

Laboratory **SUMS Techno Labs Private Limited, Plot No. 15-DP2, KIADB, Sankalapura Industrial Area, Ballari Road, Hosapete, Ballari (D), Karnataka**

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

Certificate Number **TC-6224**

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Validity **16.03.2018 to 15.03.2020**

Last Amended on --

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CHEMICAL TESTING

| I. ORES & MINERALS | | | | |
|-------------------------------|---------------------------------------|--|--------------------|------------------|
| 1. | Iron Ore | Total Fe | IS:1493 (Part-1) | 10 % to 69.9 % |
| | | Silica as SiO ₂ | | 0.5 % to 25 % |
| | | Alumina as Al ₂ O ₃ | | 0.5 % to 20 % |
| | | Phosphorus as P | | 0.02 % to 0.1 % |
| | | Sulphur as S | | 0.01 % to 0.02 % |
| | | Loss on Ignition | | ISO 11536 |
| 2. | Manganese Ore | Manganese as Mn | IS:1493 | 0.05 % to 15 % |
| | | Manganese as Mn | IS: 1473 | 5 % to 50 % |
| | | Silica as SiO ₂ | | 0.5 % to 15 % |
| | | Total Iron as Fe | | 1 % to 40 % |
| | | Alumina as Al ₂ O ₃ | | 0.5 % to 15 % |
| | | Phosphorus as P | | 0.01 % to 0.1 % |
| Sulphur as S | 0.01 % to 0.2 % | | | |
| 3. | Bauxite ore | Alumina as Al ₂ O ₃ | IS : 2000 (Part 3) | 1 % to 45 % |
| | | Silica as SiO ₂ | IS : 2000 (Part 2) | 0.5 % to 20 % |
| | | Loss on Ignition | IS : 2000 (Part 1) | 0.5 % to 10.0 % |
| | | Titania as TiO ₂ | IS : 2000 (Part 5) | 0.5 % to 12.0 % |
| | | Ferric Oxide as Fe ₂ O ₃ | IS : 2000 (Part 4) | 1 % to 35.0 % |
| 4. | Limestone & Dolomite | Loss on Ignition | IS: 1760 (Part 1) | 1 % to 50 % |
| | | Silica as SiO ₂ | IS: 1760 (Part 2) | 0.1 % to 15 % |
| | | Ferric Oxide as Fe ₂ O ₃ | IS: 1760 (Part 3) | 0.05 % to 2 % |
| | | Calcium oxide as CaO | IS: 1760 (Part 3) | 0.5 % to 56 % |
| | | Magnesium oxide as MgO | IS: 1760 (Part 3) | 0.10 % to 40 % |
| | | Alumina as Al ₂ O ₃ | IS: 1760 (Part 3) | 0.05 % to 5.0 % |
| 5. | Quartzite and high silica Sand | Silica as SiO ₂ | IS :1917 (Part 3) | 80 % to 99.5 % |
| | | Loss on Ignition | IS :1917 (Part 1) | 0.1 % to 2 % |

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| II. | ATMOSPHERIC POLLUTION | | | |
| 1. | Stack Emission Monitoring | Velocity | IS:11255 (Part3) | 3 m/s to 45 m/s |
| | | Volume of Gas Discharged | IS:11255 (Part3) | 5 Nm ³ /h to 74000 Nm ³ /h |
| | | Particulate matter | IS:11255 (Part1) | 1mg/Nm ³ to 500mg/Nm ³ |
| | | Sulphur dioxide as SO ₂ | IS:11255 (Part2) | 5mg/Nm ³ to 500mg/Nm ³ |
| | | Oxides of Nitrogen as NO _x | IS:11255 (Part7) | 3mg/Nm ³ to 400mg/Nm ³ |
| 2. | Ambient air Monitoring | Sulphur Dioxide (SO ₂) | IS: 5182 (Part II) | 5 µg/m ³ to 1000 µg/m ³ |
| | | Nitrogen Dioxide (NO ₂) | IS: 5182 (Part VI) | 6 µg/m ³ to 750 µg/m ³ |
| | | Particulate Matter (Size less than 10µm) or PM ₁₀ | IS: 5182 (Part 23) | 5 µg/m ³ to 1000 µg/m ³ |
| | | Particulate Matter (Size less than 2.5µm) or PM _{2.5} | SUMSTLPL/SOP/AA/04 Issued No/ Date : 02/07.03.2017 (Based on CPCB Guidelines for the Measurement of Ambient Air Pollutants Volume -1) | 5 µg/m ³ to 1000 µg/m ³ |
| | | Ozone (O ₃) | IS: 5182 (Part 9) | 20 µg/m ³ to 1000 µg/m ³ |
| | | Lead (Pb) | IS: 5182 (Part 22) | 1 µg/m ³ to 1000 µg/m ³ |
| | | Ammonia (NH ₃) | SUMSTLPL/SOP/AA/06 Issued No/ Date : 02/07.03.2017 (Based on CPCB Guidelines for the Measurement of Ambient Air Pollutants Volume -1) | 5 µg/m ³ to 1000 µg/m ³ |

