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RG 102

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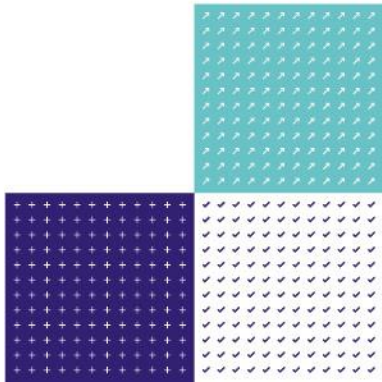
Accreditation for the Inspection of Non-public High Voltage Electrical Systems



Contents

Changes since last edition

References to standards and publications updated. Other minor editorial changes.

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1. Introduction

1.1 This publication should be read in conjunction with ISO/IEC 17020:2012 *Conformity assessment - Requirements for the operation of various types of bodies performing inspection*, ILAC P15:07/2016 *Application of ISO/IEC 17020:2012 for the Accreditation of Inspection Bodies* and UKAS publication RG 0 *Guidelines on the competence of personnel undertaking engineering inspections*.

The field of inspection covered by this publication is non-public high voltage electrical systems.

1.2 This publication has been produced by UKAS and the UKAS Technical Advisory Committee for Engineering Inspection.

1.3 The selection of an inspection body accredited against the requirements of ISO/IEC 17020:2012 and this publication is intended to assist the owner or user of an electrical system with an assurance of the level of competence concerning the provision of an inspection service.

1.4 For the purposes of this publication the term 'Inspection Body' shall be taken to mean an accredited Inspection Body.

2. Inspection services covered by RG 102 (ISO/IEC 17020:2012 Clause 5.1)

2.1 **Scope**

2.1.1 This publication details the requirements for inspection bodies undertaking the inspection of electrical systems, in the field identified in Sub-clause 2.1.2. The inspection is to ensure, as far as reasonably practicable, the detection of potential and actual defects, particularly those which may be a cause of danger or injury to persons or damage to property. It is also to ascertain if the electrical system meets relevant statutory requirements, national or international standards, approved codes of practice or guidance and similar documents.

2.1.2 (a) For this publication the field of inspection is electrical equipment forming part of, and connected to, a high voltage (HV) system operating above 1000V ac or 1500V dc. HV traction systems are excluded as they warrant separate consideration.

(b) This publication embraces non-public HV electrical plant (e.g. switchgear, capacitors, reactors, transformers, motors and generators) including the associated HV cables, joints and terminations, where these are accessible for inspection. Where a substation incorporates transformation to Low Voltage (LV), the HV/LV transformer, associated LV cables and busbars to the disconnect points of the outgoing LV circuits are also included, i.e. the equipment and busbars contained within the HV zone of protection.

Also included are items of ancillary equipment that are necessary for the safe and proper functioning of the system, e.g. tripping and closing batteries, battery chargers, protection/control systems and earthing systems.

3. Independence, impartiality and integrity
(ISO/IEC 17020:2012 Clause 4.1 including Annex A)

3.1 Inspection Bodies operating as Type A, B or C bodies as defined in ISO/IEC 17020:2012 may be accredited for inspecting electrical systems provided that they meet the requirements of ISO/IEC 17020:2012 and this publication.

3.2 **Independence**

3.2.1 To ensure the independence of inspection work, the reporting chain for inspection shall be separable from that of any other work undertaken.

3.2.2 A Type C inspection body which undertakes installation, maintenance or remedial work in conjunction with inspections shall have clearly documented procedures for each activity and shall establish adequate safeguards to ensure the integrity of the inspections. Such safeguards may include the use of alternative inspection and maintenance staff and the independent auditing of inspection work.

3.2.3 The inspection body shall, on an on-going basis, identify any risks to impartiality that may arise from its activities and be able to demonstrate mitigation controls and measures taken to eliminate such risks.

4. Organisation, management and supervision
(ISO/IEC 17020:2012 Clause 5)

4.1 In addition to the requirements of RG 0 the following shall apply:

For the inspection of electrical systems covered by this publication the requirements for supervision shown in Table 1 shall apply.

4.2 The technical manager in charge of, and having overall responsibility for, an inspection body seeking accreditation is to be of Category 1 status and shall be employed or contracted to the inspection body.

4.3 For effective supervision, inspection staff shall be monitored by personnel familiar with inspection methods and procedures. The technical manager may delegate supervisory responsibilities to locally appointed managers.

4.4 In addition to management personnel there will be requirements for personnel working on site who are qualified at lower levels but who have the ability to undertake inspection tasks and duties at the level assigned to them. Such persons shall be made aware of their duties and limitations in respect of their responsibilities and authorisations.

