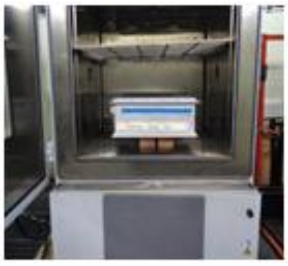
Innovation • Service • Excellence

Electrical & Electronics Laboratory (EEL)


EEL at a Glance

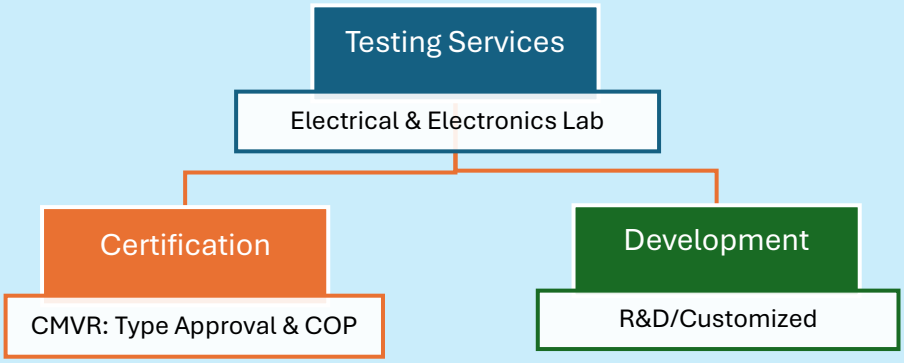
The EEL was established in April 2012 at ICAT, aimed at supporting testing of Automotive Electrical & Electronic (EE) Components. Over the years, EEL has evolved into a critical national testing infrastructure with multi-domain capabilities including Non-Automotive Domains.

Today, EEL supports testing as per **65+ National and International standards** (AIS, IS, ISO, IEC, JIS, UNECE, GSO etc.), covering a broad spectrum of components across:

- **Automotive Domains:** Battery, Charging Stations (EVSE), Motor Testing, Electronic Sub-assemblies (ESA), Vehicle Allowance System (VAS), Immobilizers, Wiring Harness, Fuse, DV & PV, Vehicle Location Tracking System, Intelligent Transport System, Speed Limiting Device, Horn, CNG/LPG/LNG Components, Vehicle Level CMVR Testing.
- **Non-Automotive Applications:** Electronics for Medical, Consumer Goods, Drones & IT Devices.

The lab is now positioned to scale up into advanced testing domains such as Advanced EV systems, Advanced Chemistry Cell, Hydrogen Technologies, ADAS, Software Validation, and Cybersecurity.

Capabilities



Specific Capabilities/USPs

Halt Hass Chamber

India's only chamber of its size for Highly Accelerated Life Testing (HALT) & Highly Accelerated Stress Screening (HASS).

Technical Standards

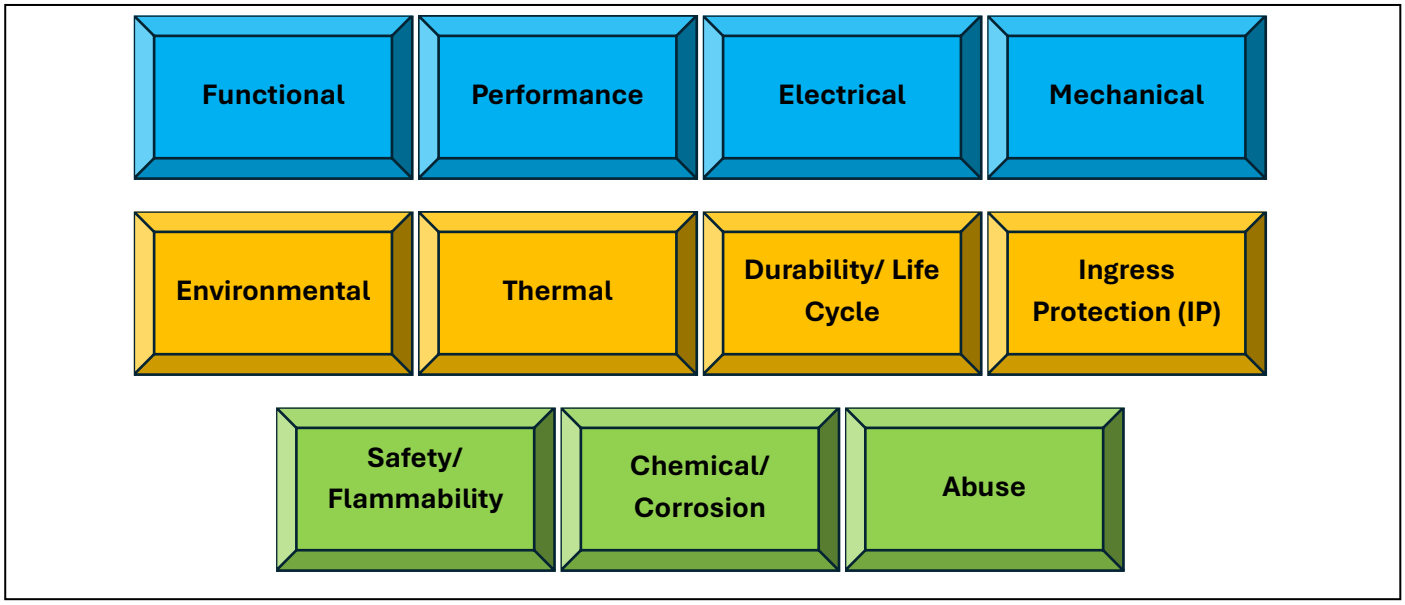
Core contributor to National and International Standards Development through active participation in AISC, BIS (TED/ETD), BEE and ISO technical committees.

