KAN TECHNICAL NOTES FOR
ELECTRICAL TESTING
LABORATORY

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APPROVAL SHEET

Reviewed by: ____________________________
Quality Manager

Approved by: ____________________________
Director of Accreditation for Laboratory and Inspection Body
# LIST OF AMENDMENT

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SPECIFIC REQUIREMENT FOR ELECTRICAL LABORATORY

1. INTRODUCTION
   a. This Specific requirements are an interpretation of the general requirements of ISO/IEC 17025-2005.
   b. This accreditation requirements are applicable to field of testing electrical, electrical technical, type of test, and or specific test in electrical area, as extra information to the already generally stated requirements in each of the clauses ISO/IEC 17025-2005.
   c. Electrical testing methods are method for electrical equipment testing for use with a voltage rating of between 50 and 1000 v for alternating current and between 75 and 1500 v for direct current. such as: electrical equipment intended for human purposes, electrical parts specifically designed for incorporation into goods and passenger lifts, specialized electrical equipment for use on ships, aircrafts, or railways, domestic plugs and socket outlets for connection to the ac mains supply, basic components intended to be incorporated into electrical equipment and other and electrical equipment testing for use high voltage system that operating above 1000v ac rms or 1500v ripple-free dc. (such as transformers, switchgear, capacitors, motors and generators) including the associated high voltage cables, joints and terminations.
   d. Electrical testing is taken to include of Insulation Tests; earth circuit test; continuity test; functionality test; run / leakage test; polarity wire test; visual inspections, test for obvious external damage; test defects-accessories, plugs or socket outlets; test defects on connectors; test k supply cords; no exposed inner cords, external sheath not cut abraded or damaged; test cords are not tangled or exposed for tripping; all flexible cords are securely anchored; and power boards ( indicator for ‘maximum load), etc.

2. PERSONNEL
   a. The Laboratory operator has been working in relevant test areas of an electrical laboratory for at least two years.
   b. This person shall demonstrate competency by performance evaluation and by oral and/or written examination, the ability to perform correctly the required duties.
c. The Laboratory operator shall understand that the risk of electric shock injury will still remain during the testing process, even with the use of earth-free test areas and/or isolating transformers.

d. The Laboratory operator shall fully understand the scenarios in which these electric shock injury risks can arise in the particular workplace.

e. Technical Manager, Laboratory Supervisors and Laboratory operator shall possess a basic education in electrical vocation or a related science.

f. The laboratory shall be directed by persons having executive responsibility & competence to assume responsibility for the services of electrical testing.

g. Laboratory management shall ensure that:
   1. Appropriate numbers of laboratory personnel, with the required education & training that to meet the demands of the service to customers.
   2. Laboratory personnel have the knowledge, skills, and abilities based on education, experience, demonstrated skills, and training. To perform their duties.
   3. Full educational and professional records of all technical staffs available to confirm their competence in Electrical testing
   4. Laboratory personnel have the given adequate first-aid training, including cardiac pulmonary resuscitation (CPR) skills.

h. Laboratory shall establish and define an internal training program and ensure the competency of laboratory personnel.

i. Laboratory shall have training procedure that used to ensure that training has taken place with each employee for procedures and methods that the employee performs.

j. The laboratory shall maintain an up-to-date record of the training that each member of staff has received.

3. ACCOMMODATION AND ENVIRONMENTAL CONDITIONS

a. Laboratory shall have distinct space, in line with the safety requirements, for performing electrical testing; the size of the room should be large enough to place workbenches and enclosed storage space for working equipment and all the necessary ancillary apparatus and instrumentation.

b. There should be sufficient space for the required number of test operators and supervisory staff. The test shall carry out in be in an area set apart by barriers to

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The laboratory should have suitable warnings provided at the entrance, Evacuation corridor should be clearly marked for emergency exit.

Permanent test areas be accessible during testing only to authorized staff or people working under their direct supervision.

The supplies should have suitable system protection against overload and over current in the event of faults, e.g. fuses.

The walls, floor and ceiling should be constructed to minimize the effects of external noise, vibration and electromagnetic interference, if relevant.

Electrical supply cables, particularly those supplying other parts of the building or site, should be enclosed in steel ductwork which should not be earthed to the laboratory earth.

The laboratory floor should have an antistatic covering particularly when high resistance circuits and instruments are to be used.

For testing of equipment at high voltage, it shall be carried out in a room or enclosed area which are provided with adequate safety protection.

For testing of materials at high temperature, it shall be carried out in properly constructed test chamber provided with adequate exhaust to disperse the combustible waste e.g. toxic gases and the elimination of pungent odors etc.

Laboratories shall control and monitor the laboratory environmental conditions, including temperature, humidity, pressure, voltage, frequency and other parameters as specified in the test standards.

Certain test standards specify a draught-free environment when performing temperature rise measurements. Normal laboratory environment is not draught-free because of the air-conditioning and ventilation system and these tests shall be conducted in suitable draught-free enclosure.

Power from general purpose outlets at the workbench should be controlled via a line conditioner or voltage stabilizer. An earthling bus common to all benches should be provided to earth each piece of electrical instrument or apparatus as required.