4.5 Where sub-contracted service providers are required, they shall be able to demonstrate their technical competence and ability to undertake the required tasks to the satisfaction of the technical manager.

5. Internal audits
(ISO/IEC 17020:2012 Clause 8.6)

5.1 ILAC P15:07/2016 applies without change.

6. Personnel
(ISO/IEC 17020:2012 Clause 6.1)

6.1 The requirements for qualifications, experience and training relevant to the inspections covered by this document are shown in Table 1.

Table 1 Experience category and supervision

Risk Group	**Highest Voltage level in work area**	**Technical Manager & Deputy**	**Locally appointed manager** *(according to operational needs e.g. remotes sites)*	**Inspection personnel**	**Entry level Category 3**
X	Above 36kV	Category 1 5 years' experience in this risk group	Category 1 5 years' experience in this risk group Supervision Level B	Category 2 4 years' experience Supervision Level B	In all risk groups the preferred entry level for competence will be evidence of completion of all appropriate assed HV training course.
Y	Above 12kV up to 36kV	Category 1 5 years' experience in this risk group	Category 1 4 years' appropriate experience in this risk group Supervision Level C	Category 2 3 years' experience Supervision Level C	
Z	Between 1kV & 12kV	Category 1 5 years' experience in this risk group	Category 2 3 years' appropriate experience in this risk group Supervision Level C	Category 2 2 years' appropriate experience Supervision Level C	Supervision will be Level D

Notes to Table 1

1. Categories, levels of supervision and constraints placed on activities are explained in Appendices 1, 2 and 3.
2. Category 1 personnel undertaking inspection activities shall be subject to Supervision Level A.
3. An inspection body may be accredited to undertake inspections in one or more of the groups X, Y, or Z.

7. Training
(ISO/IEC 17020:2012 Sub-clauses 6.1.3, 6.1.5, 6.1.7)

7.1 In addition to the requirements of RG 0, the inspection body shall ensure that each member of the inspection staff receives training and can demonstrate a working knowledge of:

(a) the relevant type(s) of electrical system(s) including the technology used for the manufacture of the products inspected, inspection, testing, operation, maintenance, significance of defects and typical problem areas;

(b) where relevant, any associated areas of technology.

8. Equipment
(ISO/IEC 17020:2012 Clause 6.2)

8.1 Inspection and test equipment used during an inspection shall be fit for purpose and suitable for the locations in which it is intended to be used.

9. Inspection methods and procedures
(ISO/IEC 17020:2012 Clause 7.1)

9.1 (a) The inspection body shall make it clear to those seeking the inspection body's services where it may be necessary to close down or otherwise deenergise and isolate equipment in order to complete the inspection. The implications of such isolation shall be considered by the inspection body and owner/operator/user.

(b) The inspection body shall co-operate with the equipment/installation owner/operator/user to ensure that inspections cause the minimum of disruption.

9.2 Inspection staff shall comply with any regulatory or local requirements relating to such procedures as Permits to Work, Sanctions to/for Test and other access control procedures appropriate to the field of activity.

9.3 In particular with Type C inspection bodies, where inspection duties may run concurrently with other duties, for example maintenance work, work being undertaken shall not extend beyond that covered by permits to work (or similar documents). If permit extensions are deemed necessary, authorisation shall be obtained in writing prior to undertaking the work.

10. Inspection records
(ISO/IEC 17020:2012 Clause 7.3)

10.1 Where integral recording facilities in inspection or test equipment are used the data shall be transferred in a readily accessible form to a permanent site at regular intervals.

11. Reporting
(ISO/IEC 17020:2012 Clause 7.4)

11.1 In addition to the requirements of ILAC P15:07/2016 the following shall apply:

Where inspections cannot be completed due to unavailability or non-access to any part of the installation, plant or equipment being inspected this limitation should be stated in the report.

11.2 Where maintenance, remedial or installation work is undertaken concurrently with inspection work, the associated inspection report shall clearly define the work associated with inspection and testing in a manner of sufficient accuracy for meaning audit trails.

11.3 Where the inspection report or certificate includes the results of subcontractors, these results shall be clearly identified.

12. Subcontracting
(ISO/IEC 17020:2012 Clause 6.3)

12.1 The requirements of ILAC P15:07/2016 apply without change.

Appendix 1 Qualification and competency categories

Category 1 A person having a wide general and technical knowledge gained through experience of the type of HV system and the risks involved, normally a chartered electrical engineer.

The person shall have:

(a) technical knowledge and experience in this subject and be able to make proper judgements on the range of technical problems likely to arise in all topics under consideration;

(b) an understanding and working experience of relevant Standards, International and National certification procedures, European Directives and National Regulations based therein, and of other relevant National laws and regulations;

(c) the ability to define inspection duties required;

(d) either the ability to draw up written plans for inspection, or to report on the technical accuracy of plans prepared by others - this knowledge shall include that pertaining to the follow up effects of any failure within their jurisdiction;

(e) the knowledge to correctly interpret the results of submitted reports and properly relate them to the tasks and duties as defined.

