SPECIFIC CRITERIA
for ELECTRONICS TESTING LABORATORIES

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# AMENDMENT SHEET

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1. Introduction

Laboratories accreditation activities are administered under the direction of National Accreditation Board for Testing and Calibration Laboratories (NABL) and involving Technical Committees and evaluation panels as recommending bodies. NABL assessment system is based on ISO/ IEC 17011 and ILAC recommendations.

This document on “Specific Criteria for Electronics Testing Laboratories” is one of a series of supplementary booklets of the document ISO/ IEC 17025: 2005 “General Requirements for the Competence of Testing and Calibration Laboratories”.

Electronics is one of the following testing fields in which NABL currently gives accreditation:

- Biological
- Chemical
- Electrical
- Electronics
- Fluid Flow
- Mechanical
- Non-Destructive
- Photometry
- Radiological
- Thermal
- Forensic

The information contained in this document must be read alongwith the document ISO/ IEC 17025: 2005.
2. Scope

The testing in the field of electronics broadly covers the following categories:

a. Electronics components such as passive, active-semiconductors & integrated circuits and hybrids.
b. Electro-mechanical components such as switches, relays and connectors.
c. Electro-magnetic components cores, solenoids, coils and transformers.
d. Wires, cables such as communication cables and PCBs.
e. Microwave components such as coaxial components, attenuators, waveguides.
f. Picture tubes-color and black and white, CRTs and allied components
g. Electronics equipments such as mobile-land, sea and air borne instruments.
h. Power supply equipments and systems.
i. Audio/ Video components and products.
j. Information technology equipments.
k. Opto electronic components and instruments such as fibre optics.
l. Telecommunication equipments and systems.
m. Electro medical equipments.
n. EMI/ EMC and ESD testing.
o. Safety Testing.
p. Environmental testing such as conditioning and durability testing.
q. Development of environmental stress screening methods (ESS).
r. Failure mode analysis techniques for components, instruments and systems.
s. Dependability analysis techniques and testing.

While assessing testing capabilities of a laboratory in each of the above categories, it should be understood that electronic products and application cover a wide variety of tests based on relevant standards such as IS, IEC, MIL and other national and international specifications/standards.

These guidelines suggest only the broad range of tests in the above mentioned categories of testing in electronics discipline for measurement of various parameters. Details pertaining to nomenclature, uncertainty, resolution, range etc. of the equipments required for carrying out above tests would be duly furnished by the application organisation at the time of seeking accreditation.
3. **Classes of Test**

In the field of Electronics testing the tests have been classified product-wise e.g. domestic electronics appliances and accessories, computer and accessories, electronics components & equipments etc. However, certain specialized tests, which are performed on a wide range of equipment, have been grouped test facility wise e.g. EMI / EMC testing, environmental testing etc.

Accreditation may be granted for tests performed in mobile laboratories, field laboratory of locations, as well as in formal laboratory accommodation.

3.1 Wherever applicable, both fixed and variable types are covered under relevant headings.

3.2 Wherever applicable, dimensions/ size, ranges and limits shall be indicated (e.g. while indicating the environmental facilities, size and temperature, humidity ranges shall be indicated).
4. Grant of Accreditation

Accreditation is normally granted for the test facilities for which the laboratory is properly equipped and has demonstrated its capability. The extent of a laboratory’s scope of accreditation will therefore vary with the range of work performed, the scope and complexity of the tests involved, the competence of laboratory staff and the capability of equipment available in the laboratory. The accreditation is accorded to a laboratory for the entire test facilities or to a part of facility.

Accreditation does not constitute a blanket approval for all activities of the laboratory. The groups of test are an arbitrary subdivision of the potential range of activities involved in electronics testing on the basis of the type of measurements being made, the scientific disciplines involved and the techniques employed. It is therefore possible for a particular test or technique to be included under several groups of test. These groups and subgroups do not however, constitute any restriction on the work which a laboratory can perform but provide a convenient means of expressing an accredited laboratory’s capabilities.
5. Personnel

The appraisal of staff is the important part of laboratory assessment as they are the key to the standard of performance. Staff engaged in the testing should have required qualifications, experience, training and technical competence for the functions they undertake and shall be conversant with various types of testing in the assigned areas. The extent of the basic technical knowledge required of senior staff varies with the complexity and uncertainty of the measurements for which accreditation is sought. They shall also have knowledge about the safety rules and instructions, use of first aid kits, fire fighting equipment and other safety devices.