Mix Gas Corrosion Chamber

Specialized system to simulate real-world corrosive conditions using gases using gases like SO_2, NO_2, H_2S, and Cl_2 under controlled humidity and temperature.

Details / Brief Specifications of Test Facilities:

Test Domains:



EEL at ICAT carries out a wide range of tests, including:

A. Functional Test

Comprehensive validation of **VLTD (with GPS/IRNSS simulation), Automotive ECUs, Battery Systems, Speed Limiting Devices, and RPAS (Vehicle-Level)** — ensuring performance, reliability, and regulatory compliance.

VLTD

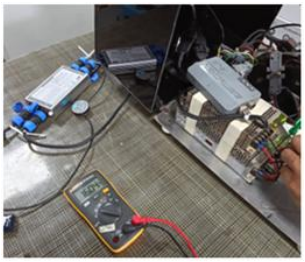
GPS/IRNSS Simulation

Functional Test

Automotive ECU

Battery Functional Test

Overcharge & Discharge

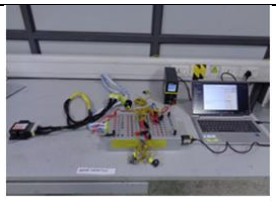


Functional Test

Speed Limiting Device (SLD)

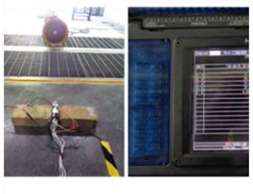
B. Performance Test:

Comprehensive validation of **Sensors & Wiring Harness Systems, Battery Performance (including post-thermal propagation), CNG Regulators, and Automotive Horns (Anechoic Chamber)** — ensuring performance integrity, safety compliance, and reliability under operational and environmental conditions.



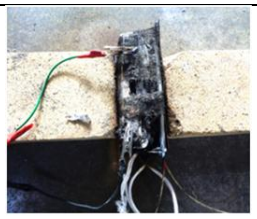
Performance Test

Sensors/Wiring Harness



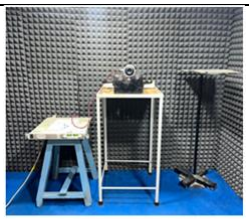
Battery Performance Test

Cell Level Testing



Battery Performance Test

Battery Test



Performance Test

Automotive Horn in Anechoic Chamber

C. Electrical Test:

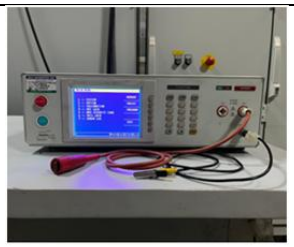
End-to-end assessment capabilities encompassing **Battery Emulators, Battery & Cell Cyclers, Short-Circuit and SC Measurement systems, Insulation Resistance testing for CNG and high-voltage architectures, AC High-Voltage and Spark testers, Electrical Test Benches, along with Impulse Dielectric, Touch Current, and Vehicle-level Insulation test setups** — supporting accurate performance verification, electrical safety evaluation, and conformity with regulatory requirements.

Battery Emulator

1000 V, 600 A, 300 kW

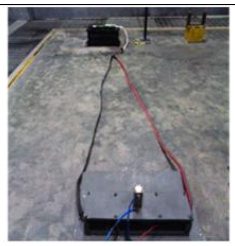
AC High Voltage Spark Tester

Wire Testing



Insulation Resistance Test

CNG/LPG, Horn, SLD Components



Battery Short Circuit Test

Test Setup

D. Mechanical Test:

Dedicated mechanical evaluation facilities including **Battery Crush Testers, Shock Test Systems, Vibration Shakers, Battery Roll-Over Test setups, Mechanical Impact and Stability testing for EVSE, and Adhesion Strength Test rigs for CNG components** — enabling robust durability assessment, structural integrity verification, and compliance with applicable safety standards.

