

RG 101

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Accreditation for the Inspection of Electrical Equipment and Installations in Potentially Explosive Atmospheres

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Changes since last edition

- References to EN 45004 have been updated to ISO/IEC 17020:2012
- EA-5/01 reference updated to ILAC P15:07/2016 - Application of ISO/IEC 17020:2012 for the Accreditation of Inspection Bodies

1. Introduction

- 1.1 This publication should be read in conjunction with:
- ISO/IEC 17020:2012 - Requirements for the Operation of Various Types of Bodies Performing Inspection
 - UKAS publication E1 General Principles for the Assessment of Inspection Bodies by the United Kingdom Accreditation Service
 - ILAC P15:07/2016 Application of ISO/IEC 17020:2012 for the Accreditation of Inspection Bodies
 - UKAS publication RG 0 Guidelines on the competence of personnel undertaking engineering inspections
- 1.2 The field of inspection covered by this publication is electrical equipment and installations in potentially explosive atmospheres. 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 purpose of this publication the term 'Inspection Body' shall be taken to mean an accredited Inspection Body.

2. Inspection services covered by RG 101

- 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) This publication is specific to the requirements of inspection bodies who undertake the inspection of Electrical Equipment and Installations in Potentially Explosive Atmospheres.
- (b) This publication is applicable to electrical equipment and installations operating at all voltages. The equipment and/or installation may be permanent, temporary, portable, transportable or hand held.
- (c) This publication is also applicable to equipment and parts of an installation which are not located within the potentially explosive atmosphere but perform a control, safety or monitoring function in accordance with the protective concept if they contribute to the safe working of such equipment, e.g. start restrict relays required for EEx'e' motor protection.

3. Impartiality and independence

(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 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 bodies 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. Organization, 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)

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](#).
- (a) Categories, levels of supervision, constraints placed on activities and risk group assessment are explained in Appendices 1, 2, 3 and 4.
 - (b) Category 1 personnel undertaking inspection activities shall be subject to Supervision Level A.
 - (c) Personnel can operate in risk groups below their limit of authorisation with the same supervision level applicable to the higher group. E.g. Category 2 (4 years' experience) would require Level A supervision to operate in group Y or group Z.
 - (d) An inspection body may be accredited to undertake inspections in one or more of the risk groups X, Y, or Z.

Table 1 Experience category and supervision

Risk Group	Technical Manager & Deputy	Inspection Personnel Limits	Entry Level Category 3
X	Category 1 (X) 5 years' experience in this risk group	Category 2 (X) 4 years' experience Supervision Level A	In all risk groups the preferred entry level for competence will be the possession of a national certificate of competency e.g. 'Compex' Certificate in appropriate EEx Units Supervision will be Level D
Y	Category 1 (Y) 5 years' experience in this risk group	Category 2 (Y) 3 years' experience Supervision Level B	
Z	Category 1 (Z) 4 years' experience in this risk group	Category 2 (Z) 2 years' experience Supervision Level C	

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 (a) Inspection and test equipment used during an inspection shall be suitable for the hazardous area in which it is intended to be used.
- (b) The use of equipment not specifically designed for the hazardous area shall not be authorised unless or until the location where it is to be used has been declared non-hazardous.

9. Inspection methods and procedures

(ISO/IEC 17020:2012 clauses 7.1 & 7.2.2)

- 9.1 (a) The inspection body shall make it clear, to those seeking the inspection body's services, where there may be the need to close down or otherwise de-energise and isolate equipment in order to complete the inspection. The implications of such action 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 operating needs and safety requirements.
- 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 frequent 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 under inspection these limitations 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 meaningful audit trails.
- 11.3 Where the inspection report or certificate includes the results of subcontractors, these results shall be clearly identified.

12. Sub-contracting

(ISO/IEC 17020:2012 Clause 6.3)

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 this type of plant 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, European Directives and National Regulations based thereon, and of other relevant National laws and regulations for the installation, maintenance and use of electrical equipment and installations in potentially explosive atmospheres.
- (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 the 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 demonstrable:

- (a) understanding of electrical Standards and codes of practice relating to the selection, installation, maintenance and use of explosion protected apparatus.
- (b) knowledge of methods used to maintain electrical integrity and explosion protection concepts.
- (c) knowledge of electrical inspection procedures which may be employed, including:
Types of inspection: initial, periodic and sample.
Grades of inspection: visual, close and detailed.
- (d) knowledge of any special electrical inspection techniques which may be required.
- (e) understanding of drawings, and manufacturers literature, relevant to the equipment to be inspected.

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 assessed training course and receiving a Certificate of Competence on satisfactorily meeting the assessment requirements.
- (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 in potentially explosive atmospheres.

They will work under constant supervision until they have sufficient experience, as determined by their supervisors, 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

App3.1 Inspection personnel shall restrict their tasks to those within the bounds of their authorization and responsibilities.

App3.2 Safety access documents, such as Permits to Work, are required before certain tasks in potentially explosive atmospheres are undertaken. Only when these have been authorised by the responsible person, can relevant work be undertaken. All their requirements, including signing off on completion, shall be strictly adhered to.