General Requirements

A Authorised signatory: Degree in electrical / electronics / communication engineering / equivalent or post graduate in physics / specialization in the relevant field, with at least one year experience in the relevant field of testing. Or, graduate in science / diploma in electrical / electronics engineering with experience of 5 years in the relevant field of testing.

B Supervisor: Graduate in science / diploma in electrical / electronics engineering with at least one year experience in the relevant field of testing or trade certificate with at least three years experience in the relevant field of testing. The personnel shall have sound knowledge of test procedures, the risk & hazards involved in testing.

C Operator: Graduate in science / diploma in electrical / electronics engineering / trade certificate with at least one year experience in the relevant field of testing. He should have sound knowledge of safety precautions to be taken during testing.

Special requirements for EMI/EMC Testing

A Authorised signatory: Degree in Electrical/ Electronics/ Communication Engineering or M.Sc. (Physics) with three years experience in the field of EMI/ EMC testing. He shall have sound knowledge of the principles of Electro-magnetic interference & compatibility and evaluation of the test results.
B **Supervisor:** Degree in Electrical/ Electronics/ Communication Engineering or M.Sc. (Physics) with one year experience or diploma in electrical / electronics engineering with at least three years experience in the field of EMI / EMC testing. He shall have sound knowledge of the principles of Electro-magnetic interference & compatibility, and precautions required during testing.

C **Operator:** Diploma in electrical / electronics engineering with one year experience in the field of EMI/ EMC testing. He shall have sound knowledge of precautions to be taken during testing.

*Note: The Assessment team may however recommend Authorized Signatory who does not meet the above specified minimum experience requirement with specific recommendations to NABL, after adjudging the competence of the Authorized Signatory during on-site assessment.*
6. Accommodation and Testing Environment

Accommodation requirements vary greatly depending on the nature of the articles to be tested and the order of accuracy required from the tests. Layout of the laboratory shall be well defined to perform the desired tests. There shall be sufficient space around test equipment to minimise the risk of damage or danger and to provide for convenient and accurate operation and measurement. The environment in which the tests are undertaken shall not invalidate the results or adversely affect the required accuracy and precision of measurement.

There shall be all evidence of the implementation of all necessary safety measures including first aid kits within the reach of all staff members and safety instructions shall be displayed prominently. Fire fighting equipments and fire exits shall be provided adequately.

Various other environmental conditions to be made available in the laboratory depending upon the type of product being tested or type of test being conducted are as follows:

6.1 The flooring shall have antistatic covering and test personnel shall ensure that all static protection measures are taken while testing static sensitive devices, high resistance circuits and instruments.

6.2 The laboratory shall be properly sealed to minimise the effects of external noise, where relevant.

6.3 Testing shall be undertaken in a shielded cage/enclosure to minimise the interference, where applicable.

6.4 All testing/ measurements which can be influenced by vibration should be carried out in a specially allotted area where vibration are minimised. Use of anti-vibration mounts and tables as required shall be provided in the laboratory. All vibration generating instruments/ machines shall be isolated as far as possible from the testing area. Proximity to lifts, plant rooms, workshops, walkways, busy roads and other sources of noise and vibration should be avoided.
6.5 Satisfactory grounding is a critical element to measurement integrity and personnel safety in the electronics testing laboratories. Dedicated earthing shall be provided to the electronics test laboratory as per relevant specification, IS:3043-1966. The earth pit shall be maintained and monitored periodically as per IS specifications and necessary records of earth resistance shall be maintained.

6.6 The power to the testing laboratory and test bench should be on a phase independent of the other electrical circuits as far as transients for which necessary starters/line filters stabilisers and isolation transformers shall be provided. The power supply shall be provided with a regulated standby power supply of adequate capacity.

6.7 Temperature and humidity control is one of the most critical elements for consideration in testing laboratory. The laboratory shall be maintained at an ambient temperature of 25 degree centigrade with tolerances to be decided as per the requirements and sensitivity of measurements being made by the laboratory. The humidity shall be between 45 and 70 percent RH. Both temperature and humidity shall be effectively monitored, controlled and recorded periodically. Where necessary, air curtains shall be provided.

