

Laboratory Essen & Co., # 92, 7th Main Road, III Phase, Peenya Industrial Area, Bangalore, Karnataka

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-6533 (in lieu of T-0768)

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Validity 27.12.2017 to 26.12.2019

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CHEMICAL TESTING

| I. | ORES & MINERALS | | | |
|----|-----------------|--------------------------------|---|--------------------------|
| 1. | Iron Ore | Fe | IS 1493 (Part 1) –1981, (RA 2006) | 30.00% to 68.00% |
| | | | EC/BLR/IHP/O&M/01, Issue.No.01,Dt:25.11.2005 | 45.00% to 68.00% |
| | | SiO ₂ | IS 1493 (Part 1) –1981, (RA 2006) | 0.50% to 30.00% |
| | | Al ₂ O ₃ | IS 1493 (Part 1) –1981, (RA 2006) | 0.50% to 15.00% |
| | | P | IS 1493 (Part 1) –1981, (RA 2006) | 0.01% to 0.30% |
| | | S | IS 1493 (Part 1) –1981, (RA 2006) | 0.003% to 0.050% |
| | | Mn | IS 1493: 1959, (RA 2006) | 0.02% to 2.00% |
| | | FeO | EC/BLR/IHP/O&M/02, Issue.No.01, Date: 6.09.2013 | 0.20% to 30.00% |
| | | | TiO ₂ | IS 1493: 1959, (RA 2006) |
| 2. | Manganese Ore | Mn | IS 1473: 2004, (RA 2008) | 20.00% to 56.00% |
| | | MnO ₂ | IS 1473: 2004 (RA 2008) | 30.00% to 70.00% |
| | | Fe | IS 1473: 2004 (RA 2008) | 1.00% to 35.00% |
| | | SiO ₂ | IS 1473: 2004 (RA 2008) | 1.00% to 30.00% |
| | | Al ₂ O ₃ | IS 1473: 2004 (RA 2008) | 1.00% to 10.00% |

Sachin Tomar
Convenor

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Program Director

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| | | P | IS 1473: 2004 (RA 2008) | 0.01% to 0.30% |
| 3. | Lime Stone Dolomite and Allied Materials | SiO ₂ | IS 1760 (Part 2)-1991 (RA 2001) | 0.50% to 20.00% |
| | | Al ₂ O ₃ | IS 1760 (Part 3)-1992 (RA 2001) | 0.10% to 5.00% |
| | | Fe ₂ O ₃ | IS 1760 (Part 3)-1992 (RA 2001) | 0.20% to 5.00% |
| | | CaO | IS 1760 (Part 3)-1992, (RA 2001) | 2.00% to 55.00% |
| | | MgO | IS 1760 (Part 3)-1992, (RA 2001) | 0.10% to 45.00% |
| | | Loss on ignition | IS 1760 (Part 1)-1991, (RA 2001) | 20.00% to 52.00% |
| 4. | Minerals For Refractories, Alumino Silicates, Clays and Feldspar | SiO ₂ | IS 12107 (Part 2)-1987, (RA 2001) | 1.00 % to 70.00% |
| | | Al ₂ O ₃ | IS 12107 (Part 3)-1987, (RA 2001) | 10.00% to 60.00% |
| | | Fe ₂ O ₃ | IS 12107 (Part 6)-1987, (RA 2001) | 0.05% to 20.00% |
| | | CaO | IS 12107 (Part 8)-1987, (RA 2001) | 0.50% to 10.00% |
| | | Na ₂ O | IS 12107 (Part 9)-1987, (RA 2001) | 0.05% to 13.00% |
| | | K ₂ O | IS 12107 (Part 9)-1987, (RA 2001) | 0.05% to 14.00% |
| | | Loss on ignition | IS 12107 (Part 1)-1987, (RA 2001) | 0.20% to 25.00% |
| 5. | Aluminium Ore (Bauxite) | SiO ₂ | IS 2000(Part 2) –1985 (RA 2001) | 0.50% to 40.00% |
| | | Al ₂ O ₃ | IS 2000 (Part 3) –1985 (RA 2001) | 20.00% to 60.00% |
| | | Fe ₂ O ₃ | IS 2000 (Part 4) –1985 (RA 2001) | 0.50% to 50.00% |