App3.3 Inspection activities or tests shall be in accordance with relevant Standards, Codes of Practice, Performance Specifications, and related National Statutory legislation.

App3.4 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 authorization. Where such action is believed to be required but is outside their authorisation, inspection staff should consult with authorised responsible persons who shall authorise any agreed requirements in writing.

Note

If the intent is to inspect equipment located where the risk is not from petroleum or gaseous products and may be from combustible dusts, evidence of knowledge of the dangers arising from these materials will be required.

Appendix 4 Guidelines on Risk Assessment

The risks under consideration may be divided into the following 3 main areas.

- (a) Risks to people
- (b) Risks to the environment
- (c) Risks to Company assets including plant and equipment

App4.1 Risks to people

- (a) Reference to the number of deaths or injuries which have occurred in incidents suggest that multiple deaths or more than 5 serious injuries, are seen as a major incident. There is no way of predicting that an incident will result in death or injury, but the probability will be dependent upon the number of people involved and their proximity to the incident.
- (b) Work undertaken by the Petrochemical industry during recent years has suggested that people within about 1000 metres from an incident could be put at risk (EEMUA Publication No. 181 – see [Appendix 5](#))
- (c) The assessment is based on the probability of persons being within range of any incident occurring within an area Zoned as being a 'Potentially explosive area'.

App4.2 Risks to the environment

- (a) This will include danger to animals, wildlife and marine life, pollution of seas, waterways and streams, damage to vegetation, herbage, trees.

App4.3 Risks to assets

- (a) This will depend on the assessed value of the particular plant. A new plant processing an expensive product in short supply will be valued higher than an ageing plant producing a product in plentiful supply, although rebuilding costs might be similar.
- (b) This risk should include loss of product, and other economic considerations. The value attributed to asset loss does not include consequential loss.

Examples of risk levels are shown in [Table App4.1](#) and of risk levels associated with plant type and location are given in [Table App4.2](#).

Table App4.1 Examples of risk levels

	No. of people	Distance from zoned area	Extent of pollution	Asset loss per incident
High risk level	>100 30 - 100	50 - 200 m <50 m	Pollution over whole area >4 sq km	>£100M
Medium risk level	>100 30 - 100 11 - 30	200 - 1000 m 50 - 200 m <50 m	Pollution range up to 4 sq km area	£1M - £100M
Low risk level	30 - 100 11 - 30 3 - 10	200 - 1000 m 50 - 200 m <50 m	Pollution limited to area immediately surrounding source	<£1M

Note

The values attached to the asset loss are representative of the rebuild and other costs attributable to an incident, and are not values for consequential loss, which could be significant.

Where situations exist, such as, for example, a gas filling plant or storage depot in a largely residential area, some engineering judgement will be required. Similarly paint spraying plant may vary from a single one-man gun to, for example, a complete car body spray line.

Table App4.2 Area of risk and risk levels for different plant type and locations

Risk group	Example of location	People			Environment			Asset loss (per incident)		
		H	M	L	H	M	L	H	M	L
X	Complete refinery	✓			✓			✓		
	Large chemical process plant	✓			✓			✓		
	Off-shore platforms	✓			✓			✓		
Y	Single batch mixing / blending plant on large site			✓			✓		✓	
	Petroleum/gas pumping station, remote unmanned			✓	✓				✓	
	Flour, coal, sugar milling		✓				✓		✓	
	Storage depot		✓		✓					✓
Z	Distribution point			✓		✓				✓
	Petrol station forecourts			✓		✓				✓
	Bagging plants			✓		✓				✓
	Paint spraying equipment			✓		✓				✓

Note

The risk assessment tables are based on user experience within industry and present knowledge and should be used with engineering judgement according to location.

Appendix 5 Selected List of Reference Documents

BS 7671:2018 Requirements for Electrical Installations (IEE IET Wiring Regulations)

The IETE also publish various guides and Codes of Practice relating to installations, equipment and inspection and testing such as: Guidance Note 3 Inspection and Testing 18th Edition 2018 Other related statutory requirements include;

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 1990 No. 13 The Electricity at Work Regulations (NI) 1991

SI 1994 No. 3260 The Electrical Equipment (Safety) Regulations 1994 (Implementing the Low Voltage Directive).

SI 1994 No. 1768 The Plugs and Sockets etc. (Safety) Regulations 1994

SI 1988 No. 1057 The Electricity Supply Regulations 1988

SI 2002 No. 2776 The Dangerous Substances and Explosive Atmospheres Regulations 2002

The Health and Safety Executive publish several guidance documents available from HSE Books.

Dangerous Substances and Explosive Atmospheres Regulations 2002: Approved Code of Practice and guidance: L138

British, European and International Standards relating to equipment which is the subject of inspection. E.g.:

BS EN 60079-17:2014 Explosive atmospheres. Electrical installations inspection and maintenance.

EEMUA Publication No 181: A guide to risk-based assessments of in-situ large Ex 'e' and Ex 'N' machines. This work resulted in the preparation of Standards publication DD ENV 50269:97, 'Assessment and representative testing of high-voltage machines'.

(EEMUA, 45 Beech Street, London, EC2Y 8AD)

The list given above 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.