Battery Crush Tester

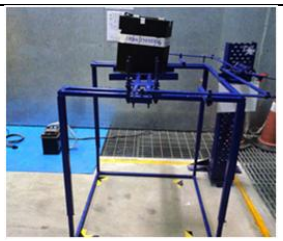
Crush Testing at 105 kN

Shock Tester

Shock Testing upto 500g

Vibration Shaker

Capacity: 6 Tons



Battery Roll over Test

Rotation Setup

E. Environmental Test:

Advanced environmental testing infrastructure featuring **Thermal Shock Chambers, Bench-Top Environmental Chambers, Dust Chambers, Explosion-proof setups for Battery Thermal Shock Testing, EV Charger environmental test systems, Ozone and Leakage test chambers for CNG/LPG components, humidity soaking facilities for E-Rickshaws, and vehicle-level Rain Storm test** — enabling thorough evaluation of durability, environmental resilience, and operational reliability under simulated real-world conditions.

Thermal Shock Chamber

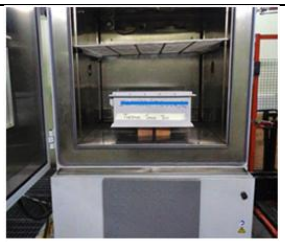
Environment Chamber

Rain Storm Test

Vehicle Level: E-Rickshaw

Environmental Test Setup

Bench-Top Chamber



Thermal Shock Test

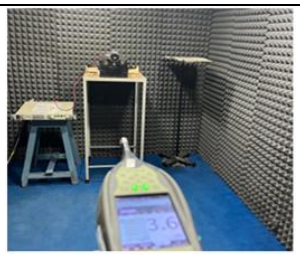
Batteries Testing in Explosion-Proof Chamber

F. Durability/Lifecycle Test:

Durability and endurance testing facilities covering **Continued Operation Test Rigs for CNG/LPG/LNG components, Acoustic Chambers for automotive horn evaluation, Battery life-cycle testing in durability chambers, EV charger durability setups, and long-duration horn endurance testing systems** — supporting reliable long-term performance and functional validation under sustained operating conditions.

Continued Operation Test Rig

CNG/LPG/LNG Components

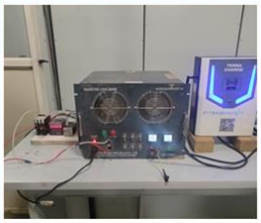


Automotive Horn Testing

Acoustic Chamber

Battery Durability Testing

Life Cycle Test in Durability Chamber



Durability Test Setup

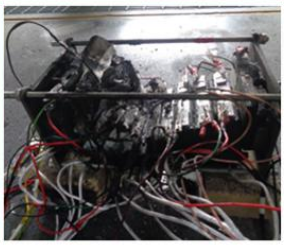
EV Charger

G. Thermal Test:

Thermal safety and reliability evaluation facilities including **Thermal Propagation testing for battery packs and failure analysis, along with Thermal Cycling and Thermal Shock testing for EV and related components** — enabling assessment of heat tolerance, failure behaviour, and performance under extreme temperature variations.

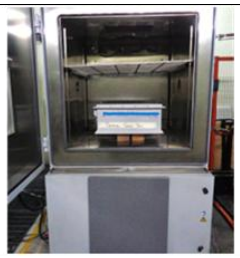
Thermal Propagation Test

Battery Pack



Thermal Propagation Test

Battery Failure Analysis



Thermal Cycling & Shock Test

EV/Other Components

H. Ingress Protection (IP) Test:

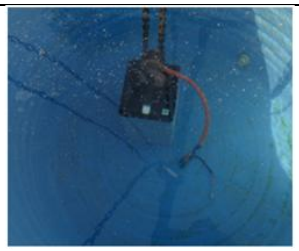
Ingress protection testing infrastructure covering **IP test setups for automotive components, water spray and dust (IP1X to 9X) evaluations, immersion testing for batteries, EVSE and charger IP validation systems, and vehicle-level IPXX testing facilities** — enabling verification of sealing effectiveness and resistance to dust and water exposure.

IP Test Setup

All Automotive Components

IP Test Setup

Water Spray Test



IPX7 Test

Water Immersion Test of Batteries

IPXX Test Setup

Vehicle Level Testing

I. Safety/Flammability Test:

Safety evaluation capabilities including **Wiring Harness flammability testing, Electrolyte leakage assessment for lead-acid batteries, Overcharge and Overdischarge safety tests for batteries, Dielectric strength and insulation resistance testing of EV chargers, and Test Probe C/D compliance checks for EVSE connectors** — supporting verification of electrical safety and protection against potential hazards.

