

ANALYTICAL SUPPORT : BUILDING MATERIALS

CORE COMPETENCE:

- Quality Evaluation of Raw Materials & Finished Products
- Mix Designs for Concrete Structures
- Durability Studies for Concrete
- Performance Studies on Precast Concrete Members
- Independent/Third Party Agency for Quality Control
- Consultancy for obtaining NABL Accreditation and ISO Certification
- Imparting Training/Awareness Programmes (National/International)

TYPICAL PRODUCTS EVALUATED / STUDIED:

Cement, Concrete (Cubes, Beams, Cylinders), Sand (Fine & Coarse), Aggregates, Bricks (Masonry, Fly Ash, Sewer, Refractory), Tiles (Terrazo, Ceramic, Concrete), Stones (Granite, Sandstone, Marble), Lime, Pipes (RCC, SW, MS, CI, DI), Fly Ash, Blocks (AAC, CLC, Concrete), Gypsum (Plaster, Board), POP, Asbestos, Pavers, Water Proofing Compound, Coating Materials, Admixtures, Microsilica, Bentonite, Sanitary Wares, Water, Steel, Wood, Soil, Resin, Grout, Filter Media etc.

STUDIES UNDERTAKEN:

- Chemical & Physical analysis of Cement (OPC, PPC, PSC, WPC, SRC, HAC) as per ISS & ASTM standards including Heat of Hydration, Degree of Whiteness
- Chemical & Physical analysis of White Cement as per European Standards
- Concrete Mix Designing (M-10 to M-80 for CC & RCC with and without Admixture, Fly Ash, Steel fibers, Microsilica, Fume Silica & other emerging additives)
- Designing of Self Compacting Concrete, High Performance Concrete, Roller Compacted Concrete, Dry Lean Concrete, Pavement Quality Concrete

- Durability Studies of Concrete (Permeability, RCPT, ISAT, Drying Shrinkage)
- Coarse & Fine Aggregates for Physico-Chemical Properties including Alkali Aggregate Reactivity by Chemical and Mortar Bar Method, Alkali Silica Reactivity, Alkali Carbonate Reactivity, Petrography, Sand Equivalent Value
- Building Bricks & Other Type of Bricks for Physico-Mechanical Properties
- Refractory Material for Physico-Mechanical and Chemical Properties including Pyrometric Cone Equivalent, Linear Change, Density, Compressive Strength
- Stones for Physico-Mechanical & Chemical Properties including Freezing & Thawing, Strength, Abrasion, Hardness, Water Absorption, Density & Durability
- Tiles for Physico-Mechanical Properties including Surface Abrasion, PIE Rating, Resistance to Wear, Strength, Hardness, Water Absorption
- Pozzolanic Materials for various Physico-Chemical Properties including Lime Reactivity, Soundness, Compressive Strength, Fineness
- Sanitary wares for Physico-Chemical Properties including Performance, Endurance, Resistance to Different Materials, Identification of polymer
- Blocks, Pavers, Kerbs, Channels for Strength, Drying Shrinkage, Density
- Concrete Cubes, Cylinders, Beams for Compressive Strength, Permeability, Moisture Movement, Thermal Conductivity, Accelerated Aged Studies
- Precast Concrete Members (Manhole Covers, Drain Covers & other Building Components) for Load Test
- Pipes for Hydrostatic Pressure, Water Absorption & other Physico-Mechanical Properties

- Admixtures/Accelerators for Physico-Chemical Parameters including Uniformity Tests, Strength, Shrinkage, Air Content, Slump as per ISS & ASTM
- Gypsum Plaster / POP/ Asbestos for Physico-Chemical Properties including Transverse Strength, Setting Time, Expansion, on Setting Soundness, Frost Resistance
- Construction Chemicals (WPC, Sealant, Curing Compounds, Epoxy, Grouts, Resin, Protective Coatings) for Physico-Chemical Properties including Bond Strength, Working Time, Strength, Permeability, Corrosion Resistance
- Drilling Mud for Marsh Cone Viscosity, Density, pH
- Filter Media Sand for Uniformity Coefficient & Chemical Analysis

MAJOR INSTRUMENTS:

- Compressive Strength Machines Upto 3000kN
- Flexural Strength Machine
- Rapid Chloride Permeability Test Unit
- Tile Flexural, Impact & Abrasion Units
- PIE Rating Unit for Ceramic Tiles
- Pyrometric Cone Equivalent Unit
- Thermal Conductivity Unit
- Moh's Hardness Kit
- Self Compacting Concrete Designing
- Vee-Bee Consistometer
- Vibration Machines
- Needle Vibrators & Slump Cones
- Autoclaves-Soundness Test
- Accelerated Curing Water Bath