Workbench should be adequately illuminated and the luminance should preferably be in the range of 400 to 500 lux.
4. **TEST METHOD AND METHOD VALIDATION**

The test method are adequately documented are based on the latest valid edition of a published reference method, including:

i. Title and method number;

ii. Scope and field of application;

iii. Number of revision;

iv. Page numbering, total number of pages;

v. References;

vi. Principles and definitions;

vii. Apparatus;

viii. Expression of results;

ix. Performance criteria;

x. Issuing authority

b. The method contain the title, scope and field of application, references, principles and definitions, reagents and materials, apparatus, analytical methodology, expression of results, performance criteria, revision history, page numbering, total number of pages, issuing authority.

c. A method should be validated when it is necessary to verify that its performance parameters are adequate for use for a particular analytical problem:

i. New method developed for particular problem;

ii. Established method revised to incorporate improvements or extended to a new problem;

iii. When quality control indicates an established method is changing with time;

iv. Established method used in a different laboratory, or with different analysts or different instrumentation;

v. To demonstrate the equivalence between two methods, e.g. a new method and a standard.

d. Methods developed in-house must be adequately validated, documented and authorized before use.

e. Where they are available, matrix matched reference materials should be used to determine any bias, or where this is not possible, results should be compared
with other technique(s), preferably based on different principles of measurement.

f. Measurement of the recovery of gravimetrically added spike analyte, measurement of blanks and the study of interferences and matrix effects can also be used to check for bias or imperfect recovery.

g. Estimation of uncertainty must form part of this validation process and in addition to covering the above factors, should address issues such as sample homogeneity and sample stability.

h. In-house methods are fully documented, appropriately validated and authorized for use.

i. Copies of published and official methods are available. The most up-to-date version of the method is available to the analyst.

j. Analyses are supervised to follow the methods specified.

k. Methods have an appropriate level of advice on calibration and quality control.

l. The validation of the method contain (depending on the type of method (qualitative, semi quantitative, etc) :
   i. Criteria for determining the required number of samples to be tested. validation of test method performed under same conditions as those of a real assay;
   ii. Precision;
   iii. Repeatability;
   iv. Recoveries of spiked samples;
   v. Specificity of the method in a given matrix;
   vi. Analytical range;
   vii. Linearity;
   viii. Limit of detection;
   ix. Limit of quantification;
   x. Accuracy;
   xi. Confirmation techniques;
   xii. Statement that the method used in the validation is fit for the intended use.

5. EQUIPMENT AND MEASUREMENT TRACEABILITY

a. Laboratory shall have :
   i. Equipment records containing description of the instrument, critical accessories and software, manufacturer's name, type identification and serial number;
Laboratory number; installation qualification (IQ) and operational qualification (OQ) records obtained from the installer or manufacturer; and other related material such as instrument service and repair, warranty information, service contract conditions and specifications;

ii. Laboratory shall have operating instructions for each instrument, including starting and shutting down the instrument;

iii. Built test equipment be designed and constructed to the same standards of safety as proprietary equipment. Test equipment be of a proprietary design.

b. Insulation test instruments can generate high voltages at their output and some have an option to limit the output current to a safe level. The generally accepted safe limited current is 5 mA.

c. If higher current levels are necessary, special precautions need to be put in place to prevent injury. These include using test probes fitted with control switches, or using interlocked enclosures to prevent access to the dangerous parts, and restricting the testing work to authorized people.

d. The connecting leads of test equipment shall be a design that provides adequate protection from electric shock.

e. Oscilloscope’s measuring probes which allow the Class I oscilloscope shall be earthed to the mains supply.

f. Where an isolating transformer is used for the supply to the equipment under test this should comply with the standards and a separate transformer should be used at every test bench. If this is not reasonably practicable, the same isolating transformer may be used for supplies to alternate benches, provided the risk of referencing this supply to earth at any bench is properly controlled and the transformer does not then have an unacceptably high leakage current.

g. When an instrument is discovered to be improperly operating, it is tagged and taken out of service.

h. Equipment is not returned to service until performance checks and verification have been performed and documented.

i. Each instrument has an established schedule specifying performance checks, including the testing frequency and acceptable performance specifications.
6. **ASSURING THE QUALITY OF TEST RESULTS**
   
a. Laboratory Quality Control is an essential aspect of ensuring that data released is fit for the purpose determined by the quality objectives.

b. Approach of quality control is the principal recourse available for ensuring that only quality data is released.

c. The Principle of the laboratory quality control program is its internal quality control to monitoring of test performance, and its external quality control based on the laboratory’s performance in proficiency testing programs.

d. Laboratory Management is responsible for establishing a Laboratory Quality Control Program and ensures that quality control is performed and reviewed of quality control data for acceptability.

e. Operators are responsible for conducting quality control analyses in accordance with The Laboratory Quality Control Program.

**Bibliography**

1. BS EN 50191: 2001 Erection and operation of electrical test equipment.

2. BS EN 61010-1: 1993 Safety requirements for electrical equipment for measurement, control and laboratory use.


4. BS EN 61557-1:1997, IEC 6155-1:1997 Electrical safety in low voltage distribution systems up to 1000 V ac and 1500 V dc: Equipment for testing, measuring or monitoring of protective measures. General requirements.