Electrolyte Leakage Test

Lead Acid Batteries

Dielectric Strength Test

EV Chargers

Battery Safety

Overcharge/Discharge Test

Test Probe C/D

Standard Test Pin & Wire Probe Test: EVSE

J. Chemical/Corrosion Test:

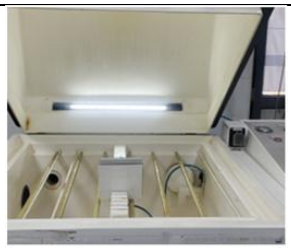
Corrosion testing facilities equipped with **Salt Spray Chambers for automotive components, dedicated salt spray evaluation for multiple products, and corrosion testing setups for battery modules** — enabling assessment of material durability and resistance to harsh environmental conditions.

Salt Spray Chamber

All Automotive Component

Salt Spray Corrosion Test

VLTD Product

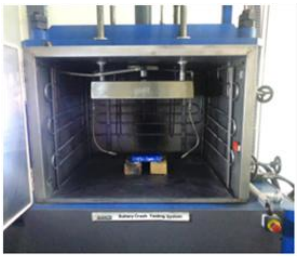


Corrosion Test

Battery Module

K. Abuse Test & Fire Test:

Critical safety testing capabilities including **Battery Crush testing, Nail Penetration testing at cell level, Fire Resistance evaluation for batteries and fuel tanks** — supporting assessment of extreme failure behaviour and validation of safety performance under hazardous conditions.



Battery Crush Testing

1 m X 1 m

Nail Penetration Test

Cell Level Testing

Fire Resistance Test

Fire Test of Batteries/Fuel Tank

Key Projects Executed:

Development Test of Batteries for a Leading OEM: Covering life cycle characteristics, capacity testing, and repeated performance testing (RPT) at cell & module level. The project involves 80% DoD multiple cell testing, carried out simultaneously using customized chambers, demonstrating advanced capabilities in handling large-scale cell evaluations.	
EVSE Charger Testing: EVSE charger testing up to 180 kW conducted at ICAT, utilizing in-house partial facilities combined with collaboration from an external agency. The project highlights ICAT's growing capability in high-power charging system evaluation and reflects a flexible, collaborative approach to address emerging industry requirements in electric vehicle infrastructure.	

Standards / Regulations (National & International):

EEL conducts testing in adherence to globally recognized standards including ISO, IEC, JIS, DIN, BIS, AIS, and more - ensuring trust, safety, and compliance.

Mandatory Certification Standards as per CMVR Tested in EEL:

Battery

- AIS-038 | AIS-048
- AIS-156
- ISO 12405-4
- IS 16893: Part-II & III

EVSE

- IS 17017

CNG/LPG/LNG

- ECE-R67 | ECE-R110
- ISO 15500: Part-2, 6, 7, 9, 11
- IS 15714 | IS 15716
- IS 15722 | AIS-028

CMVR Vehicle Level

- AIS-038 | AIS-052
- AIS-076 | AIS-093
- AIS-102 | AIS-119
- AIS-125 | AIS-139
- AIS-145 | AIS-153
- AIS-156 | AIS-168
- AIS-171 | AIS-174
- IS-14283 | IS-16694

VTS/ITS/RPAS/RFID

- AIS-140 | AIS-153 (Annex 4)
- IS 16722
- IS 16833
- IS 16940
- IS 17270

Auto Electronics & Safety

- AIS-018
- AIS-026
- AIS-076
- IS 1884

Compliance / Lab Accreditations / Recognitions:

Accreditation	Accreditation Agency	Scope
ISO 9001, 14001, 45001	Intercert	IMS: Quality, Environmental, OHSAS
ISO 17025	NABL	Mechanical (CNG/LPG), Electrical (Automotive), Electronics (Non-Automotive), Cell & Battery
BIS	BIS	IS 13252 (Part-1): Non-Automotive: IT Equipment, IS 616: Non-Automotive (Audio-Video)
TEC	TEC	Battery (IEC 62133), IT Equipment (IEC 60950-1)

Correlation & Benchmarking:

EEL ensures strong correlation and benchmarking through regular participation in **Inter-Laboratory Comparison (ILC) and Proficiency Testing (PT)** programs to evaluate performance against peer laboratories.

Conducts **Intra-lab and Blind Sample Testing** to maintain objectivity, identify variations, and ensure unbiased measurement results.

Performs **Scheduled Intermediate Checks** between calibration cycles to continuously verify measurement accuracy and stability.

Implements **Test Replication through multiple runs** to confirm repeatability, consistency, and reliability of test outcomes.

Electrical & Electronics Lab (EEL)

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