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Guide to the Regulatory Requirements For Explosion-protected Apparatus

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mineral resources
Department:
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Contents

This document is referenced in the Mine Health and Safety Act, 1996 (Act No. 29 of 1996)

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Reference is made in 3.1.5, 3.1.18 and 6.3.3 to the "relevant national legislation". In South Africa, this means the applicable of the following:

a) The Mine Health and Safety Act, 1996 (Act No. 29 of 1996)

Reference is made in 3.1.2, 4.2(b), 4.4, 5.1.2 and the note to B.1 to a "government-endorsed accreditation body". In South Africa, this means the South African National Accreditation System (SANAS).

Reference is made in 5.2.2 to the "relevant national department". In South Africa this means the Department of Mineral Resources.

Reference is made in A.15 to the "relevant national legislation". In South Africa this means the Mine Health and Safety Act, 1996 (Act No. 29 of 1996).

Reference is made in E.2.2(a) to the "authorised representative of the regulator of mines". In South Africa this means the Chief Inspector of Mines of the Department of Mineral Resources as defined in the Mine Health and Safety Act, 1996 (Act No. 29 of 1996).

Annexes A, B, D, E, F, G, H, J, K and L form an integral part of this document. Annexes C and I are for information only.

1. INTRODUCTION

The regulator referred to in this document agreed that information pertaining to statutory product conformity requirements, including approved standards, approved inspection authorities, accredited/approved test laboratories, and approved certification bodies, will be made publicly available by means of this recommended practice.

The Chief Inspector of Mines of the Department of Mineral Resources has undertaken to accept responsibility for the accuracy and the updating of this recommended practice and the Department of Mineral Resources will promptly publish any changes made.

2. SCOPE

This recommended practice deals with product conformity requirements for explosion-protected apparatus used in South Africa.

NOTE SANS 10108 covers the classification of hazardous locations in terms of the possibility of fire or explosion owing to the presence of flammable gases, vapours, mists, dusts, fibres or flyings in the air, and also gives the selection criteria for apparatus suitable for safe use in such locations, called explosion-protected apparatus.

3. NORMATIVE REFERENCES

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies. Information on currently valid national and international standards can be obtained from the SABS Standards Division.

3.1 Standards

SANS 96, *Batch sampling and acceptance criteria for explosion-protected apparatus (EPA).*

SANS 808, *Cable glands for use on flameproof enclosures (Ex d)*.

SANS 868-1-1, *Compression-ignition engine systems and machines powered by such engine systems, for use in mines and plants with explosive gas atmospheres or explosive dust atmospheres or both – Part 1-1: Hazardous locations in underground mines – Basic explosion protected engines.*

SANS 868-1-2, *Compression-ignition engine systems and machines powered by such engine systems, for use in mines and plants with explosive gas atmospheres or explosive*

dust atmospheres or both – Part 1-2: Hazardous locations in underground mines – Explosion protected engine systems.

SANS 868-1-3, *Compression-ignition engine systems and machines powered by such engine systems, for use in mines and plants with explosive gas atmospheres or explosive dust atmospheres or both – Part 1-3: Hazardous locations in underground mines – Machines.*

SANS 868-3-1, *Compression-ignition engine systems and machines powered by such engine systems, for use in mines and plants with explosive gas atmospheres or explosive dust atmospheres or both – Part 3-1: Hazardous locations on surface – Basic explosion protected engines.*

SANS 868-3-2, *Compression-ignition engine systems and machines powered by such engine systems, for use in mines and plants with explosive gas atmospheres or explosive dust atmospheres or both – Part 3-2: Hazardous locations on surface – Explosion protected engine systems.*

SANS 868-3-3, *Compression-ignition engine systems and machines powered by such engine systems, for use in mines and plants with explosive gas atmospheres or explosive dust atmospheres or both – Part 3-3: Hazardous locations on surface – Machines.*

SANS 868-1[1)], *Flameproof compression ignition engines for use in hazardous areas in mines – Part 1: Engine subassembly*.

SANS 868-4, *Compression-ignition engine systems and machines powered by such engine systems, for use in mines and plants with explosive gas atmospheres or explosive dust atmospheres or both – Part 4: Non-hazardous locations in underground coal mines.*

SANS 970/ISO 5397, *Leather – Determination of nitrogen content and "hide substance" – Titrimetric method.*

SANS 1020, *Power-operated dispensing devices for flammable liquid fuels*.

SANS 1142[2)], *Diesel engines modified for use in hazardous locations (other than in mines).*

SANS 1213, *Mechanical cable glands*.

1) This standard has been withdrawn and replaced with SANS 868-1-1, SANS 868-1-2 and SANS 868-1-3, but it has been included because equipment might still be manufactured to this standard during the validity period of the equipment certification.
2) This standard has been withdrawn and replaced with SANS 868-3-1, SANS 868-3-2 and SANS 868-3-3, but it has been included because equipment might still be manufactured to this standard during the validity period of the equipment certification.

SANS 1438, *Portable light assemblies for underground use in mines.*

SANS 1489-1, *Electrical connectors in group I and group II hazardous areas – Part 1: General requirements for group I hazardous areas.*

SANS 1489-2, *Electrical connectors in group I and group II hazardous areas – Part 2: Restrained type plugs and sockets for group I hazardous areas.*

SANS 1489-3, *Electrical connectors in group I and group II hazardous areas – Part 3: Bolted type plugs and sockets for group I hazardous areas.*

SANS 1489-4, *Electrical connectors in group I and group II hazardous areas – Part 4: Medium voltage couplers and adaptors for group I hazardous areas.*

SANS 1515-1, *Gas measuring equipment primarily for use in mines – Part 1: Battery-operated portable, flammable gas measuring instruments and warning devices.*

SANS 1515-2, *Gas measuring equipment primarily for use in mines – Part 2: Fixed, transportable and vehicle-mounted flammable gas measuring and warning sensor heads and instruments.*

SANS 1654, *DC-powered (battery-operated) machines for use in hazardous locations in mines*.

SANS 1804-2, *Induction motors – Part 2: Low-voltage three-phase standard motors.*

SANS 10086-2, *The installation, inspection and maintenance of equipment used in explosive atmospheres – Part 2: Electrical apparatus installed underground in mines.*

SANS 10108,*The classification of hazardous locations and the selection of apparatus for use in such locations.*

SANS 10142-1, *The wiring of premises – Part 1: Low-voltage installations.*

SANS/ISO 14001, *Environmental management systems – Requirements with guidance for use.*

SANS 60079-0/IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*.

SANS 60079-1/IEC 60079-1, *Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures "d".*

SANS 60079-2/IEC 60079-2, *Explosive atmospheres – Part 2: Equipment protection by pressurized enclosures "p".*

SANS 60079-5/IEC 60079-5, *Explosive atmospheres – Part 5: Equipment protection by powder filling "q"*.

SANS 60079-6/IEC 60079-6, *Explosive atmospheres – Part 6: Equipment protection by oil-immersion "o".*

SANS 60079-7/IEC 60079-7, *Explosive atmospheres – Part 7: Equipment protection by increased safety "e".*

SANS 60079-11/IEC 60079-11, *Explosive atmospheres – Part 11: Equipment protection by intrinsic safety "i"*.

SANS 60079-13/IEC 60079-13, *Explosive atmospheres – Part 13: Equipment protection by pressurized room "p".*

SANS 60079-15/IEC 60079-15, *Explosive atmospheres – Part 15: Equipment protection by type of protection "n"*.

SANS 60079-16/IEC 60079-16, *Electrical apparatus for explosive gas atmospheres – Part 16: Artificial ventilation for the protection of analyzer(s) houses*.

SANS 60079-18/IEC 60079-18, *Explosive atmospheres – Part 18: Equipment protection by encapsulation "m"*.