Category 2 In addition to the requirements of Category 3 the person shall have a demonstrable:

(a) understanding of electrical standards including design standards and codes of practice for the selection and use of equipment together with the applicable inspection criteria;

(b) understanding of the safety rules and associated codes of practice that are applicable to the operation of HV networks;

(c) understanding of the inspection and maintenance requirements of HV network assets as specified in codes of practice and other relevant documents;

(d) knowledge of electrical inspection procedures which may be employed, including:

Types of inspection:
- initial
- periodic
- sample

Grades of inspection:
- visual - without dismantling
- visual - partial dismantling
- involving diagnostic measurements

(e) knowledge of methods used to maintain electrical integrity;

(f) knowledge of any special electrical inspection and testing techniques which may be required;

(g) understanding of drawings.

Category 3 Persons with a proven minimum level of competence will be suitable for selection at entry level. This may be gained by:

(a) Attending an appropriate assessed HV training course and subsequently receiving a Certificate of Competence.

(b) Persons employed prior to the date of application for accreditation to this module, who have inspection experience gained over a number of years working on high voltage systems. They will work under constant supervision until they have sufficient experience, as determined by their supervisor, to allow them to work under frequent supervision prior to achieving the competence levels required for Category 2.

It is anticipated that a minimum of 1 year working under frequent supervision will be required before upgrading to Category 2 can be considered.

Appendix 2 Levels of supervision

Regular documented meetings of inspection personnel with their management shall be conducted to resolve specific issues and to review work undertaken.

In the Levels described below, 'Supervisor' means a more qualified /and or experienced technical person, however named. Direct Contact means on the job contact at the site of operation.

Level A: Occasional
Formal, direct contact to review work with Supervisor at least annually. More frequent direct contact with Supervisor may be necessary. Authoritative technical support from personnel of Category 1 or 2 to be readily available.

Level B: Infrequent
Direct contact with Supervisor at least every 3 months. Access to supervision and technically authoritative support to be available as needed.

Level C: Frequent
Direct contact with Supervisor at least weekly. Authoritative technical support from Category 1 or 2 personnel.

Level D: Constant
Direct daily contact with Supervisor at site of operation. Authoritative technical support from Category 1 or 2 personnel to be readily available.

Appendix 3 Constraints placed on activities

Inspection personnel shall restrict their tasks to those within the bounds of their authorisation and responsibilities.

Safety access documents such as Permits to Work are required before most tasks are undertaken on non-public HV systems. Only when these have been authorised by the responsible person, can relevant work be undertaken. All the requirements, including signing off on completion, shall be strictly adhered to.

Inspection activities or tests, shall be in accordance with relevant Standards, Codes of Practice, Performance Specifications, and related National Statutory legislation.

Inspection staff must not:

(a) become involved with technology outside their field of declared competence other than when in consultation with, and acting with the approval of, competent persons.

(b) carry out any repairs to equipment or to initiate changes to operating parameters unless it is in accordance with their assigned duties.

(c) authorise or undertake any remedial action beyond their authorisation. Where such action, which is believed to be required, but is outside their authorisation, inspection staff should consult with an authorised responsible person who shall authorise any agreed requirements in writing.

Appendix 4 Selected list of reference documents

The list given is not intended to be exhaustive. Reference should be made to all regulations which are relevant to the location of the installation and also to all revisions which have been published.

SI 1974 No. 1439	Health and Safety at Work etc Act 1974 Chapter 37
SI 1978 No.1039 (NI.9)	Health and Safety at Work (NI) Order 1978
SI 1992 No. 2051	The Management of Health and Safety at Work Regulations 1992
SI 1992 No. 3004	The Workplace (Health, Safety and Welfare) Regulations 1992
SI 1998 No. 2306	Provision and Use of Work Equipment Regulations 1998
SI 1989 No. 635	The Electricity at Work Regulations 1989.
SR 1991 No. 13	The Electricity at Work Regulations (NI) 1991
SI 1988 No. 1057	The Electricity Supply Regulations 1988
BS 6626:2010	Maintenance of electrical switchgear and controlgear for voltages above l kV and up to and including 36 kV
BS 6867:2013	Maintenance of electrical switchgear and controlgear for voltages above 36 kV. Code of practice

The IET also publish various guides and Codes of Practice relating to installations, equipment and inspection and testing such as:

High Voltage Engineering Testing 3rd Edition

The Health and Safety Executive publish a number of guidance documents available from HSE Books.