- Curing Baths with Temperature Control
- Heat of Hydration Unit
- Humidity Cabinets
- Freezing & Thawing Unit
- Jolting Apparatus Paddle Mixer
- Le-chatlier Apparatus
- Vicat Apparatus
- Aggregate Impact, Crushing & Abrasion Value Units
- Elongation & Flakiness Gauges
- Air Content Unit
- Ball Mills, Jaw Crushers & Pulverizer
- Hydrostatic Pressure Test Equipments for Pipes

STANDARDS/SPECIFICATIONS:

- Indian Standard Specifications (ISS)
- British Standard Specifications (BS)
- American Society for Testing & Materials (ASTM)
- European Standards (EN)
- German Standards (DIN)
- Japanese Standards (JIS)
- Canadian Standards (CSA)
- International Organisation for Standardization (ISO)
- Saudi Arabian Standards (SASO)
- Indian Road Congress (IRC)
- CPWD Specifications
- MOST/MORTH Specifications
- Defence Specifications (DRDO)

ANALYTICAL SUPPORT: PETROLEUM & FUEL

CORE COMPETENCE:

- Quality Evaluation of Liquid & Solid Fuels
- Study of Insulating Oils for their Suitability in Electrical Equipment
- Suitability Studies with Proposed Remedies for Transformer Oils
- Assessment of Fuel Additives for their Performance & Optimizing Doses
- Adulteration in Petroleum Oils
- Studies on used Engine Oil from Aircraft
- Imparting Training for Fuel Analysis

TYPICAL MATERIALS EVALUATED / STUDIED:

Liquid Fuels: Diesel (HSD & LDO) , Bio Diesel, Petrol, Kerosene, Transformer Oil, Furnace Oil, Engine Oil, Turbine Oil, Hydraulic Oil, Quenching Oil, Cutting Oil, ATF, RPO, Antifreeze Coolant, FRHF

Solid Fuels: Coal, Coke, Bagasse, Rice Husk, Paddy Husk, Saw Dust

Lubricants: Lube Oil, Grease, Wax, Jellies, Polishes

Bitumen & Related Materials : Bitumen, CRMB, PMB, Anti-Stripping Agent, Charcoal, Activated Carbon, Carbon Black

Miscellaneous Products : Transformer Oils, Grease, Wax, Jellies, Polishes

MAJOR PARAMETERS :

Viscosity & Viscosity Index	Air Release Value
Pour Point	Cloud Point
Aniline Point	Congealing Point
Flash & Fire Point	Sediments
ASTM Color	Interfacial Tension
Foaming Tendency / Stability	Flash Point (PMCC, ABEL, COC)
Ash Fusion Temperature	Weld Load & Scar Diameter
Dissolved Gas Analysis (DGA)	FURAN Compounds
Conradson Carbon Residue	Ramsbottom Carbon Residue
Reid Vapour Pressure	Calculated Cetane Index
Rust Preventive Characteristics	Emulsion Characteristics
Frothing Characteristics	Cold Filter Plugging Point
Oxidation Stability	Particle Charge
Copper Strip Corrosion	Silver Strip Corrosion
Distillation Range	Trace/Wear/Additive Metals
Total Base Number	Total Acid Number
Softening Point	Penetration
Frass Breaking Point	Ductility
Equilibrated Moisture	Water/Moisture Content
Electric Strength (BDV)	Dielectric Dissipation Factor
Hard Groove Grindability Index	Specific Resistance
Proximate Analysis	Ultimate Analysis
Volatile Matter	Swelling Number
Gross Calorific Value	Net Calorific Value
Caking Index	Useful Heat Value
Burning Quality	Smoke Point

INSTRUMENTS:

- Automatic Distillation Unit
- Automatic Bomb Calorimeter
- Automatic CHNS-O Analyzer
- Cold Filter Plugging Point (CFPP)
- Automatic Softening Point
- Coal ASTM Air Flow Oven
- Coal ASTM Vertical Tube Furnace
- GC, GC-MS/MS & LC-MS
- TGA & DTA
- GC with TOGA for DGA in Transformer Oils
- IR Spectrophotometer
- Atomic Absorption Spectrophotometer
- Four Ball Test Equipment
- Air Release Value Unit
- Silver Strip Corrosion Unit
- Frass Breaking Point
- Emulsion Stability Unit (for 1000 hours)
- Rust Preventive Characteristics Unit
- COC Flash Point Unit
- Breakdown Voltage Unit
- Ductilometer
- Density Meter
- Reid Vapour Pressure
- Hard Groove Grindability Unit
- Ramsbottom Carbon Residue
- Automatic Flash Point Tester
- Automatic Interfacial Tensiometer
- Ash Fusion Temperature Unit
- Coulometric Karl Fischer
- Automatic Penetrometer
- Coal ASTM Volatile Matter Furnace
- ASTM Colour Unit
- HPLC
- ICP-OES/ICP MS
- Refractometer
- Flame Photometer
- Brookfield Viscometer
- Oxidation Stability of Oils & Greases
- Foaming Stability Unit
- Copper Strip Corrosion Unit
- Tar Viscometer
- Dean & Stark Unit
- Ford Cup Viscometer
- Pour Point Unit
- Tan Delta Resistivity Unit
- Kinematic Viscosity Unit
- Corrosion Properties Unit
- Existent Gum in Gasoline
- Melting Point of Wax
- Conradson Carbon Residue