SANS 60079-25/IEC 60079-25, *Explosive atmospheres – Part 25: Intrinsically safe electrical systems.*

SANS 60079-26/IEC 60079-26, *Explosive atmospheres – Part 26: Equipment with equipment protection level (EPL) Ga.*

SANS 60079-28/IEC 60079-28, *Explosive atmospheres – Part 28: Protection of equipment and transmission systems using optical radiation.*

SANS 60079-30-1/IEC 60079-30-1, *Explosive atmospheres – Part 30-1: Electrical resistances trace*
heating – General and testing requirements.

SANS 60079-30-2, *Explosive atmospheres Part 30-2: Electrical resistance trace heating - Application guide for design, installation and maintenance* SANS 60079-31/IEC 60079-31, *Explosive atmospheres – Part 31: Equipment dust ignition protection by enclosure "t".*

SANS 60079-33/IEC 60079-33, *Explosive atmospheres – Part 33: Equipment protection by special protection "s".*

SANS 60529, *Degrees of protection provided by enclosures (IP Code).*

SANS 61241-1[3)], *Electrical apparatus for use in the presence of combustible dust – Part 1: Protection by enclosures "tD"*.

SANS 61241-1-1[3)], *Electrical apparatus for use in the presence of combustible dust – Part 1-1: Electrical apparatus protected by enclosures and surface temperature limitation – Specification for apparatus.*

SANS 61241-11, *Electrical apparatus for use in the presence of combustible dust – Part 11: Protection by intrinsic safety "iD".*

SANS 61241-18[4)], *Electrical apparatus for use in the presence of combustible dust – Part 18: Protection by encapsulation "mD".*

SANS 62262/IEC 62262, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code).*

3.2 Other publications

ATEX Directive (Directive 94/9/EC), *The approximation of the laws of Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres.*

4. DEFINITIONS AND ABBREVIATIONS

For the purposes of this document, the definitions given in SANS 10108 and the following apply.

4.1 Definitions

4.1.1 **acceptable**
acceptable to the relevant national regulator or regulators

4.1.2 **accredited test laboratory (ATL)**
test laboratory that is accredited by a government-endorsed accreditation body (see foreword), and approved by the relevant regulator(s) to carry out tests

3) This standard has been withdrawn and replaced with SANS 60079-31, but it has been included because equipment might still be manufactured to this standard during the validity period of the equipment certification.
4) This standard has been withdrawn and replaced with SANS 60079-18, but it has been included because equipment might still be manufactured to this standard during the validity period of the equipment certification.

specified in the appropriate standards and to issue certificates (known as IA certificates) for explosion-protected apparatus (EPA) indicating that such apparatus complies with safety requirements and any other requirements of the relevant regulator(s)

4.1.3 **approved**
approved by the relevant national regulator

4.1.4 **approved certification body**
certification body whose IA certificates are accepted by the relevant national regulator or regulators

4.1.5 **approved standard**
standard approved by the relevant national regulator or regulators in terms of the relevant national legislation (see foreword)

4.1.6 **batch**
not more than 300 units of apparatus, for example, basic explosion-protected engines or components of such engines, of the same type and size, from one supplier or repairer and submitted at any one time for assessment and testing, in accordance with SANS 96

4.1.7 **batch testing**
testing conducted by an ATL on a batch of apparatus of type tested and certified design, to verify compliance with this recommended practice

4.1.8 **declaration of conformance (DOC)**
document supplied by a manufacturer or a repairer that is a member of a mark scheme, declaring that the equipment covered by the declaration has been manufactured or repaired in accordance with the requirements of the mark scheme

4.1.9 **equipment protection level (EPL)**
level of protection assigned to equipment based on its likelihood of becoming a source of ignition between explosive gas atmospheres, explosive dust atmospheres, and the explosive atmospheres in mines susceptible to firedamp

NOTE: The equipment protection level may optionally be employed as part of a complete risk assessment of an installation (see SANS 60079-14).

4.1.9.1 ***EPL Da***
equipment for explosive dust atmospheres, having a "very high" level of protection, and which is not a source of ignition in normal operation, during expected malfunctions, or during rare malfunctions

4.1.9.2 ***EPL Db***

equipment for explosive dust atmospheres, having a "high" level of protection, and which is not a source of ignition in normal operation or during expected malfunctions

4.1.9.3 ***EPL Dc***

equipment for explosive dust atmospheres, having an "enhanced" level of protection, which is not a source of ignition in normal operation, and which may have some additional protection to ensure that it remains inactive as an ignition source in the case of regular expected occurrences (for example, the failure of a lamp)

4.1.9.4 ***EPL Ga***

equipment for explosive gas atmospheres, having a "very high" level of protection, and which is not a source of ignition in normal operation, during expected malfunctions or during rare malfunctions

4.1.9.5 ***EPL Gb***

equipment for explosive gas atmospheres, having a "high" level of protection, and which is not a source of ignition in normal operation or during expected malfunctions

4.1.9.6 ***EPL Gc***

equipment for explosive gas atmospheres, having an "enhanced" level of protection, which is not a source of ignition in normal operation, and which may have some additional protection to ensure that it remains inactive as an ignition source in the case of regular expected occurrences (for example, the failure of a lamp)

4.1.9.7 ***EPL Ma***

equipment for installation in a mine susceptible to firedamp, having a "very high" level of protection, which has sufficient security that it is unlikely to become an ignition source in normal operation, during expected malfunctions or during rare malfunctions, even when left energized in the presence of an outbreak of gas

4.1.9.8 ***EPL Mb***

equipment for installation in a mine susceptible to firedamp, having a "high" level of protection, which has sufficient security that it is unlikely to become a source of ignition in normal operation or during expected malfunctions in the time span between there being an outbreak of gas and the equipment being de-energized

4.1.10 **explosion-protected (Ex) equipment (EPA)**
explosion-protected (Ex) apparatus
equipment designed and approved for use in explosive atmospheres (hazardous areas) in accordance with a suitable protection method

NOTE 1: In IEC standards, the term "equipment for (use in) explosive atmospheres" is preferred. "Equipment" is used as a general term including apparatus, fittings, devices, components, and the like.

NOTE 2: Most current explosion protection techniques apply to electrical equipment, but standards are being developed for mechanical Ex equipment. The SANS 868 series applies to flameproof compression-ignition engines (diesel engines).

4.1.10.1 ***group I equipment***
electrical equipment intended for use in mines susceptible to firedamp

NOTE 1: The types of protection for Group I take into account the ignition of both firedamp and coal dust along with enhanced physical protection for equipment used underground.

NOTE 2: Electrical equipment intended for mines where the atmosphere, in addition to firedamp, may contain significant proportions of other flammable gases (i.e. other than methane), should be constructed and tested in accordance with the requirements relating to Group I and also to the subdivision of Group II corresponding to the other significant flammable gases. This electrical equipment should then be marked appropriately (for example, "Ex d I/IIB T3" or "Ex d I/II (NH3)").

4.1.10.2 ***group II equipment***
electrical equipment intended for use in places with an explosive gas atmosphere other than mines susceptible to firedamp

NOTE 1: Electrical equipment of Group II is subdivided according to the nature of the explosive gas atmosphere for which it is intended. Group II subdivisions are as follows:
a) IIA: a typical gas is propane;
b) IIB: a typical gas is ethylene; and
c) IIC: a typical gas is hydrogen.

NOTE 2: Equipment marked IIB is suitable for applications requiring Group IIA equipment. Similarly, equipment marked IIC is suitable for applications requiring Group IIA or Group IIB equipment.