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Convenor

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| | | Nickel (Ni) | SUMSTLPL/SOP/AA/08 Issued No/ Date : 02/07.03.2017 (Based on CPCB Guidelines for the Measurement of Ambient Air Pollutants Volume -1 May-2011) | 15 ng/m ³ to 1000 ng/m ³ |
| | | Arsenic(As) | SUMSTLPL/SOP/AA/09 Issued No/ Date : 02/07.03.2017 (Based on CPCB Guidelines for the Measurement of Ambient Air Pollutants Volume -1 May-2011) | 3 ng/m ³ to 1000ng/m ³ |
| | | Carbon Monoxide (CO) | SUMSTLPL/SOP/AA/10 Issued No/ Date : 01/07.03.2017 | 1.5 mg/m ³ to 40 mg/m ³ |
| 3. | Ambient Noise Levels Monitoring | Noise Level (Leq, Lmin, Lmax) | IS: 9989 | 35 dB (A) to 130 dB (A) |
| III. | WATER | | | |
| 1. | Ground Water/ Surface Water | pH @ 25 ^o C | APHA 23 rd Ed. 4500 H ⁺ | 1 to 14 |
| | | Total Hardness as CaCO ₃ | APHA 23 rd Ed. -2340 C | 2 mg/L to 5000 mg/L |
| | | Calcium as ca | APHA 23 rd Ed. - 3500 Ca B | 2 mg/L to 3000 mg/L |
| | | Magnesium as Mg | APHA 23 rd Ed. - 3500 Mg B | 2 mg/L to 3000 mg/L |
| | | Chloride as Cl | APHA 23 rd Ed. -4500 Cl B | 2 mg/L to 10000 mg/L |
| | | Total Alkalinity as CaCO ₃ | APHA 23 rd Ed. - 2320 B | 2 mg/L to 5000 mg/L |
| | | Conductivity @25 ^o C | APHA 23 rd Ed. -2510 B | 1 µs/cm to 100000 µs/cm |
| | | Total Dissolved Solids at 180 ^o C | APHA 23 rd Ed. -2540 C | 2 mg/L to 10000 mg/L |