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|------------|---|--|---|--|
| | | TiO ₂ | IS 2000(Part 5) –1985, (RA 2001) | 0.50% to 7.00% |
| | | Loss on ignition | IS 2000 (Part 1)-1985 , (RA 2001) | 5.00% to 35.00% |
| II. | WATER | | | |
| 1. | Drinking Water, Ground water, Surface water, | Colour | IS:3025 (Part 4)-1983, (RA 2012) | 5 mg/L to 100 mg/L |
| | | Odour | IS: 3025 (Part 5)-1983 , (RA 2012) | Qualitative |
| | | Taste | IS 3025 part 7-1984, (RA 2012) | Qualitative |
| | | Turbidity | IS: 3025(Part 10)-1984, (RA 2017) | 0.1 mg/L to 100 mg/L |
| | | pH | IS: 3025(Part 11)-1983, (RA 2012) | 3.0 to 12.00 |
| | | Total Hardness,(asCaCO ₃) | IS: 3025(Part 21)-1983, (RA 2014) | 1.0 mg/L to 1000 mg/L |
| | | Calcium Ca | IS :3025(Part 40) :1991, (RA 2014) | 1.0 mg/L to 500 mg/L |
| | | Magnesium as Mg | IS: 3025 (Part 46):1994, (RA 2014) | 0.50 mg/L to 500 mg/L |
| | | Total Alkalinity,as CaCO ₃ | IS: 3025(Part 23):1986, (RA 2012) | 1.0 mg/L to 500 mg/L |
| | | Total Dissolved Solids | IS 3025 (Part 16):1984, (RA 2012) | 5.0 mg/L to 3000 mg/L |
| | | Sulphate as SO ₄ | IS 3025(Part 24):1986 (RA 2014) | 0.50 mg/L to 500.00 mg/L |
| | | Nitrate as NO ₃ (mg/l) | 4500-NO B APHA 22 nd – 2012 edition | 0.1 mg/L to 100 mg/L |
| | | Phenolic Compounds as C ₆ H ₅ OH | IS :3025(Part 43):1992, (RA 2014) | 0.01 mg/L to 10 mg/L |

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| | | Boron as B | IS: 3025(Part 57):2005, (RA 2010) | 0.2 mg/L to 10 mg/L |
| | | Iron (asFe) | 3500 Fe ⁻ B, APHA 22 nd edition | 0.1 mg/L to 10 mg/L |
| | | Cyanide as CN | IS: 3025(Part 27):1986, (RA 2014) | 0.05 mg/L to 10 mg/L |
| | | Chlorides as Cl | IS: 3025(Part 32):1988, (RA 2014) | 2.5 mg/L to 1000 mg/L |
| | | Free Residual chlorine | IS: 3025(Part 26):1986, R.A. 2014 | 0.2 mg/L to 10 mg/L |
| | | Fluoride as F | 4500-F- A, APHA 22 nd Edition | 0.5 mg/L to 10 mg/L |
| | | Ammonia | IS: 3025(Part 34):1988, R.A. 2014 | 0.50 mg/L to 10.0 mg/L |
| | | Sulphide | IS: 3025(Part 29)-1986, R.A. 2014 | 0.05 mg/L to 10 mg/L |
| | | Aluminium | APHA: 22 nd Edition 3500-AI B | 0.10 mg/L to 100.00 mg/L |
| | | Manganese | IS:3025 - Part 59:2006, R.A. 2012 | 0.10 mg/L to 100 mg/L |
| | | Total Chromium | IS 3025 Part 52:2003 R.A. 2014 | 0.05 to 100 mg/L |
| | | Arsenic | IS 3025 (Part 37) : 1988, R.A. 2014 | 0.01 mg/L to 100 mg/L |
| | | Barium | IS 13428 :2005, RA 2014 | 0.10 mg/L to 20.00,mg/L |
| | | Copper | IS: 3025- Part 42:1992, RA 2014 | 0.05 mg/L to 5.00 mg/L |
| | | Selenium | IS:3025- Part 56 :2003, RA 2014 | 0.01 mg/L to 200 mg/L |
| | | Silver | Annex J, IS 13428: 2005, RA 2014 | 0.05 mg/L to 4.00 mg/L |
| | | Zinc | IS:3025 - Part 49:1994, RA 2014 | 0.10 mg/L to 20.00 mg/L |