4.1.10.3 ***group III equipment***

electrical equipment intended for use in places with an explosive dust atmosphere other than mines susceptible to firedamp

NOTE 1: Electrical equipment of Group III is subdivided according to the nature of the explosive dust atmosphere for which it is intended. Group III subdivisions are as follows:

a) IIIA: combustible flyings;
b) IIIB: non-conductive dust; and
c) IIIC: conductive dust.

NOTE 2: Equipment marked IIIB is suitable for applications requiring Group IIIA equipment. Similarly, equipment marked IIIC is suitable for applications requiring Group IIIA or Group IIIB equipment.

4.1.11 explosive atmosphere

air, under atmospheric conditions, mixed with flammable substances in the form of gas, vapour, mist, dust, fibres, or flyings which, after ignition, permits self-sustaining propagation

4.1.12 hazardous location
hazardous area

area in which an explosive gas atmosphere, or an explosive dust atmosphere, or an explosive gas/dust atmosphere is, or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of equipment

NOTE: For information on hazardous areas in specific industries, see SANS 10108.

4.1.13 **IA certificate**
type certificate

national certificate issued for Ex equipment by an ATL endorsing conformance with the relevant national standards

NOTE 1: IA certificates apply to both surface (Group II and Group III) and mining (Group I) applications.

NOTE 2: The entity who submits the equipment for testing, and in whose name the certificate is issued is described as the "certificate holder", the issuing ATL is the legal owner of the certificate.

4.1.14 **IA certificate holder**

entity to whom the IA certificate is issued

4.1.15 **maintenance**
routine actions taken to preserve the fully serviceable condition of the installed apparatus

NOTE: "Routine" can include minor repairs in the form of change or replacement "in kind", for example, replacement of ballasts or lamps, which are identical to the original parts.

4.1.16 **notified body**
body that carries out the tasks pertaining to the conformity assessment procedures referred to in the applicable ATEX Directive of the European Community when third party certification is required

NOTE: In European countries where the ATEX Directive applies, member countries are responsible for identifying the notified bodies.

4.1.17 **product certification scheme**
mark scheme
scheme that aims to ensure that a product covered under the scheme, and that bears the certification mark of the scheme, complies with the defined standard or standards, by using control elements such as surveillance audits and production sample assessments

4.1.18 **regulator**
as defined in the relevant national legislation (see foreword)

4.1.19 **repair**
action taken to restore a faulty apparatus to its fully serviceable condition, and in compliance with the relevant standard

NOTE 1: The "relevant standard" means the explosion protection standard to which the apparatus was originally designed or a more recent version.

NOTE 2: Minor repairs carried out on the user's premises by maintenance staff are considered to be maintenance.

4.1.20 **safe electrical system**

4.1.20.1 ***certified intrinsically safe electrical system***
intrinsically safe electrical system for which a certificate has been issued confirming that the electrical system complies with the relevant system standard

NOTE: SANS 60079-25 is such a system standard.

4.1.20.2 ***intrinsically safe electrical system***
intrinsically safe loop
assembly of interconnected items of electrical apparatus, described in a descriptive system document, in which the circuits or parts of circuits, intended to be used in an explosive atmosphere, are intrinsically safe circuits

4.1.21 ***special IA certificate***
special type certificate
certificate issued by an ATL for Ex equipment submitted for repair or refurbishment and which has no IA certificate but for which proof of Ex certification exists to endorse conformance with the most critical requirements of relevant national standard(s), and which has a certificate number ending with "S"

4.1.22 **type testing**
assessments and tests conducted on prototype apparatus by an ATL to verify compliance of the apparatus design and performance with the applicable standard(s), and the results of which are normally published in a type test report confidential to the certificate holder and issuing ATL

4.1.23 **typical loop**
system in which the equipment (including cabling), type, explosion protection rating and certification) has not been changed and the loop or an additional loop is required to be installed in another location in the existing plant

4.2 Abbreviations

ANZEx (Scheme)	Australian and New Zealand explosion protection scheme
BASEEFA	British Approvals Service for Electrical Equipment in Flammable Atmospheres
BVS	Bergbau-Versuchsstrecke
CENELEC	Comité Européen de Normalisation Électrotechnique
CESI	Centro Elettrotecnico Sperimentale Italiano
CSA	Canadian Standards Association
DEMKO	Danmarks Elektriske Materielkontrol
DIP	Dust-Ignition-Proof or Dust-Ignition-Protected
DMT	Deutsche Montan Technologie

IS	Intrinsic safety or intrinsically safe (alternative to "Ex i")
EPA	Explosion-protected apparatus
FM	Factory Mutual Research Corporation
IECEx	International Electrotechnical Commission explosion protection System
ILAC	International Laboratory Accreditation Cooperation
ISA	International Society of Automation
INERIS	Institut National de l'Environnement Industriel et des Risques
ISSeP	Institut Scientifique de Service Public
LCIE	Laboratoire Central des Industries Electriques
LOM	Laboratório Oficial José Maria de Madariaga
MASC	Mining and Surface Certification
NEMKO	Norges Elektriske Materiellkontroll
NFPA	National Fire Protection Association
OEM	Original Equipment Manufacturer
PTB	Physikalisch-Technische Bundesanstalt
SAEx	South African Explosion Prevention
SCS (previously Sira)	Sira Certification Service
SIMTARS	Safety in Mines Testing and Research Station
SP	Sveriges Provnings
TÜV	Technischer Überwachungsverein
UL	Underwriters' Laboratories

5. REGULATORY REQUIREMENTS FOR EXPLOSION-PROTECTED EQUIPMENT

5.1 Product conformity for explosion-protected equipment is established through testing and certification by means of

a) type testing in accordance with 4.2 (compulsory for all equipment), and either

b) batch testing the production units in accordance with 4.2, or

c) producing production units under an approved product certification scheme.

NOTE: The following terms are also used to describe aspects of certification:
a) unit verification, for batch testing; and
b) production quality assurance, for control of the production process under a product certification scheme.

5.2 The minimum requirements for type testing or batch testing are as follows:

a) An approved standard shall be used.

b) Testing or assessment (or both) shall be carried out by an ATL (accreditation recognized by ILAC, for example, accreditation by a government-endorsed accreditation body (see foreword), in accordance with SANS 17025, will normally be approved).

When a laboratory subcontracts work, either because of unforeseen circumstances (for example, workload, need for further expertise or temporary incapacity), or on a continuing basis (for example, through permanent subcontracting, agency or another accredited test laboratory), SANS 17025 requires that this work shall be placed with a competent subcontractor. A competent subcontractor is one that, for example, complies with the requirements of SANS 17025, for the work in question.

c) A type test (IA) certificate for type-tested apparatus shall be issued.

d) A batch test report shall be issued for batch-tested apparatus, and shall include

1) the serial numbers of the batch items, and
2) the number of the IA certificate.

Batch testing shall be carried out by a test officer accredited for the relevant approved standard(s). The testing or assessment shall be carried out against the original test report and against a checklist approved by the test officer. Any routine test specified in the standard(s) shall be carried out.

Testing shall be non-destructive. The sampling concept given in SANS 96 may be applied. If the batch testing is done by an ATL other than the ATL that originally certified the product, the ATL carrying out the batch testing will issue a batch assessment report.

5.3 For batch-tested apparatus, any units listed in the batch test report that are not sold by the expiry date of the covering IA certificate shall not be deemed to be covered by the IA certificate unless submitted to the following procedure:

a) Sample quantities, in accordance with SANS 96, shall be selected by the ATL from the full batch (i.e. shall not be selected by the supplier).

b) A supplement to the IA certificate (or a new certificate with supplement if the ATL is not the same) shall be issued and shall include the relevant serial numbers.

5.4 A product certification scheme shall be operated by an approved certification body and shall be of an acceptable type.

