM E1245 - 03: 2008 | 2 % to 70 % |
| 9. | Ferrous & Non-ferrous | Coating thickness by Microscopic Method | IS 3203: 1982 (RA 06) ASTM B 499: 2009 | Magnification Upto 1000x 0.005 mm. L.C. |

Rajeshwar Kumar
Convenor

N. Venkateswaran
Program Manager

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|--------------------|--|---|---|--|
| Location: 1 | | | | |
| 10. | Stainless Steels | Ferrite Content By Ferritoscope | ASTM A 800/800M-10 | 0.1% to 80% |
| 11. | Austenitic Stainless Steels | Resistance to Inter Granular Corrosion Test Practices A, B, C, E & F | ASTM A 262: 14 | Qualitative (Practices A & E Practices B, C & F : 0.1 to 100 mpy) |
| 12. | Duplex (Austenite-Ferrite) Stainless steels | Detecting Presence of Detrimental Inter Metallic phases | ASTM A 923: 2014 | Qualitative (Magnification 1000x Max.) |
| | | Pitting & Crevice Corrosion Test | ASTM G 48: 2011 | Qualitative (Magnification Max 20x) |
| | | Chloride Stress Corrosion Cracking | ASTM G 36-94 (RA 2006) | Qualitative |
| | | Hydrogen Induced Cracking | NACE MR0175 / ISO 15156: 2003 NACE TM 0284-03 | Qualitative |

Rajeshwar Kumar
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N. Venkateswaran
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|--------------------|---|--------------------------------------|---|--|
| Location: 1 | | | | |
| 13. | Stainless Steels & Related Alloys | Sulphide Stress Corrosion Cracking | NACE MR0175 / ISO 15156: 2003 NACE TM 0177-05 | Qualitative |
| 14. | Wrought Nickel, Rich Chromium Bearing Alloys | Detecting Susceptibility to IGC A. B | ASTM G-28-02 (RA 2008) | 0.1 mpy to 100 mpy |
| 15. | Brazed Products | Peel Test Fracture Test | ASME (Sec IX): 2010 QB 170 QW 182 | Qualitative |

Rajeshwar Kumar
Convenor

N. Venkateswaran
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| S.No. | Product / Material of Test | Specific Test Performed | Test Method Specification against which tests are performed | Range of Testing / Limits of Detection |
|-------|----------------------------|-------------------------|---|--|
|-------|----------------------------|-------------------------|---|--|

Location: 2

I. MECHANICAL PROPERTIES OF MATERIALS

| | | | | |
|-----------|---|-------------------------|--|---|
| 1. | Ferrous and Non Ferrous Products | Tensile test | DIN EN 10002 - 1: 2001 | 10 kN to 1000 kN |
| | | Yield Stress | IS 1608: 2005 | |
| | | Ultimate Tensile Stress | ASTM A 370: 2014 | |
| | | Elongation | ASTM E8/8M: 2013a | |
| | | Reduction in Area | ISO 6892-1: 2009 | 2% to 70 % |
| | | Proof Stress | | 5 to 70 % |
| | Welded Coupon Plate | Transverse Tensile Test | BS EN 895: 1995 | 1000 kN max. |
| | | Nick Break Test | IBR 2005 IS 2825-69 (RA 07) | 1000 kN max. |
| 2. | Ferrous / Non Ferrous Plates | Bend Test | IS 1599: 2012 ASTM A 370: 2014 ASTM E 290-14 | Upto 100 mm Mandrel Dia (Qualitative) |
| | Rods and Torsteel | Rebend test Torsteel | IS 1786: 2008 IS 1599 - 2012 | 36 mm max. 36 mm max. (Qualitative) |

Rajeshwar Kumar
Convenor

N. Venkateswaran
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| S.No. | Product / Material of Test | Specific Test Performed | Test Method Specification against which tests are performed | Range of Testing / Limits of Detection |
|--------------------|----------------------------|--|--|--|
| Location: 2 | | | | |
| 3. | Pipes | Drift Expansion Test | IS 2335-05, ASTM A 1016M 2014 A1016M: 2013 ASTM A 370: 2014 | 90mm O/D max |
| | | Flattening Test | IS 2328-05 ASTM A999 / A999M: 2014 ASTM A530 / A530M: 2012 ASTM A 1016/A1016M: 2014 ASTM A 370: 2014 ASTM B111 / B111M – 11 | 400mm O/D max |
| | | Flanging Test | IS 2330-01/A 370: 2014 | 100 mm Max. |
| | | Crushing Strength | IS 3601: 2006 ASTM A 370: 2014 | 10kN to 1000kN |
| 4. | Concrete Cubes | Compression Test | IS 516: 1959 (RA 2008) | 10kN to 1000 kN |
| 5. | Metallic Materials | Charpy Impact Test U Notch V Notch | ASTM E 23-12/ A 370-14 | Upto 300J Room temp to (-)101°C |
| | | Vickers Hardness Test Including Micro Hardness | IS 1501: 2002 (RA 2007) ASTM A 370: 2014 ISO 6507-1: 2005 ASTM E384-2011e1 | HV 5 to HV 30 700HV Max. |