SPECIALIZED STUDIES:

- Ash Fusion Temperature in Coal
- Four Ball Test for Lubricants
- Cold Filter Plugging Point (CFPP) in Diesel Oils.
- SOAP Analysis in Fresh & Used Engine Oils for Various Airlines.
- Study on the Engine Flush Products & Radiator Flush Products for their Performance and Efficiency
- Studies on the Efficacy of Radiator Coolant
- Studies on Various Solid Fuels to Ascertain their Fuel Efficiency
- Emulsion Stability of Fire Resistant Hydraulic Fluids for 1000 hours at $27 \pm 2^\circ\text{C}$
- Performance Studies of Automotive Fuel Additives

STANDARDS / SPECIFICATIONS :

- Indian Standard Specification (ISS)
- British Standard Specification (BS)
- American Society for Testing & Materials (ASTM)
- European Standard (EN)
- German Standard (DIN)
- International Organisation for Standardization (ISO)
- Institute of Petroleum (IP)
- Japanese Standard (JIS)

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ANALYTICAL SUPPORT: ROADWORKS

CORE COMPETENCE:

- Assessment of Flexible Pavements
- Job Mix Formula for Flexible Pavements
- Traffic Density Survey
- Road Failure Studies
- Designing of Roads
- Post Construction Assessment of Roads
- Consultancy for Obtaining Accreditation for NABL/ISO Certification for Laboratories
- Imparting Training/Awareness Programs (National and International)

TYPICAL PRODUCTS EVALUATED / STUDIES:

Raw Materials : Bitumen, Emulsion, CRMB, Subgrade, Granular Sub Base, Wet Mix Macadam, Water Bound Macadam, Anti-stripping Agent, Coarse Aggregates, Stone Dust, Lime.

Finished Products : Bituminous Mix (BM), SDBC, Mastic Asphalt, Premix Carpet, BUSG.

Survey Studies : Topography, Benkelman Beam Deflection, Roughness Survey, Levels by Total Station & Auto Level, Traffic Survey, Distometer, GPS.

Site Testing : Core Cutting for Binder, Density & Thickness of individual Layers.

MAJOR PARAMETERS:

- All Physico-Chemical Parameters as per MORTH/IRC/ISS for: Aggregates, Sub Grade, Stone Dust, Bitumen, Emulsion, WBM, WMM, GSB
- Job Mix Formula Preparation for GSB, WMM, BM & BC
- Stone Polishing Value for Aggregates
- Petrography for Aggregates
- Hardness Number of Mastic Asphalt
- Marshal Stability of Bituminous Materials
- Retained Tensile Strength

INSTRUMENTS:

- Bump Integrator
- Benkelman Beam Unit
- Total Station
- Automatic Compactors
- Automatic Mixer
- Buoyancy Balance
- Skid Resistance Tester
- Stone Polishing Value Unit
- Marshal Unit
- Hardness Number Unit
- Automatic Asphalt Furnaces
- Bitumen Extractor
- Automatic Softening Point Unit
- Automatic Penetrometer
- Ductility Unit
- TFOT Air Oven
- Kinematic Viscosity Unit
- Absolute Viscosity Unit
- Flash Point Unit
- Loss Angeles Abrasion Machine
- Aggregate Impact Value Machine
- Compressive Strength Machine

STANDARDS/SPECIFICATIONS:

- Indian Standard Specification (ISS)
- British Standard Specification (BS)
- American Society for Testing & Materials (ASTM)
- AASHTO
- European Standard (EN)
- German Standard (DIN)
- International Organisation for Standardization (ISO)
- Indian Road Congress (IRC)
- CPWD Specifications
- MOST/MORTH Specifications

ANALYTICAL SUPPORT : CONCRETE NON DESTRUCTIVE EVALUATION (NDE)

Non Destructive Evaluation (NDE) enables one to assess the condition and quality of the concrete structures without damaging their future usefulness.