NOTE: Normally, a certification body with accreditation recognized by the International Accreditation Forum (IAF), for example, accreditation by a government-endorsed accreditation body (see foreword), in accordance with ISO/IEC 17065, will be approved.

5.5 All new, converted, re-designed or repaired apparatus for use in hazardous locations in all surface industries and mines shall, in accordance with annex A, have an IA certificate number displayed on such apparatus before being entered into service.

The IA certificate shall be in accordance with the requirements of 4.1 to 4.3, but additional requirements, such as for mine-worthiness, may apply as determined by the Chief Inspector of Mines from time to time.

5.6 All types of explosion-protected apparatus (EPA) shall be independently tested and certified by an ATL. Self-certification shall not be allowed.

NOTE: In certain countries and regions, a degree of self-certification is allowed. For example, the ATEX Directive (Directive 94/9/EC) on explosion-protected apparatus traded in the European Union allows self-certification of equipment. Such test results will not be accepted for the issue of an IA certificate.

5.7 All types of explosion-protected apparatus shall comply with the relevant approved standard(s) given in annex B.

NOTE: In certain countries and regions, certification based on other requirements is allowed. For example, the ATEX Directive (Directive 94/9/EC) on explosion-protected apparatus traded in the European Union allows certification in accordance with the so-called essential health and safety requirements. Compliance with these requirements only will not be accepted for the issue of an IA certificate.

5.8 Intrinsically safe systems (loops) shall be type approved to SANS 60079-25 by an ATL. Typical loops may be installed under cover of the original type approval without recertification by an ATL.

FISCO systems complying with SANS 60079-11 (see Annex I) and SANS 60079-25 also require ATL approval

5.9 IA certificates and test reports are not transferrable. They remain the property of the issuer (ATL). The recipient has the right to make copies and issue them to those who may require a copy of the documents.

6. APPROVED STANDARDS, TEST LABORATORIES AND CERTIFICATION BODIES

NOTE: An organization (for example, company or Group of companies) may often offer testing as well as certification services. The independence of these services is ensured by the accreditation process.

6.1 General

6.1.1 Annex B refers to the standards and test laboratories for the testing and certification of explosion-protected apparatus, and annex C lists approved certification bodies and their certification markings.

6.1.2 The accreditation of the test laboratory shall incorporate the standard or standards to which assessment and testing have been done, unless the relevant regulator approves, in writing, a limited period of approval for such tests to be carried out until accreditation has been completed by the government-endorsed accreditation body (see foreword). An authenticated copy of a test report issued by the test laboratory that indicates such accreditation can normally be considered as sufficient proof of accreditation.

6.1.3 The application of the certification mark associated with a product certification scheme to a unit can normally be considered as sufficient proof of production of the unit under the scheme. An authenticated copy of the scheme certificate covering the apparatus shall also be provided. In the case of batch testing, an authenticated copy of the batch test report shall be provided (see 4.2).

6.1.4 The date publication of the standard or any amendment against which the testing is conducted, may not be older than 10 years.

6.2 Validity of certification

6.2.1 Certification of Ex equipment may become invalid or re-certification may be desirable due to various reasons. For example, standards are subject to change to upgrade the protection they offer, on a regular basis. Further, modifications may render equipment unsafe.

6.2.2 The rules established by the relevant national departments (see foreword) with regards to the validity of certification shall be as specified in annex A.

7. OTHER CERTIFICATION SCHEMES - OPERATION AND ACCEPTABILITY OF CERTIFICATES

7.1 ATEX Directive - European Union

7.1.1 The European Union's product certification scheme for explosion-protected apparatus under the New Approach Directives is defined in the ATEX Directive (Directive 94/9/EC). The ATEX Directive requires compliance with the so-called essential health and safety requirements that may be partly demonstrated by compliance with the harmonized EN 60079 series. Only apparatus certified according to the ATEX Directive may be sold in the European Union as from 1 July 2003.

NOTE: The ATEX Directive was preceded by Directive 76/117/EEC (equipment for surface plants) and Directive 82/130/EEC (equipment for gaseous mines).

7.1.2 Test results covered by ATEX certificates issued by European Notified Bodies shall be acceptable for certification purposes in South Africa under the following conditions:

a) All equipment shall be third-party certified; self-certified apparatus for zone 2 (for example, Ex nA apparatus) and zone 22 (for example, Ex tc apparatus) shall not be accepted.

b) All apparatus shall comply fully with the relevant standards, i.e. apparatus certified only in accordance with the essential health and safety requirements of the ATEX Directive shall be locally assessed and certified as specially protected (Ex s).

c) Suppliers shall obtain, and supply at least the following documentation to the ATL for the issue of an IA certificate:

1) an EC-type examination certificate prepared by a notified body; and

2) a valid quality assurance notification, issued by a notified body.

Importers or suppliers (or both) are required to keep such documentation in their possession for as long as the items are in service. ATLs are required to keep such documentation for a period of at least two years after the expiry of the IA certificate.

NOTE: Category 3 (zone 2 and zone 22 according to the ATEX Directive) explosion-protected apparatus may be self-certified under the ATEX Directive, but self-certified apparatus is not acceptable in South Africa (see 4.6).

In order for apparatus (other than dust-ignition-protected apparatus listed in SANS 10108) to be used in zone 20 and zone 21 locations, its certification generally needs to include such intended use.

7.1.3 In cases where the equipment protection is not fully covered by a standard or standards (as given in annex B) from the EN 60079 series due to, for example, technological advancement, certification in accordance with the essential health and safety requirements is allowed under the ATEX Directive, but only apparatus that is fully compliant with an EN 60079 series standard or standards is acceptable for certification in South Africa (see 4.7).

7.1.4 The manufacturer shall be represented within the European Union. The manufacturing process shall meet one of four possible product/production control factors as detailed in the ATEX Directive (Directive 94/9/EC).

7.1.5 Test laboratories and certification bodies are appointed as Notified Bodies in each member country of the European Union. The Notified Bodies in the European Union (appointed under the ATEX Directive) include, but are not limited to, BASEEFA 2001, CESI, DEMKO, DMT, INERIS, ISSeP, LCIE, LOM, NEMKO, PTB, SCS, SP and certain branches of TÜV. The website of the European Union shall be consulted for the latest list of Notified Bodies and their accreditations.

7.2 UL, FM and CSA listing — North America

Once the apparatus has been type tested to a UL, FM or CSA standard, a manufacturer can apply for the listing mark.

NOTE 1: Some IEC standards have been adopted in the United States of America.

NOTE 2: Historically, selected North-American certificates have been accepted in South Africa.

7.3 IECEx certified equipment scheme — International

7.3.1 Participating countries may nominate national test laboratories (ExTLs) or certification bodies (ExCBs) for assessment and accreditation under the scheme (which is part of the IECEx System). The IEC 60079 series of standards and recently also the ISO/IEC 80079 series of standards (requirements related to non-electrical Ex equipment or to both electrical and non-electrical Ex equipment) are used for assessment and testing.

7.3.2 South Africa participates in the scheme and therefore every effort shall be made to accept IECEx reports and certificates without further testing.

7.3.3 Countries that have adopted or are adopting the IECEx standards include, but are not limited to, most of the European countries, eastern countries, Australia, the USA, and Canada. The degree to which IEC standards are adopted varies greatly, but the ultimate goal is for them to replace national standards, and in so doing, remove barriers to trade. In South Africa, the IEC 60079, ISO 80079 series of standards are adopted technically unchanged as far as is practicable, but their legal status is determined in terms of the relevant national legislation (see foreword).

7.4 Australia and New Zealand

7.4.1 Standards Australia (AS) is an independent body and is the officially recognized National Standards Body in Australia. Standards are developed and written using procedures similar to those used in South Africa. Standards are often jointly adopted by Standards Australia and Standards New Zealand (NZS).