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| | | Sulfate as SO ₄ ²⁻ | APHA 23 rd Ed.-4500 SO ₄ B | 1 mg/L to 1000 mg/L |
| | | Fluoride as F | APHA 23 rd Ed.-4500 F D | 0.1 mg/L to 5 mg/L |
| | | Nitrate as NO ₃ | APHA 23 rd Ed.-4500 NO ₃ E | 1 mg/L to 50 mg/L |
| | | Nitrite as NO ₂ | APHA 23 rd Ed.-4500 NO ₂ B | 0.1 mg/L to 10 mg/L |
| | | Iron as Fe | APHA 23 rd Ed.-4500 Fe B | 0.02 mg/L to 10 mg/L |
| | | Turbidity | APHA 23 rd Ed.-2530 B | 0.5 to 100 NTU |
| | | Colour | APHA 23 rd Ed. B | 5 Hazen Units to 500 Hazen Units |
| | | Sodium as Na | APHA 23 rd Ed.-3500 Na B | 2 mg/L to 500 mg/L |
| | | Potassium as K | APHA 23 rd Ed. -3500 K B | 1 mg/L to 500 mg/L |
| | | Boron as B | APHA 23 rd Ed. - 4500 B | 0.1 mg/L to 10 mg/L |
| IV. | POLLUTION & ENVIRONMENT | | | |
| 1. | Waste Water (Effluents/Sewage) - Waste & Effluents water | pH @ 25°C | APHA 23 rd Ed. 4500 H ⁺ | 1 to 14 |
| | | Total Hardness as CaCO ₃ | APHA 23 rd Ed. - 2340 C | 2 mg/L to 5000 mg/L |
| | | Calcium as ca | APHA 23 rd Ed. - 3500Ca B | 2 mg/L to 3000 mg/L |
| | | Magnesium as Mg | APHA 23 rd Ed. - 3500Mg B | 2 mg/L to 3000 mg/L |
| | | Chloride as Cl | APHA 23 rd Ed.-4500Cl B | 2 mg/L to 10000 mg/L |
| | | Total Alkalinity as CaCO ₃ | APHA 23 rd Ed. - 2320 B | 2 mg/L to 5000 mg/L |
| | | Conductivity @25°C | APHA 23 rd Ed. - 2510 B | 1 µs/cm to 100000 µs/cm |
| | | Total Dissolved Solids | APHA 23 rd Ed.-2540 C | 2 mg/L to 10000 mg/L |
| | | Sulphate as SO ₄ | APHA 23 rd Ed.-4500 SO ₄ B | 1 mg/L to 1000 mg/L |
| | | Fluoride as F | APHA 23 rd Ed.-4500 F D | 0.1 mg/L to 5 mg/L |
| | | Nitrate as NO ₃ | APHA 23 rd Ed.-4500 NO ₃ B | 0.1 mg/L to 11 mg/L |
| | | Nitrite as NO ₂ | APHA 23 rd Ed.-4500 NO ₂ B | 0.1 mg/L to 11 mg/L |
| | | Iron as Fe | APHA 23 rd Ed.-4500 Fe B | 0.02 mg/L to 10 mg/L |
| | | Turbidity | APHA 23 rd Ed.-2530 B | 0.5 NTU to 100 NTU |
| | Colour | APHA 23 rd Ed.B | 5 Hazen Units to 500 Hazen Units | |
| | Sodium as Na | APHA 23 rd Ed.-3500 Na B | 2 mg/L to 500 mg/L | |
| | Potassium as K | APHA 23 rd Ed. - 3500 K B | 1 mg/L to 500 mg/L | |
| | Boron as B | APHA 23 rd Ed. - 4500 B | 0.1 mg/L to 10 mg/L | |

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| | | Chemical oxygen Demand | APHA 23 rd Ed.- 5220 B | 4 mg/L to 40000 mg/L |
| | | Biological oxygen Demand at 27 ^o C for 3 days | IS:3025 (Part-44) | 2 mg/L to 5000 mg/L |
| | | Oil & Grease | APHA 23 rd Ed. 5520 B | 5 mg/L to 1000 mg/L |
| | | Acidity | APHA 23 rd Ed.2310 B | 2 mg/L to 5000 mg/L |
| | | Total Solids Dried at 103-105 ^o C | APHA 23 rd Ed.2540 B | 2 mg/L to 10000 mg/L |
| | | Total Suspended Solids Dried at 103-105 ^o C | APHA 23 rd Ed.-2540 D | 2 mg/L to 100 mg/L |
| | | Phenol | APHA 23 rd Ed.-5530 D | 0.1 mg/L to 4 mg/L |
| | | Lead | APHA 23 rd Ed.- 3111 B | 1 mg/L to 100 mg/L |
| | | Aluminum | APHA 23 rd Ed.- 3111 D | 2 mg/L to 100 mg/L |
| | | Chromium | APHA 23 rd Ed.- 3111 B | 1 mg/L to 100 mg/L |
| | | Manganese | APHA 23 rd Ed.- 3111 B | 0.5 mg/L to 100 mg/L |
| | | Cadmium | APHA 23 rd Ed.- 3111 B | 0.5 mg/L to 100 mg/L |
| | | Mercury | APHA 23 rd Ed.- 3112 B | 0.01 mg/L to 100 mg/L |
| | | Arsenic | APHA 23 rd Ed.- 3113 B | 0.01 mg/L to 100 mg/L |
| 2. | Soil /Sediments - Soil/ Organic Manure/ Biomass | pH | CI-2, IS:2720 (Part-26) | 2 to 13 |
| | | Conductivity | IS:14767 | 1.0 mS/m to 200.0 mS/m |
| | | Water Content | Sec-1, IS:2720 (Part-II) | 1 % to 20 % |
| | | Organic Matter | Sec-1, IS: 2720 (Part 22) | 0.1 % to 2 % |
| | | Total Kjeldal Nitrogen as N | SUMSTLPL/SOP/Soil/05 Issued No-02/Date 07.03.2017 based on Department of Agriculture & Cooperation, MoA, Gol & FAO Methods, IS 14684 | 10 mg/kg to 1000 mg/kg |
| | | Available Nitrogen as N | SUMSTLPL/SOP/Soil/06 Issued No-02/ Date 07.03.2017, based on Department of Agriculture & Cooperation, MoA, Gol & | 1 mg/kg to 1000 mg/kg |