CORE COMPETENCE :

- Assessment of Quality of in-situ Concrete through NDT
- Assessment of Structural Soundness
- Investigation for Restoration & Rehabilitation of Structures
- Assessment of Structures Damaged by Fire or other Calamities
- Evaluation of TG Decks in Thermal Power Stations
- Evaluation of Bridges for Strength & Discontinuities
- Assessment of Quality of Concrete used for Railway Sleepers
- Establishing Correlation between NDT & Semi NDT Techniques for Assessment of Concrete Grade

NON DESTRUCTIVE EVALUATION STUDIES :

Assessment of Concrete Structure for:

- Compressive Strength after Core Extraction (dia 50 to 150 mm)
- Surface Strength of Concrete Structure using Rebound Hammer
- Ultrasound Pulse Velocity Measurement through Concrete Structure for Checking the Compaction, Discontinuities, Homogeneities and Health of Concrete
- Extent of Corrosion in the Rebars through Half Cell Potential Meter
- Rebar Scanning of Structure for Number, Dia and Spacing of Bars using Ferro Scanning System
- Cover Depth through Elcometer
- Extent of Carbonation in Cover Concrete
- Detection of Reinforcement during Core Extraction

INSTRUMENTS :

- Rebound Hammer (PROCEQ: Silver Schmidt "N" Digital, PROCEQ N-34, PROCEQ N-10, CNS Farnell)
- Ultrasonic Pulse Velocity Units (PROCEQ TICO, PUNDIT PLUS, CONTROLS)
- Ferro Scanning System (HILTI PS 200)
- Ferro Detectors (HILTI)
- Half Cell Potential (ELCOMETER)
- Cover Meter (HILTI PS 35)
- Core Cutting Systems (HILTI : DD 120, DD 160, DD 200)
- Core Cutting Systems (Rothenberger: Eurodema, F 202)
- Core Cutting Systems (Hakken SPJ SAX-C)

STANDARDS/SPECIFICATIONS :

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- American Society for Testing & Materials (ASTM)
- International Organisation for Standardization (ISO)
- Indian Road Congress (IRC)
- CPWD Specifications
- MOST/MORTH Specifications

ANALYTICAL SUPPORT : WOOD & WOODEN PRODUCTS

CORE COMPETENCE :

- Physico-Mechanical Properties of Wood & Wooden Products
- Identification of Declared Wood
- Study of Bamboo Match Sticks for Physico-Mechanical Properties & Performance
- Performance & Workmanship Evaluation of Wooden Door & Window Frame vis-a-vis Concrete Door & Window Frames

- Wood Shutter Doors Performance Testing
- Bench Marking of Wooden Furniture

Activity Area :

Ply wood : General Purpose, Marine, Fire Retardant, Concrete Shuttering

Boards : Wood Particle Board, Veneered Particle Board, Block Board

Timber : Wood

Flush Door Shutter : Doors

TYPICAL MATERIALS EVALUATED / STUDIED :

Wood	Flush Door Shutter	Plywood	Boards
Density	Screw Withdrawal	Glue Shear Strength	General Flatness
Nail Holding	Knife Test	Adhesion of Plies	Local Plainness
Screw Withdrawal	Glue Adhesion	Water Resistance	Abrasion Test
Dimensions	End Immersion	Mycological Test	Screw Withdrawal
Squareness	Dimensions	Moisture Content	Density
Modulus of Rupture	Impact Indentation	Tensile Strength (Along & Across the Grain)	Resistance to Stain, Crack, Cigarette Burn & Steam
Modulus of Elasticity	Flexure Test	Modulus of Rupture	Mycological Test
Tensile Strength	Edge Loading	Modulus of Elasticity	Moisture Content
Identification of Declared Wood	Shock Resistance	Preservative Treatment (Cu, Cr, B & Total Retention)	Dimensions & Dimensional Changes
Moisture Content	Buckling Test	Dimensions	Tensile Strength
Compression	Slamming Test	Squareness	MOR & MOE
Shear Strength	Misuse Test	Fire Retardancy	Resistance to Water
Hardness	Varying Humidity Test		Adhesion of Plies

INSTRUMENTS :

Ultimate Tensile Strength Machines (UTM)	Stout Table
Wood Identification Kit	Abrasion Resistance Unit
Atomic Absorption Spectrophotometer (AAS)	ICP-OES/MS
Straight Edge	Right Angle
Controlled Temperature Water Bath	Boiling Water Bath
Micrometers & Screw Gauge	Vernier Callipers
Compressometer	Varying Humidity Chamber
Air Ovens	Fire Retardant Apparatus
Wood Shutter Door Assembly	Different Type of Fixtures
Facility for Mycological Test	

STANDARDS/ SPECIFICATIONS:

- Indian Standard Specifications (ISS)
- British Standard Specifications (BS)
- American Society for Testing & Materials (ASTM)
- CPWD Specifications
- Field Books for Identification of Wood

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ANALYTICAL SUPPORT: FERTILIZERS & RAW MATERIALS

CORE COMPETENCE:

- Quality Evaluation of Fertilizers
- Raw Materials Evaluation

Evaluation of Fertilizers

Various fertilizers are evaluated for their macro & micro nutrients using conventional volumetric, gravimetric as well as sophisticated instrumental techniques mainly Inductively Coupled Plasma or Atomic Absorption Spectrophotometer for their chemical properties. Other physical properties are checked by using suitable related equipment.