7.4.2 In Australia, Ex equipment is authorized by the relevant government department regulating each state. This authorization is issued by a test house authorized to do so by the State Department. Examples are Test Safe for New South Wales and SIMTARS for Queensland.

7.4.3 The process of adopting standards from the International Electrotechnical Commission (IEC) was started by the standards bodies of Australia (AS) and New Zealand (NZS), through their joint committee on electrical equipment in hazardous areas (EL-14); many of their standards are already fully aligned with the relevant

IEC standards. The AS or NZS standards, however, are the ones in force in terms of regulations.

7.4.4 From the end of 2005, all Ex equipment for use in Australia or New Zealand shall be certified in terms of the IECEx scheme, or the new ANZEx scheme (very similar to the IECEx and ATEX schemes). In terms of equipment certified under the IECEx scheme, there is still a requirement for imported equipment to obtain a local certificate.

8. APPARATUS MARKING

8.1 General

Due to the potential disastrous consequences if the wrong equipment is used, all equipment shall be clearly labelled with information supporting the safe use of the equipment.

NOTE: Annex C gives information on the marking of explosion-protected equipment certified under different product certification schemes.

8.2 Marking

Marking shall be

a) durable,

b) visible in all installation configurations, and

c) legible.

8.3 Test for durability

8.3.1 Rub the marking lightly for 15 s with a piece of cloth soaked with water.

8.3.2 After drying, rub for a further 15 s with a piece of cloth soaked with white spirit.

NOTE: White spirit is also known as mineral spirits, mineral turpentine, turpentine substitute, petroleum spirits, and solvent naphtha (petroleum), and composed of a mixture of aliphatic and alicyclic C7 to C12 hydrocarbons with a maximum content of 25 %, by mass, of C7 to C12 aromatic hydrocarbons. This will not affect the marking.

9. CAP LAMPS FOR MINERS

The documents required for cap lamp certification shall be in accordance with annexes D, E, F and G.

ANNEX A: Upgrading and maintenance of EPA certificates for mines and factories

(normative)

A.1 In South Africa, all explosion protection equipment (EPA) used in underground mines (Group I) and on the surface (Groups II and III) shall be covered by an IA certificate. This includes machines; to qualify for certification a machine shall be made up of equipment with valid certification. The requirements given in A.2 to A.19 cover the validity of IA certificates.

A.2 All IA certificates issued shall have a validity period of 10 years for manufacturing purposes. EPA having been manufactured under a valid IA certificate will not be affected when the certificate expires; in other words, such products will be considered to still have valid certification. An IA certificate based on overseas certification will be valid, depending on the continued validity of the overseas equipment certification as well as product quality assurance, for a maximum period of three years. It is the responsibility of the IA certificate holder to ensure that an updated quality system certificate is submitted to the relevant ATL if the validity period is less than three years.

For renewal of certification, a new IA certificate number shall be issued. For certification of modifications affected to equipment within the validity cycle, a supplement may be issued if the original certifier is involved; otherwise a new certificate shall be issued.

A.3 If, during a validity period or if the equipment is in service after its certificate has expired, the product is modified or changed the equipment shall be re-evaluated, this shall be done by an ATL and re-certified. This re-evaluation or re-certification (or both) shall take into account the current edition of the national standard used for certification and the complete product shall meet the requirements of that standard.

A.4 During the validity period of IA certificates the product may be manufactured or supplied either under the batch test method or under an approved product certification scheme irrespective of changes to the national standard, provided that the product does not change from the original certified design and that no unsafe condition that affects the product is identified in the original edition of the standard used for certification.

A.5 Repairs and overhauls shall be carried out in such a way that they will not invalidate the IA certificate. Repairs and overhauls carried out by a party other than the certificate holder, where the repairer or over-hauler is not in possession of the certification documents, shall be carried out in such a manner that the product meets the minimum requirements of the applicable national standards to which the product was originally certified, or any more recent edition (see annex H for specific requirements).

A repair facility shall either be certified under an approved product certification scheme to repair or overhaul specific EPA, or shall submit repaired products for batch testing. A declaration of conformance (DOC) shall be issued by the repairer with each repaired product.

A repairer of Ex equipment that is a member of a product certification scheme shall operate in accordance with an appropriate quality system such as SANS 9001. The requirements of the IECEx operational document No. Ex OD014 Version 2 (see bibliography) can be used as a guideline, and are based on SANS 9001, with the addition of specific repair requirements for Ex equipment.

A.6 Should a product be modified or changed in such a way that it no longer complies with the certified design, it shall be re-submitted to an ATL for re-evaluation. This re-evaluation shall take into account the current national standard and the product shall comply with that standard. This applies to newly manufactured as well as second-hand products.

A.7 Existing IA certificates and government mining engineer (GME) certificates (the latter associated with V or VM numbers) issued

a) before 1998 are no longer valid, and

b) after 1998 (only IA certificates), shall not be valid after October 2015.

New IA certificates shall have a validity period of 10 years from the date of issue. The date of issue and the date of expiry shall be stated on new certificates.

A.8 A product still in production shall be submitted for re-certification to an ATL before the IA certificate expires so as to achieve re-certification before the expiry date. The product will be re-assessed or tested (or both) and will be re-certified to the current edition of the national standard. Where the current edition of the national standard dictates that a product shall be upgraded or changed, the onus is on the manufacturer or supplier of the product to institute such upgrades or changes as to ensure that the product complies with the current national standard, as required for re-certification.

A.9 Where a product with a valid IA certificate is found to be unsafe for use, the certificate holder shall take appropriate steps to rectify the design of such a product and re-certify such rectified products. Unsafe products already supplied shall be recalled and both the regulatory body and the ATL (and approved certification body for mark holders) that issued the certificate shall be notified.

A.10 In cases where any system safety parameter of an intrinsically safe apparatus is changed, consideration shall be given to the safety of the loops in which the apparatus is used, and such loops shall be re-certified.

NOTE: If a change to loop equipment results in incompatible safety parameters in accordance with a certification standard, the ATL may consider the use of risk assessment methods (SANS 31010) and a concession may be issued.

A.11 Where a standard is superseded during the validity period of a certificate, then such standard shall still be deemed to apply to the product for the validity period of the certificate. In terms of batch-tested products, ATLs shall still be able to test to such standards while the certificates remain valid.

A.12 Certification that covers variations in product design, or covers a range of similar products, shall show in the test report or IA certificate that each variation or design has been considered and tested where deemed necessary, and each variation or design shall be clearly stated in the test report and IA certificate.

A.13 Any repairer shall attach to the product a durable, legible and noticeable label that gives at least the following information:

a) the repairer's certificate number (when operating under an approved product certification mark scheme for Ex certified equipment);

b) the IA certificate number;

c) the name of the repairer; and

d) the month and year of repair or overhaul.

NOTE: It is not intended that the need for a repair label be applicable to routine maintenance or replacement of identical parts.

A.14 The label fitted by the original equipment manufacturer (OEM) shall not be removed, but labels fitted by previous repairers shall be removed. If the OEM label is missing, the repairer may submit the finished product to an ATL and have the product re-certified to the current national standards. In this case, the repairer shall fit a supplier's plate displaying the new IA certificate number.

A.15 When EPA subject to the relevant national legislation (see foreword) changes ownership, the seller shall provide the IA certificate plus either a mark scheme certificate or a batch test report providing proof of certification (see clause 4), to the buyer. The buyer shall ensure that the relevant documentation is submitted. The

seller shall ensure that the equipment is compliant with the approved design. If these requirements are not fully met, the equipment shall be considered to be un-certified and shall be submitted to an ATL for re-testing to the approved standards and shall be issued with a new IA certificate number, in accordance with the relevant national legislation (see foreword).