Rajeshwar Kumar
Convenor

N. Venkateswaran
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|-------------------------------|--|--------------------------|--|--|
| Location: 2 | | | | |
| | Metallic Materials | Brinell Hardness Test | IS 1500: 2013 (RA 2010) ISO 6506-1: 2005 ASTM A 370: 2014 ASTM E10 - 14 | 2.5mm/187.5kgf 400 HBW max. |
| | | Rockwell Hardness Test | IS 1586: 2012 ASTM A 370: 2014 ISO-6508: 2005 ASTM E18: 2014 | A,B,C,T & N 20 to 88 HRA 20 to 100HRB 20 to 100HRBW 20 to 70HRC 67 to 93HR15T 70 to 94 HR15N 42 to 86 HR30N |
| 6. | Hooks | Load Test on Hooks | IS 15560: 2005 | Upto 10000 kg |
| 7. | Nuts & Fabricated Components | Proof Load Test Nuts | IS 1367 (Part 6): 94 (RA 2004) ASTM A 370: 2014 ISO 898-2: 2012 | Qualitative (M10 to M36 size) |
| II. METALLOGRAPHY TEST | | | | |
| 1. | Ferrous & Non Ferrous Metals, (Steel Bars Billets, Blooms, Forgings of Carbon & Low Alloy Steel Castings) | Macro Structure Analysis | ASTM E-381-96: 2012 IS 11371- 85 (RA 2007) IS 13015- 91 (RA 2007) | Qualitative |

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|--------------------|---|--|---|--|
| Location: 2 | | | | |
| 2. | Sheets, Plates, Weldments Ground Parts | Macro Structure Analysis | IS 3600 (Part 9): 1985 ASTM E 340: 2000 (RA 2013) ASME (Sec IX): 2010 | Qualitative |
| 3. | Ferrous & Non Ferrous | Microstructure Analysis | IS 7739-75 (RA 2003) ASM Handbook Vol 9 ASTM E407: 2007 ASTM E562: 2011 Various Parts | Magnification 1000x Max. |
| 4. | Cast Irons | Determination of Microstructure of Graphite | ASTM A247: 2010 IS 7754: 1975 (RA 2007) | Magnification 100x to 1000x. |
| 5. | Ferrous, Non Ferrous Metals | Estimation of Grain Size by Microscopic method | ASTM E 112: 2013 EN-ISO-643: 2003 ASTM E 930-99: 2007 ASTM E1951 - 02: 2007 Comparison Method | Magnification Max 100x ASTM Grain Size 00 to 10 |
| | | Coating Thickness by Microscopic Method | IS 3203: 1982 (RA 06) ASTM B 499: 2009 | Magnification 1000x Max. 0.001 mm. L.C. |
| 6. | Steels | Estimation of Grain Size by Microscopic Method | IS 4748: 2009 Comparison Method | Magnification Max 100x |

Rajeshwar Kumar
Convenor

N. Venkateswaran
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|--------------------|--|--|--|--|
| Location: 2 | | | | |
| | Steel | Determination of Inclusion Rating Method A & D Method K | ASTM, E 45: 2013 IS 4163: 2012 ASTM E1951 - 02: 2007 DIN-50602: 1985-09 | Magnification Max 100x |
| | | Effective Case Depth By Microscopic Method | IS 6416: 1988(07) | 0.01mm to 3mm |
| | | Determination of Depth of Decarburised Layer | ASTM E 1077-01: 2005, 2014 IS 6396: 2000 (RA 2007) | 0.001mm min. |
| 7. | Austenitic Stainless Steels | Resistance to Inter Granular Corrosion Test Practices A | ASTM A 262-14 | Qualitative (Practices A) |
| 8. | Multiphase Metals/ Alloys | Determination of Volume Fraction of Phases | ASTM E 562: 2011 ASTM E1245 - 03: 2008 | 2% to 70 % |
| 9. | Stainless Steels | Ferrite Content by Ferritoscope | ASTM A 800/800M-10: 2014 | 0.1 FN to 110 FN 0.1% to 80% |
| 10. | Duplex (Austenite-Ferrite) Stainless Steels | Detecting presence of Detrimental Inter Metallic Phases Method A | ASTM A 923: 2014 | Qualitative |

Rajeshwar Kumar
Convenor

N. Venkateswaran
Program Manager

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| Location: 2 | | | | |
| 11. | Brazed Products | Peel Test Fracture Test | ASME (Sec IX): 2010 QB 170 QW 182 | Qualitative |

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Convenor

N. Venkateswaran
Program Manager