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| | | Cadmium | IS:3025-Part 41:1992, RA 2014 | 0.003 mg/L to 2 mg/L |
| | | Lead | IS : 3025 – Part 47:1984, RA 2014 | 0.01mg/L to 20 mg/L |
| | | Mercury | IS:3025-Part 48:1994 RA 2014 | 0.001 mg/L to 300 mg/L |
| | | Molybdenum | 3111D, APHA 22 nd Edition | 0.10 mg/L to 40.00 mg/L |
| | | Nickel | IS:3025-Part 54:2003, RA 2014 | 0.10 mg/L to 10 mg/L |
| III. | POLLUTION AND ENVIRONMENT | | | |
| 1. | Waste water (Effluent /Sewage) | Colour | IS: 3025(Part 04):1983, R.A. 2012 | Qualitative |
| | | Odour | IS: 3025(Part 05):1983, R.A. 2012 | Qualitative |
| | | Total Suspended Solids, (mg/l) | IS: 3025(Part 17):1984, R.A. 2012 | 5.0 mg/L to 1000.0 mg/L |
| | | Total Dissolved solids (mg/l) | IS: 3025(Part 16)-1984, R.A. 2012 | 5.0 mg/L to 3000 mg/L |
| | | Temperature in °C | IS: 3025(Part 9):1984, R.A. 2006 | 15°C to 50°C |
| | | pH Value | IS: 3025(Part 11)-1983, R.A. 2012 | 1.00 to 14.00 |
| | | Oil & Grease | IS: 3025(Part 39):1991, R.A. 2014 | 10.00 mg/L to 1000.00 mg/L |
| | | Residual chlorine (Total/Free) | IS: 3025(Part 26):1986, R.A. 2014 | 0.10 mg/L to 1000 mg/L |
| | | Ammonical Nitrogen | IS: 3025(Part 34):1988, R.A. 2014 | 2.0 mg/L to 1000.0 mg/L |
| | | Total Kjeldahl Nitrogen | IS: 3025(Part 34):1988, R.A. 2014 | 2.00 mg/L to 1000.00 mg/L |
| | | Free Ammonia | IS: 3025(Part 34)-1988, R.A. 2014 | 2.00 mg/L to 1000.00 mg/L |
| | | Biochemical Oxygen Demand (BOD), at 27°C for 3 days | IS: 3025 (Part 44):1993, R.A. 2013 | 3.0 mg/L to 3000.0 mg/L |

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| | | Chemical Oxygen Demand ,(COD) | IS: 3025(Part 58):2006 R.A. 2012 | 10.0 mg/L to 10000.0 mg/L |
| | | Arsenic | IS3025(Part 37): 1988,, RA 2014 | 1.00 mg/L to 100.00 mg/L |
| | | Mercury | IS:3025-Part 48:1994 RA :2014 | 0.001 mg/L to 300,mg/L |
| | | Lead | IS:3025-Part 47:1984 RA :2014 | 0.01 mg/L to 20.00,mg/L |
| | | Cadmium | IS:3025-Part 41:1992, RA :2014 | 0.003 mg/L to 2.00,mg/L |
| | | Hexavalent Chromium as Cr ⁺⁶ | IS: 3025(Part 52):2003, RA: 2014 | 0.05 mg/L to 100.00 mg/L |
| | | Total Chromium, | IS 3025 Part 52:2003, RA: 2014 | 0.05 mg/L to 100.00,mg/L |
| | | Copper | IS: 3025- Part 42,RA: 2014 | 0.05 mg/L to 5.00,mg/L |
| | | Zinc | IS:3025 - Part 49:1994, RA: 2014 | 0.10 mg/L to 20.00,mg/L |
| | | Nickel | IS:3025-Part 54:2003, RA :2014 | 0.10 mg/L to 10.00,mg/L |
| | | Boron as B | IS: 3025(Part 57):2005, RA 2010 | 0. 1 mg/L to 100.00,mg/L |
| | | Cyanide as CN, | IS: 3025(Part 27):1986, RA: 2014 | 0.05 mg/L to 100,mg/L |
| | | Chlorides as Cl | IS: 3025(Part 32):1988, RA: 2014 | 5.00 mg/L to 5000.00 mg/L |
| | | Fluoride as F | 4500-F ⁻ A:APHA Method 22 nd edition | 0.2 mg/L to 100 mg/L |
| | | Dissolved Phosphate as PO ₄ | IS: 3025(Part 31)-1988, RA: 2014 | 1.0 mg/L to 100 mg/L |
| | | Sulphate as SO ₄ | IS: 3025(Part 24)-1986, RA: 2014 | 0.50 mg/L to 1000 mg/L |
| | | Sulphide as S | IS: 3025(Part 29)-1986, RA: 2014 | 1.0 mg/L to 100 mg/L |