A.16 All records related to manufacture, repair or overhaul of Ex certified apparatus shall be kept for a minimum period of 10 years by the product certificate holder.

A.17 Historically, IA certificates were not issued for some second-hand explosion-protected equipment, for one of the following reasons:

a) the equipment was sold before IA certificates became compulsory; or

b) a standard motor was converted under a certified Ex N or DIP repair mark scheme; or

c) only a test report was issued.

A.18 When the equipment described in A.17 is submitted for repair or refurbishment and proof of previous national certification exists, an IA certificate shall be issued as follows:

a) For repairers operating under a mark scheme, a special IA certificate (see 3.1.21) covering that type of product shall be issued in the name of the repairer, after assessment by an ATL.

b) For repairers not operating under a mark scheme, a special IA certificate covering that particular unit (serial number) will be issued in the name of the end user after assessment by an ATL. Repairs of other units of the same type of product will require a new IA certificate to be issued after assessment by an ATL of those units.

Otherwise the product shall be treated as a prototype.

NOTE 1: It is accepted that multiple IA certificates will be generated for the same type of product using the procedure given in A.18.

NOTE 2: Proof of previous national certification includes marking, or comparison with an identical unit for which such proof does exist and whose components can be compared by assessment and measurement.

Minimum requirements for a variety of the most common products are included in annex H. An ATL testing such equipment, as well as a future repairer repairing such

equipment shall make use of a checklist based on these minimum requirements. The checklist shall be based on the current or previous edition of the relevant South African National Standard(s) at the time of repair and shall be updated when necessary. The checklist shall be supported by a detailed product description. The description shall include sketches, photos, drawings or combinations of these, to identify the equipment and its essential Ex properties.

A.19 A guideline for the certification of equipment forming part of intrinsically safe loops is given in annex I.

The relevant responsible parties for certification are given in table A.1.

Table A.1: Parties responsible for certification

1	2
RESPONSIBLE PARTY	**RELEVANT CLAUSE**
Manufacturer or Supplier	A.1, A.2, A.4, A.6, A.7, A.8, A.11, A.16
Repairer	A.3, A.5, A.6, A.13, A.14, A.17 and A.18
User	A.1, A.2, A.5, A.6, A.8, A.10, A.11, A.15, A.17, A.18 and A.19
ATL	A.1, A.2, A.3, A.8, A.12, A.17 and A.18

ANNEX B: Approved standards, test laboratories and certification for EPA

(normative)

B.1 Since 1995, all new EPA requires a certificate issued by an ATL, in accordance with the requirements of this recommended practice. Such certification shall be in accordance with approved national standards (see column 3 of table B.1). However, test results from certification in terms of other standards may be used as the basis for issuing such a certificate (IA certification) on condition that the ATL is provided with adequate evidence of recognized prior testing which demonstrates compliance with the applicable approved national standard.

NOTE: The website of the government-endorsed accreditation body (see foreword) can be consulted for a list of current ATLs and their respective scopes of accreditation.

B.2 The majority of the relevant IEC standards (IEC 60079 series and ISO/IEC 80079 series) have been or will be adopted as South African National Standards. The relevant CENELEC standards are either identical or closely related to the IEC standards and therefore to South African National Standards. Consequently, test results produced under the IECEx Scheme and ATEX Directive are recognized in terms of B.1.

Table B.1: Approved standards for EPA

1	2	3
Type of equipment	**Electrical (E) or mechanical (M) properties of equipment**	**Approved standards**
Equipment with specific types of protection		
Intrinsically safe (Ex i, Ex iD)	E	SANS 60079-11 (Group I, II)
		SANS 60079-25 (system)
		SANS 61241-11 (Group III)
Equipment with EPL Ga (protected by two Gb techniques or double-protected)	E	SANS 60079-26 (Group II)
Flameproof (Ex d)	E	SANS 60079-1
Pressurized (Ex p, Ex pD)	E	SANS 60079-2
	E	SANS 60079-13
	E	SANS 60079-16
	E	SANS 61241-4 (Group III)
Encapsulated (Ex m, Ex mD)	E	SANS 60079-18 (Group I, II) SANS 61241-18[b] (Group III)
Powder-filling (Ex q)	E	SANS 60079-5
Specially protected (Ex s)	E	SANS 60079-33
Increased safety (Ex e)	E	SANS 60079-7
Oil immersion (Ex o)[b]	E	SANS 60079-6
Type "n" (Ex nA, Ex nR, Ex nC, Ex nL [c], Ex nZ [c])	E	SANS 60079-15
	E	SABS 970
Dust ignition protected by enclosure "t" (previously dust-ignition-protected or -proof (DIP))	E	SANS 60079-31
	E	SANS 61241-1-1[b]
	E	SANS 61241-1[b]
Specialized apparatus		
Machines powered by compression-ignition engines	E/M	SANS 1142[b] (Group II machines)
	E/M	SANS 868-1-1, SANS 868-1-2, SANS 868-1-3 (all for Group I machines)
	E/M	SANS 868-3-1, SANS 868-3-2, SANS 868-3-3 (all for Group II machines)
	E/M	SANS 868-4 (vehicles for use in non-hazardous locations in underground mines)

1	2	3
Type of equipment	**Electrical (E) or mechanical (M) properties of equipment**	**Approved standards**
	E/M	SANS 868-1[b], SANS 868-2[b] (all for Group I machines)
D.C. mining machines	E	SANS 1654
Mains-powered electrical mining machines	E	SANS 10086-2 (applicable sections)

Table B.1: (*concluded*)

1	2	3
Type of equipment	**Electrical (E) or mechanical (M) properties of equipment**	**Approved standards**
Equipment with specific types of protection		
Specialized apparatus		
Cable glands	E	SANS 60079-0 (Ex e)
	E	SANS 60079-1 (Ex d)
	E	SANS 61241-1-1[b], SANS 61241-1[b]
	E	SANS 808 (Ex d)
	E	SANS 1213 (only the section on Ex e glands)
Plugs and sockets, couplers and adaptors	E	SANS 1489-1, SANS 1489-2, SANS 1489-3, SANS 1489-4 (Group I and Group II, operating voltages (Uo/U) not exceeding 220/380 V, 650/1100 V, 1900/3300 V, 3800/6600 V, 6343/11000 V and 12700/22000 V and 19000/33000 V)
Helmet light assemblies	E	SANS 1438 (Group I)
Gas measuring and warning detectors for mines	E	SANS 1515-1, SANS 1515-2
Fuel dispensers and metering pumps	E	SANS 1020
Equipment with optical radiation	E	SANS 60079-28
Electrical resistance trace heating	E	SANS 60079-30-1 and SANS 60079-30-2
Ingress protected (IP) enclosures	E/M	SANS 60529
Mechanically protected (IK) enclosures	E/M	SANS 62262
NOTE: Owing to rapid developments in the field of explosion-protected apparatus, the information in this table is subject to change. The reader should be in possession of the latest edition of this recommended practice. The relevant test laboratories should be approached for approval of apparatus not covered by this table.		

1	2	3
Type of equipment	**Electrical (E) or mechanical (M) properties of equipment**	**Approved standards**
[a] Engineering documentation of a FISCO/FNICO fieldbus loop cannot replace third-party (ATL) loop certification; although fieldbus loops cover safety parameters, other aspects are not defined and are required to be assessed. [b] These standards have been withdrawn, but have been included because equipment may still be repaired or manufactured (or both) to these standards during the validity period of the equipment certification (see annex A). [c] Ex nL has been re-named Ex ic and is now part of SANS 60079-11. Ex nZ has been re-named Ex mc and is now part of SANS 60079-18.		