TYPICAL MATERIALS EVALUATED / STUDIED:

- Straight Nitrogenous Fertilizers
- Straight Phosphatic Fertilizers
- Straight Potassic Fertilizers
- Straight Sulphur Fertilizers
- Complex Fertilizers
- Fortified Fertilizers
- Micro Nutrients
- Water Soluble Complex Fertilizers

PARAMETERS:

- Purity of Chemicals
- Impurity Profile for Chemicals
- Micronutrients
- Macronutrients
- Moisture Content
- Total Nitrogen

INSTRUMENTS:

Atomic Absorption Spectrophotometer (AAS)	UV-visible Spectrophotometer (UV-vis)
Flame Photometer	Inductively Coupled Plasma-OES
Air Circulating Ovens	Selective Ion Analyzer
pH Meter	Conductivity Meter
Turbidity Meter	Muffle Furnaces

STANDARDS/SPECIFICATIONS:

- Indian Standard Specifications (ISS)
- American Society for Testing & Materials (ASTM)
- International Organization for Standardization (ISO)
- Fertilizer Control Order (FCO)

Raw Materials Evaluation

Raw materials used in the manufacture of fertilizers e.g. rock phosphate, ammonia, gypsum, sulphuric acid, phosphoric acid etc. are being analyzed at SRI for their purity and impurity profile along with their physical characteristics, e.g. grain size, specific gravity, solubility, density, hygroscopicity etc. Based on this data, manufacturers can use the raw material in proper quantities and ratios for the production of fertilizers.

- Total Phosphate
- Total Potash
- Citric Acid Soluble Phosphate
- Neutral ACS Phosphate
- Water Soluble Phosphate
- Water Soluble Potash
- Free Phosphoric Acid
- Ammonical Nitrogen
- Urea Nitrogen
- Nitrate Nitrogen
- Calcium Nitrate
- Free Acidity
- Particle Size
- Sulphur
- Biuret
- Acid Soluble Matter
- Heavy Metal

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ANALYTICAL SUPPORT: INORGANIC CHEMICALS, MINERALS & ORES

CORE COMPETENCE:

- Chemical Composition of Mineral & Ores
- Chemical Analysis of all type of Cements
- Chemical Analysis of Building Materials
- Mineralogical Composition of Materials
- Physico-chemical properties of Thermal Insulation Materials
- Physico-chemical Properties of Refractories
- Chemical Composition of Glass & Ceramics
- Physico-chemical Properties of Activated Alumina
- Physico-chemical Properties of Activated Carbon
- Chemical Composition of Rock Phosphate & Sulphur
- Chemical Composition of Scale Deposits
- Analysis of Raw Materials of Cement for Quarry Selection
- Method Development for New Products
- Training Programs for Testing & Awareness System.

MAJOR PARAMETERS:

- Loss on Ignition
- Iron Oxide
- Calcium Oxide
- Sodium Oxide
- Potassium Oxide
- Barium Oxide
- Boron
- Cobalt
- Arsenic
- Mercury
- Nitrogen
- Total Moisture
- Free Moisture
- Combined Water
- Solid Content
- Free Lime
- Dead Burnt Lime
- Whiteness
- Oil Absorption
- Acidity
- Adsorption Capacity
- Silica
- Magnesia
- Chlorides
- Phosphates
- Manganese
- Lead
- Zirconium

- Fluorine
- Selenium
- Heavy Metals
- Acid Solubles
- Acid Insolubles
- Water solubles
- Sieve analysis
- Free Silica
- Bulk Density
- Apparent Porosity
- Alkalinity
- Attrition Loss
- Swelling Power
- Boil Test

- Dimensions
- Thermal Shock
- Alumina
- Titania
- Sulphates
- Copper
- Chromium
- Zinc
- Nickel
- Molybdenum
- Tellurium
- Carbon
- Water Insolubles
- pH Value
- Volatile Matter
- Moh's Hardness
- Available Lime
- Carbonates
- Specific Gravity
- Ash Content
- Oil Content
- Friability
- Gel Formation
- Fragmentation
- Defects in Glass
- Thermal Conductivity