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|-----|----------------------------|---|--|--|
| | | | FAO Methods, IS 14684 | |
| | | Available Phosphorus as P ₂ O ₅ | SUMSTLPL/SOP/Soil/07 Issued No-02/Date 07.03.2017, based on Department of Agriculture & Cooperation, MoA, Gol & FAO Methods | 25 mg/kg to 1000 mg/kg |
| | | Extractable/ Available Potassium as K | SUMSTLPL/SOP/Soil/08 Issued No-02/Date 07.03.2017, based on Department of Agriculture & Cooperation, MoA, Gol & FAO Methods, ICARDA | 10 mg/kg to 1000 mg/kg |
| | | Extractable/ Available Sodium as Na | SUMSTLPL/SOP/Soil/09 Issued No-02/Date 07.03.2017, based on Department of Agriculture & Cooperation, MoA, Gol & FAO Methods, ICARDA | 10 mg/kg to 1000 mg/kg |
| | | Extractable Calcium as Ca | SUMSTLPL/SOP/Soil/10 Issued No-02/Date 07.03.2017, based on Department of Agriculture & Cooperation, MoA, Gol & FAO Methods, ICARDA | 1 meq/l to 1000 meq/l |
| | | Extractable Magnesium as Mg | SUMSTLPL/SOP/Soil/11 Issued No-02/Date 07.03.2017, based on Department of Agriculture & Cooperation, MoA, Gol & FAO Methods, ICARDA | 1 meq/l to 1000 meq/l |

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| | | Soluble Chloride as Cl | SUMSTLPL/SOP/Soil/12 Issued No-02/Date 07.03.2017, based on Department of Agriculture & Cooperation, MoA, Gol & FAO Methods, ICARDA | 10 mg/kg to 1000 mg/kg |
| | | Soluble Sulphate as SO ₄ | SUMSTLPL/SOP/Soil/13 Issued No-02/Date 07.03.2017, based on Department of Agriculture & Cooperation, MoA, Gol & FAO Methods, ICARDA | 10 mg/kg to 1000 mg/kg |
| | | Available Iron | SUMSTLPL/SOP/Soil/14 Issued No-02/Date 07.03.2017, based on Department of Agriculture & Cooperation, MoA, Gol & FAO Methods | 1 mg/kg to 1000 mg/kg |
| | | Available Zinc | SUMSTLPL/SOP/Soil/15 Issued No-02/Date 07.03.2017, based on Department of Agriculture & Cooperation, MoA, Gol & FAO Methods | 1 mg/kg to 1000 mg/kg |
| | | Available Manganese | SUMSTLPL/SOP/Soil/16 Issued No-02/Date 07.03.2017, based on Department of Agriculture & Cooperation, MoA, Gol & FAO Methods | 1 mg/kg to 1000 mg/kg |

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| V. | SOLID FUELS | | | |
| 1. | Coal / Coke | Total Moisture | ASTM D 3302/ D 3302 M | 1% to 40 % |
| | | Moisture in the analysis sample | ASTM D 3173 | 0.1 % to 25 % |
| | | Ash | ASTM D 3174 | 0.1 % to 50 % |
| | | Volatile Matter | IS1350 (Part-1) | 0.50 % to 60 % |
| | | Fixed Carbon | ASTM D 3172 | 30 % to 80 % |
| | | Gross Calorific Value | ASTM D 5865 | 2500 K Cal / Kg to 8000 K Cal / Kg |
| | | Sulphur | ASTM E 775 | 0.2 % to 1% |

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