ANNEX C: Marking of electrical apparatus for use in explosive atmospheres

(informative)

C.1 General

C.1.1 Certain compulsory information (because it is required to ensure safety) shall be marked on explosion-protected equipment in a safe, legible and durable manner (see SANS 60598-1 for marking guidance). The marking information required in accordance with national and similar standards includes

a) the name of the equipment manufacturer,

b) a description of the equipment (make and model (or frame size)),

c) the unique identification (serial) number of the equipment,

d) the electrical input and output data of the equipment,

e) the explosion-protection ratings,

f) conditions associated with certification, and

g) the ATL and IA certificate number.

C.1.2 Reduced marking for small and very small equipment is covered by the IEC and CENELEC standards.

In this annex, information and examples are given of marking of explosion-protected equipment.

NOTE: As there are currently major developments in IEC explosion-protection standards and therefore by implication in South African National Standards, the reader is encouraged to use only the latest edition of this recommended practice together with SANS 10108.

C.2 Marking of explosion-protection ratings

C.2.1 General

Standards approved (or which have been approved in the past) for certification of explosion-protected apparatus used in South Africa can be Grouped according to their approach to the marking of explosion-protection ratings, as given in C.2.2 and C.2.3.

C.2.2 IEC, CENELEC and related South African National Standards

C.2.2.1 As part of the drive towards global standardization, cooperation between the IEC and CENELEC requires the corresponding technical committees to consider each other's standards for mutual acceptance. As a result, several of these standards are identical or closely related.

C.2.2.2 The IEC and CENELEC standards (the latter applicable under the ATEX Directive) for apparatus used in explosive gases and vapours atmospheres call for the following marking:

(E)Ex	**d**	**IIB**	**T3**
Indicative of explosion-protected equipment built in accordance with IEC	Type of protection: Flameproof equipment (CENELEC) standards	Equipment Group gas	Temperature class

NOTE: The CENELEC standards require additional marking, refer to C.2.2.4.

The current, unified marking system specified by IEC requires that the equipment protection level (EPL) is added at the end of the above marking (see C.5 for examples).

C.2.2.3 The certificate number could be followed by one of the following identification letters:

X: The applicable specific conditions at the letter-symbol X should be ascertained from the contents of the certificate.

U: An incomplete piece of explosion-protected apparatus or component (for example, unequipped enclosures, lamp holders, contact blocks, terminals, plugs, reducers, and impregnation materials).

C.2.2.4 The ATEX Directive requires marking in addition to the marking given in C.2.2.2 and C.2.2.3; marking that identifies the category of equipment required (the zone in IEC terminology).

CE		**II**	**1**	**GD**
CE mark	EU explosive atmosphere certification mark	Gas Group	Equipment category (M1, M2,1, 2, or 3)	G = gas D = dust

C.2.3 North American standards

C.2.3.1 General

C.2.3.1.1 Historically, explosion-protected apparatus certified to selected FM and UL standards (USA) and CSA standards has been accepted in South Africa.

This is no longer the case, but marking information is included as an aid to technical staff dealing with operational equipment.

C.2.3.1.2 In the United States of America, FM, UL and ISA standards have also been accepted as American National Standards Institute (ANSI) standards. Although the North American standards for explosion protection differ from the IEC and CENELEC standards, North-American products with certification to IEC and CENELEC standards for explosion protection are on the increase, as is the acceptability of IEC standards.

C.2.3.2 Underwriters' Laboratories (UL) and Canadian Standards Association (CSA)

In the immediate vicinity of the certification mark, a statement appears that the specified equipment is for use in hazardous locations. The Groups of hazardous materials are given by the statement: "class I, Group A, B, C or D" (or a combination of these), and "class II, Group E, F or G" (or a combination of these). The gases and vapours appropriate to class I, Groups A, B, C and D and the dusts appropriate to class II, Groups E, F and G are given in NFPA 70.

A separate statement as to whether the equipment is intrinsically safe or explosion-proof (flameproof) might appear, but dust-ignition-proofing (dust-ignition-protection) is always indicated by a coded reference to the types of material for which the equipment has been certified.

C.2.3.3 Factory Mutual Research Cooperation (FMRC)

Equipment is marked, in the immediate vicinity of the FM mark, indicating whether it is intrinsically safe or explosion-proof (flameproof) for class I,

divisions 1 and 2 (zone 1 and zone 2) locations or non-incendive (non-sparking) for zone 2 locations only. The gases and vapours for which the electrical apparatus is suitable are given by the statement, "class I, Groups A, B, C or D" (or a combination of these), as for the UL and CSA.

C.3 Additional marking for specific purposes

Additional marking may include

a) a warning marking, for example, "WARNING – DO NOT OPEN WHEN ENERGIZED", or

b) a specific condition of use (in which case the "X" suffix to the certificate number is not required, (see C.2.2.3)), for example, "STATIC HAZARD – WIPE WITH A DAMP CLOTH ONLY".

C.4 Apparatus group and temperature class conventions

C.4.1 Table C.1 gives a simplified comparison of terminologies used to describe the different apparatus groupings applicable to gases, vapours and dusts, in respect of explosion-protected apparatus.

C.4.2 Table C.2 gives simplified comparison of the different equipment temperature classes applicable to gases and vapours, in respect of explosion-protected apparatus.

Table C.1: Terminologies used to describe apparatus groupings for explosion-protected apparatus

1	2	3	4	5	
Representative substance for which the equipment is suitable	**Group in accordance with SANS/IEC/EN 60079, SANS/IEC/EN 61241 and ISO/IEC 80079 series standards**	**Group in accordance with old South African and British standards**	**Group in accordance with old German standards**	**American-Canadian group marking in accordance with UL, FM or CSA standards**	
Acetylene	IIC	2C (or 2f)	3n (or 3c)	Group A	Class I
Hydrogen; manufactured gas	IIC	2C (or 2e)	3a	Group B	
Ethylene; diethyl ether	IIB	2B (or 2d)	2	Group C	
Pentane, petrol vapours, alcohols, ammonia	IIA	2A (or 2c, 2b and 2a)	1	Group D	
Metal dust, such as aluminium, magnesium	Metallic dusts			Group E	Class II
Carbon black, charcoal, coke dusts	Non-metallic dusts			Group F	
Flour, starch or grain dusts				Group G	
Conductive dusts	IIIC				
Non-conductive dusts	IIIB				
Combustible flyings	IIIA				

Table C.2: Temperature class groupings for explosion-protected apparatus

1		2	3
Temperature class		**Maximum equipment temperature** °C	**Materials**
SANS/IEC/EN 60079, SANS/IEC/EN 61241 and ISO/IEC 80079 series standards. USA: NEC 505	**USA: NEC 500**		
T1	T1	450	Methane, hydrogen, acetone, petrol
T2 - - - -	T2 T2A T2B T2C T2D	300 280 260 230 215	Toluene, acetylene, butane, butadiene, chloroethylene
T3 - - -	T3 T3A T3B T3C	200 180 165 160	Kerosene, hexane, naphta, acrylaldehyde
T4 -	T4 T4A	135 120	Diethyl ether, trimethylamine
T5	T5	100	
T6	T6	85	Carbon disulphide

C.5 Examples of markings

C.5.1 Examples of the compulsory marking of explosion-protected electrical apparatus in accordance with the IEC unified marking system are given in C 5.2 to C.5.13.

NOTE 1: These examples do not include the marking normally required by the general standards for construction of electrical apparatus (for example, electrical parameters); however, said marking forms part of the compulsory marking of explosion-protected apparatus.

NOTE 2: Practical considerations might restrict or preclude the use of italic characters or of subscripts and a simplified presentation may be used, for example Uo rather than U_o.