TYPICAL PRODUCTS EVALUATED / STUDIED

Ores & Minerals: Limestone, Dolomite, Bauxite, Chromite, Fluorspar, Iron Ore, Manganese Ore, Magnesium Ore, Nickel Ore, Titanium Ore, Zirconium Ore, Lead Ore, Zinc Ore, Copper Ore, Molybdenum Ore, Quartz, Gypsum, Barite, Biotite, Feldspar, Graphite, China Clay, Soapstone, Rock Phosphate, Asbestos, Lime, Coal, Mica, Bentonite, Asbestos, Emery Grains

Building Materials: Cement, Aggregates, Sand, Admixture, Water Proofing Compound, Clay, Soil, Concrete, Stones

Glass & Ceramics: Glass Sheets, Glass Bottles, Glass Powder, Ceramics

Thermal Insulations: Mineral Wool, Glass Wool, Insulation Blanket

Refractories : Fire Bricks, Calcium Silicate, Zircon, Castable.

Other Materials : Silica Gel, Activated Alumina, Sulphur, Scale Deposits

INSTRUMENTATION FACILITY FOR MINERAL ORES :

- AAS with VGA & GTA
- ICP- OES, ICP-MS
- UV-visible Spectrophotometer
- Selective Ion Analyzer
- Flame Photometer
- Thermogravimetric Analyzer
- Lazer Particle Analyzer
- CHNS-O Analyzer
- IR- Spectrophotometer
- Lovibond Refractrometer
- Thermal Conductivity
- Electro Analyzer
- Dean & Stark
- Turbidity Meter
- Karl Fischer
- Conductivity Meter
- Adsorption Capacity
- Moh's Hardness Kit
- Strohelin Unit and CO2 Assembly
- Soxhlet Apparatus
- Nitrogen Assembly

STANDARDS/ SPECIFICATIONS:

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ANALYTICAL SUPPORT : METAL AND ALLOYS

The Metal Alloy Laboratory in Shriram Institute for Industrial Research undertakes analytical studies listed below on copper alloys, ferrous alloys, aluminum alloys, aluminum-magnesium alloys, nickel alloys, solder alloys, tin alloys as per National, International and product specific standards.

Mechanical Studies - Yield Strength, Ultimate Tensile Strength, Elongation, Hardness, Fractography, Impact Energy, Compressive Strength, Flexural Strength using UTM, Hardness Testers (Rockwell, Brinell), Microhardness Tester, Impact Tester (Charpy Holder).

Metallographic Studies- Phase Analysis, Grain Size, Inclusion Rating, Case Depth, Decarb Depth and Graphite Type.

Spectrochemical and Wet Analysis- The Laboratory is well equipped to carry out Spectrochemical and Wet Testing of Metal Alloys using AAS (VGA & GTA), ICP-OES.

Non Destructive Analysis- The laboratory carries out Non-Destructive Analysis on Metal, Alloys and Welded Metal Joints using Ultrasonic, Radiography, MPI, DPI for Identifying Cast & Process Induced Internal Defects and Welding Defects in Above-Mentioned Metal Alloys.

Analysis of Coatings- Chemical Composition, Thickness, Adhesive Strength on Galvanized, Anodized, Nickel, Silver, Gold, Electroless Nickel, Copper, Ceramic, Palladium, Rhodium, Platinum and Powder Coatings on Metal and Non-Metal Surfaces.

Specialized Studies- Structure-Property Correlations, Consultancy Research Projects, Failure Analysis, Corrosion, Tribology.

Corrosion - The Lab has Facility for carrying out Corrosion Studies (Corrosion Penetration Rate, Identifying Type of Corrosion), on Metal Alloys and Coatings.

ANALYTICAL SUPPORT: HOME APPLIANCES AND BATTERIES

SRI Electrical Section is equipped with the State-of-the-Art Facilities to Undertake Assignments of Various Electrical Studies (Safety and Performance) for Electric Home Appliances & Batteries and Has Qualified & Trained Scientists for its Operations Including Calculation of Measurement Uncertainty (MU) and Imparting Training to Various Organizations.