6.8 The light fittings should be chosen to ensure adequate illumination at the work bench without glare. The illumination should be in the range 400 to 500 lux. Provisions for emergency lighting should exist in the testing area.
7. Measurement Traceability and Calibration

Testing laboratory is required to establish and maintain traceability of their equipments (measurements) to national standards at all times as mentioned in NABL 142.

In the absence of meeting the above requirements, the laboratory is required to establish/substantiate, through documents the traceability to international standards for its testing activities. Where relevant, the test equipment shall be subjected to inservice checks between regular re-calibrations.
8. **Subcontracting of Testing**

The laboratory shall itself normally perform the testing which it contracts to undertake. Where a laboratory subcontracts a substantial or critical part of the testing, this work shall, wherever possible, be placed with another laboratory accredited under the scheme. The laboratory shall advise the client as far as possible about the contract for testing or its intention of subcontract a substantial or critical part of the testing to another party.
9. Sampling

The sampling procedure would normally be covered by the documented test norms/standards according to which testing is done. The test results are limited to the samples submitted for testing. This fact shall be specifically indicated in the test reports to ensure the objectivity in reporting the scope of the test results.
10. List of Electronics Tests

Products for Testing

All electronic Products
Discrete Semiconductor Devices
Monolithic Integrated Circuits
Hybrid Integrated circuits
Electro-mechanical components
Electro-magnetic components
Opto-electronics components
Wires, Cables, Sleeves
Piezo Electric devices
Electron Tubes
Passive Components
Electro Acoustic Devices
Magnetic Tapes
PCBs
Laminates
Micromotors
Fan Regulator
Amplifier
Multimeter, voltmeter, Ammeter
LCR Meter
Transistor Analyzer
Electronic Counter
Distortion Analyzer
Oscillators, Pulse and Date Generator
Oscilloscope
Plotter
AF Power Meter
Temp. Controlled Soldering Station
Power Supplies
Voltage Stabilizer
Isolation Transformer
Inverter
UPS
Process Controllers
Dry Battery
Wet Battery
Personal Computer
Disc Drives
Keyboard
Printers, Plotters
Monitor
TV Receiver
AM/ FM Radio Receiver
TV Tuner
AM/ FM Radio Frequency Generator
Transreciever
Pattern Generator
Filter and Attenuators
Electronics Calculator (Non-programmable type)
Tape Deck Mechanism
Tape Recorder
VCR
Telephone Test Set
Acoustic Equipment
Opto-Electronics Equipment
Mobile phones
**Types of Tests**

Type approval Test  
Environmental Test  
Acceptance Test  
Routine Test  
Screening Test  
EMI/EMC Test  
Safety Tests  
Special Tests  
Continuity  
Resistance Value  
Capacitance Value  
Inductance Value  
Impedance Value  
Insulation Resistance  
Voltage Proof  
Leakage Current  
Dielectric Strength  
Tangent of Loss Angle  
Power Factor  
Adjacent Channel  
Insertion Loss  
Attenuation/Gain  
Power Consumption  
Power Loss (for cores, etc.)  
Power Output (AF/RF equipment etc.)  
Voltage Regulation  
V-I Characteristics  
Timing Tests for Semiconductor Devices  
Performance Efficiency  
Sensitivity  
Colour Killer Sensitivity  
Noise Limited Sensitivity
Frequency Response
Gain Limited Sensitivity
Distortion
Noise Level
Phase Shift
Time Delay
Flux Density
Cross Talk
Temperature Rise
Picture Brightness
Geometric Distortion
Sound Pressure Level
Acoustic Response
Conducted Emission
Radiated Emission
Conducted Susceptibility
Radiated Susceptibility
ESD Compatibility
Environmental Testing  - Cold
 - do-  - Dry Heat
 - do-  - Damp Heat
 - do-  - Solar Radiation
 - do-  - Mould Growth
 - do-  - Salt Mist
 - do-  - Low Air Pressure
 - do-  - Change of Temperature
 - do-  - Sealing
 - do-  - Resistance to Soldering Solderability etc.
 - do-  - Thermal Shock
 - do-  - Sulphur Dioxide, Hydrogen Sulphide etc.
 - do-  - Combined Cold, Low Air Pressure and Damp Heat
 - do-  - Fire Hazard
 - do-  - Flammability
Durability testing
- Vibration Sinusoidal
- Vibration Random
- Acceleration
- Bump
- Shock

Mechanical testing
- Robustness of Termination
- Endurance/ Life Testing

Quieting sensitivity
Audio Squelch Sensitivity
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