Prompt, Precise and Accurate Analytical Services, in the field of Electrical Studies are offered to the Satisfaction of Wide Spectrum of National and International Agencies for the Following Products:

ELECTRIC HOME APPLIANCES:

- Electric Ceiling Type Fan- IS: 374
- Electric Table Type Fan- IS: 555
- Electric Pedestal Type Fan- IS: 1169
- Propeller Type AC Ventilating Fan- IS: 2312
- Railway Carriage Fan- IS: 6680
- Mineral Filled Sheathed Heating Element- IS: 4159
- Electric Immersion Water Heater- IS: 368
- Stationary Storage Type Electric Water Heater- IS: 2082
- Electric Instantaneous Water Heater- IS: 8978
- Domestic Electric Food Mixer- IS: 4250
- Domestic Electric Clothes Washing Machine for Household Use- IS: 14155
- Ingress Protection

BATTERIES:

- Lead Acid Storage Batteries for Motor Vehicles- IS: 7372
- Lead Acid Storage Batteries for Motor Vehicles with Light Weight & High Cranking Performance- IS: 14257
- Lead Acid Batteries Electric Road Vehicles- IS: 13514
- Stationary Lead Acid Batteries (with Tubular Positive Plates) in Mono-Block Container- IS: 13369
- Stationary Cells & Batteries Lead Acid Type (with Tubular Positive Plates)- IS: 1651
- Stationary Valve Regulated Lead Acid Batteries- IS: 15549
- Lead Acid Starter Batteries- IEC: 60095-1

ANALYTICAL SUPPORT : ELECTRICAL INSTALLATIONS

SRI offers Prompt, Precise and Accurate Analytical Services, in the Field of Electrical Installations, to the Satisfaction of Wide Spectrum of National and International Agencies in the Following Fields of Electrical Installations.

Electrical Section is Equipped with the State-of-the-Art Facilities to Undertake Assignments for Testing/Studies of Various Electrical Installations Including Fittings by Qualified and Trained Personnel. The Services Include Calculation of Measurement Uncertainty (MU) and Imparting Training to Various Organizations.

Aluminium Conductors for Overhead Transmission Purpose

- Aluminium Stranded Conductors- IS: 398 (Part 1)
- Aluminium Conductors, Galvanized Steel-Reinforced- IS: 398 (Part 2)
- Aluminium Conductors, Aluminized Steel-Reinforced- IS: 398 (Part 3)
- Aluminium Alloy Stranded Conductors [Al.-Magnesium-Silicon Type]- IS: 398 (Part 4)
- Aluminium Conductors - Galvanized Steel-Reinforced for Extra High Voltage (400 kV and above)- IS: 398 (Part 5)

Cables & Accessories

- PVC Insulated Cable upto 1100 V- IS: 694
- PVC Insulated (Heavy Duty) Cables upto 1100 V- IS: 1554 (Part 1)
- PVC Insulated (Heavy Duty) Cables from 3.3 kV to 11 kV- IS: 1554 (Part 2)
- XLPE Insulated PVC Sheathed Cables upto 1100 V- IS: 7098 (Part 1)
- XLPE Insulated PVC Sheathed Cables from 3.3 kV to 33 kV- IS: 7098 (Part 2)
- XLPE Insulated Thermoplastic Sheathed Cables from 66 kV to 220 kV- IS: 7098 (Part 3)
- Elastomer Insulated Cable upto 1100 V- IS: 9968 (Part 1)
- Elastomer Insulated Cable from 3.3 kV to 33 kV- IS: 9968 (Part 2)
- Cables for Motor Vehicles- IS: 2465, JASO D 611, DIN 72551 (Part.5), JIS C 3406 & ISO 6722
- Welding Cables- IS: 9857
- Arial Bunched Cable for Working Voltage upto 1100 V- IS: 14255

- Cables Required to Maintain Circuit Integrity under Fire Conditions- BS: 6387
- Cables for Rated Voltages of 1 kV- IEC: 60502-1
- Cables for Rated Voltages from 6 kV- IEC: 60502-2

Lamps, Luminaries and Accessories

- Self Ballasted Lamps for General Lighting Services- IS: 15111 (Part 1)
- Self Ballasted Lamps for General Lighting Services- IS: 15111 (Part 2)
- High Pressure Sodium Vapour Lamp- IS: 9974
- Luminaires for Road & Street Lighting- IS: 10322 (Part 5/Sec. 3)
- Ingress Protection as per Various Specifications

Wiring Accessories

- Conduit for Electrical Installation of Insulating Material- IS: 9537 (Part 3)
- Metallic Conduit for Electrical Installation- IS: 9537 (Part 2)
- Plug & Socket Outlet of Rated Voltage upto & Including 250 V & Rated Current upto & including 16 A- IS: 1293
- Switches for Domestic & Similar Purposes- IS: 3854

Insulating Materials

- Pressure Sensitive Adhesive Insulating Tapes for Electrical Purposes- IS: 7809 (Part 3/Sec.1)
- Pressure Sensitive Adhesive Insulating Tapes for Electrical Purposes- IS: 7809 (Part 1)
- Electrical Insulating Mat- IEC: 61111
- Insulating Mat for Electrical Purposes- IS: 15652

ANALYTICAL SUPPORT: CALIBRATION SERVICES

We offer Prompt, Precise and Accurate Calibration Services to the Satisfaction of a Wide Spectrum of National and International Agencies.

SRI Calibration Laboratory is Equipped with the State-of-the-Art Facility to Undertake Calibration Assignments of Various Parameters by Well Qualified and Trained Scientists for its Operations Including Calculation of Measurement Uncertainty (MU) and Imparting/Providing Training to Various Organisations.

MECHANICAL:

Mass:

- Weights: 1 mg to 20 kg
- Balances: upto 50 kg

Volume:

- Pipette, Burette, Cylinder, Flask, Micropipette, Syringe, etc.: 10 µl to 1000 ml
- Butyrometer: upto 100 %

Density (Hydrometer, Lactometer, Alcoholmeter):

0.650 to 1.800 g/cm³

Acoustic (Sound Level Meter):

94, 104 & 114 dB

Speed (Non Contact):

Tachometer & Centrifuge Machine: 1100 to 15000 RPM

Torque Wrench [(Type I, Class B, C) & (Type II, Class A, B)]: upto 100 Nm

Pressure:

- Pressure Gauge (Pneumatic): Upto 20 kg/cm²
- Pressure Gauge (Hydraulic): 3.2 to 700 kg/cm²
- Vacuum Gauge: (-)0.87 to 0 kg/cm²

THERMAL (RANGE: -70 °C to 1000 °C):

- Thermometer
- RTD and PRT
- Thermocouple
- Temperature Indicator / Controller/Recorder/ Pyrometer Along with Sensors

ELECTRO-TECHNICAL:

- Source (Voltmeter, Ammeter, Multimeter, Resistance Meter, Frequency Meter)

DC Voltage: 1 mV to 1000 V

DC Current: 10 µA to 19 A

DC Resistance: 100 µΩ, 500 µΩ, 1000 µΩ, 1900 µΩ, 10 mΩ, 100 mΩ, 1 Ω; 1 Ω to 100 MΩ; 200 MΩ & 2 GΩ

AC Voltage: • At 50 Hz to 100 kHz: 10 mV to 100 V

- At 10 kHz: 100 V to 1000 V

AC Current: • At 50 Hz to 5 kHz: 100 µA to 10 A

- At 1 kHz: 10 A to 19 A

Frequency: 50 Hz to 10 MHz

Temperature Simulation (Temperature indicator/ controller): • RTD/PRT: -80 °C to 650 °C

- Thermocouple (Types B, E, J, K, N, R, S, T & C): 0 °C to 1200 °C

DIMENSION:

- Vernier Caliper: upto 600 mm
- Micrometer: upto 150 mm
- Thickness Gauge: upto 100 mm
- Slip Gauges: 0.5 to 100 mm
- Glass Scale: upto 100 mm
- Test Sieves: upto 125 mm
- Length Bar: upto 600 mm
- Dial Test Indicator: upto 25 mm
- Feeler Gauge: upto 2 mm
- Plain Plug Gauge: upto 75 mm
- Snap Gauge: upto 100 mm
- Height Gauge: upto 600 mm
- Measuring Pin: upto 25 mm
- Thread Pitch Gauge: upto 2 mm
- Radius Gauge: upto 25 mm

FLUID FLOW:

Reverse flow viscometer: 0.001 to 1 mm²/s²

Direct flow viscometer: 0.001 to 18 mm²/s²

CALIBRATION AT SITE:

Thermal: Temperature Controller/ Indicator with Sensor as Fitted in any Thermal Equipment for the Range -70 °C to 1000 °C

Mass: Balances upto 50 kg

Length: Profile Projector - Linear: 25 mm, Magnification: upto 50X

Speed: 1100 to 15000 RPM

Pressure: (-)0.87 kg/cm² to 20 kg/cm²

Parameters/Equipments Other Than Those Mentioned Above

Force & Pressure Devices	: Compound Gauge, Manometer, Proving Ring, Tensile Testing Machine, Dead Weight Tester
Viscometer	: Saybolt (Universal & Furol), Brookfield
Humidity Measurements	: Hair Hygrometer (Dial Type), Hygrometer (Dry & Wet Bulb Type)
Time	: Stop Watch & Timer
Electro-Technical	: Tong Tester/Clamp Meter
Textile Equipments	: Tear Tester, UTM, Abrasion Tester, Perspiration Tester, Crockmeter, Laundrometer
Rubber/ Plastic/ Paint Equipments	: Shore Hardness, Melt Flow Index, Pour Point Apparatus
Analytical Equipments/Apparatus	: Spectrophotometer, Refractometer, Moisture Meter, Turbidity Meter, Conductivity Meter, Flash Point Apparatus, Bomb Calorimeter, Autoclave, Conditioning Chamber, Neutral Density Filters.

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