C.5.2 Examples of marking for electrical equipment with the type of protection flameproof enclosure "d" (EPL Ma or EPL Mb) for use in mines susceptible to firedamp:

Bedelle S.A
Type A B 5
Ex d I 150 °C Ma alternate Ex db I 150 °C
No. 325
ABC 02.1234

Bedelle S.A
Type A B 5
Ex d I 150 °C Mb alternate Ex db I 150 °C
No. 325
ABC 02.1234

C.5.3 An example of marking for Ex component, with the type of protection flameproof enclosure "d" (EPL Gb) with intrinsically safe "ia" (EPL Ga) output circuit, for explosive gas atmospheres other than in mines susceptible to firedamp, gas of subdivision C, manufactured by H. Ridstone and Co. Ltd:

Type KW 369:
Ex d [ia Ga] IIC Gb alternate Ex db [ia] IIC
DEF 02.0536 U
HR

C.5.4 An example of marking for electrical equipment, utilizing types of protection increased safety "e" (EPL Gb) and pressurized enclosure "px" (EPL Gb), maximum surface temperature of 125 °C, for explosive gas atmospheres other than mines susceptible to firedamp, with gas of ignition temperature greater than 125 °C, and with specific conditions of use indicated in the certificate:

H. Atherington Ltd
Type 250 JG 1
Ex e px IIC 125 °C (T4) Gb alternate Ex eb pxb IIC 125 °C (T4)
No. 56732
GHI 02.0076 X

C.5.5 An example of marking for electrical equipment, utilizing types of protection flameproof enclosure "d" (EPL Mb and Gb) and increased safety "e" (EPL Mb and Gb) for use in mines susceptible to firedamp and explosive gas atmospheres other than mines susceptible to firedamp with gas of subdivision B and ignition temperature greater than 135 °C:

A.R. Achutz A.G.
Type 5 CD
Ex d e I T4 Mb alternate Ex db eb I T4 °C
Ex d e IIB T4 Gb alternate Ex db eb IIB T4
No. 5634
JKL 02.052

C.5.6 An example of marking for electrical equipment with type of protection flameproof enclosure "d" (EPL Gb) for explosive gas atmospheres other than mines susceptible to firedamp on the basis of ammonia gas only:

Wokaitert Sarl
Type NT 3
Ex d II (NH3) Gb alternate Ex db II (NH3)
No. 6549
MNO 02.31

C.5.7 An example of marking for electrical equipment with type of protection encapsulation "ma" (EPL Da) for explosive dust atmospheres containing conductive dusts of Group IIIC with a maximum surface temperature of less than 120 °C:

ABC Company
Type RST
Serial No. 123456
Ex ma IIIC T120 °C Da alternate Ex ma IIIC T120 °C
IP68
N.A. 01.9999

C.5.8 An example of marking for electrical equipment with type of protection "ia" (EPL Da) for explosive dust atmospheres containing conductive dusts of Group IIIC with a maximum surface temperature of less than 120 °C:

ABC Company
Type XYZ
Serial No. 123456
Ex ia IIIC T120 °C Da alternate Ex ia IIIC T120 °C
IP20
N.A. 01.9999

C.5.9 An example of marking for electrical equipment with type of protection "p" (EPL Db) for explosive dust atmospheres containing conductive dusts of Group IIIC with a maximum surface temperature of less than 120 °C:

ABC Company
Type KLM
Serial No. 123456
Ex p IIIC T120 °C Db alternate Ex pb IIIC T120 °C
IP65
N.A. 01.9999

C.5.10 Electrical equipment with type of protection "t" (EPL Db) for explosive dust atmospheres containing conductive dusts of Group IIIC with a maximum surface temperature of less than 225 °C and less than 320 °C when tested with a 500 mm dust layer:

ABC Company
Type RST
Serial No. 987654
Ex t IIIC T225 °C T500 320 °C Db alternate Ex tb IIIC T225 °C T500 320 °C
IP65
N.A. 02.1111

C.5.11 An example of marking for electrical equipment with type of protection "t" (EPL Db) for explosive dust atmospheres containing conductive dusts of Group IIIC with a maximum surface temperature of less than 175 °C with an extended ambient temperature range of –40 °C to +120 °C:

ABC Company
Type RST
Serial No. 987654
Ex t IIIC T175 °C Db alternate Ex tb IIIC T175 °C
IP65
–40°C ≤ Tamb ≤ 120 °C
N.A. 02.1111

C.5.12 An example of marking for electrical equipment with type of protection encapsulation "ma" (EPL Ga) for explosive gas atmospheres of Group IIC with a maximum surface temperature of less than 135 °C and with type of protection encapsulation "ma" (EPL Da) for explosive dust atmospheres containing conductive dusts of Group IIIC with a maximum surface temperature of less than 120 °C, and for which a single certificate has been prepared:

ABC Company
Type RST
Serial No. 123456
Ex ma IIC T4 Ga alternate Ex ma IIC T4
Ex ma IIIC T120 °C Da alternate Ex ma IIIC T120 °C
IP67
N.A. 01.9999

C.5.13 An example of marking for electrical equipment with type of protection encapsulation "ma" (EPL Ga) for explosive gas atmospheres of Group IIC with a maximum surface temperature of less than 135 °C and with type of protection encapsulation "ma" (EPL Da) for explosive dust atmospheres containing conductive dusts of Group IIIC with a maximum surface temperature of less than 120 °C, and for which two independent certificates have been prepared:

ABC Company
Type RST
Serial No. 123456
Ex ma IIC T4 Ga alternate Ex ma IIC T4
N.A. 01.1111
Ex ma IIIC T120 °C Da alternate Ex ma IIIC T120 °C
IP54
N.B. 01.9999

C.6 Approved certification bodies and their certification marks

C.6.1 Approved South African certification marks

Most approved certification bodies use a certification mark that indicates unambiguously, or in conjunction with other symbols, that the apparatus is certified as explosion protected. The following certification marks are commonly found on apparatus used in South Africa:

a) **CERTEX**

Drg.14473a

b) **SABS Certification (Pty) Ltd**

c) **MINING AND SURFACE CERTIFICATION (MASC)**

C.6.2 Foreign certification marks

The following marks do not indicate acceptable certification for new equipment, but may be used as the basis for issuing an IA certificate by an ATL for equipment in use:

a) **British Approvals Service for Electrical Equipment in Flammable Atmospheres (BASEEFA)**, or Ministry of Power, or Ministry of Technology, or Department of Trade and Industry, United Kingdom

NOTE: The BASEEFA marks shown below were issued at various times during the existence of this organization. The organization has since been privatised. The current BASEEFA 2001 (Pty) Ltd is one of the EC Notified Bodies and uses the marking system referred to in C.6.2(f). Only second-hand apparatus will therefore carry this mark.

Drg.14474

Drg.14475

or plain Ex

b) **Physikalisch-Technische Bundesanstalt (PTB) or Bergbau Versuchsstrecke (BVS), Germany**

NOTE: This mark organization has since been appointed as one of the EC Notified Bodies and uses the marking system referred to in C.6.2(f). Only second-hand apparatus will therefore carry this mark.

Drg.14476

c) **Underwriters' Laboratories (UL), USA**

Drg.14478

Drg.14477

or

d) **Factory Mutual Research Corporation (FM), USA**

Drg.14479

e) **Canadian Standards Association (CSA**)

Drg.14480

f) **Certification mark under the ATEX Directive (European Council Directive 94/9/EC) for equipment certified by a Notified Body**

NOTE: The (abbreviated) name of the Notified Body is displayed as part of the certification number.

Drg.14481

g) **Certification mark under the IECEx Scheme**

C.7 Unmarked electrical apparatus

In the case of electrical apparatus that is unmarked, or where the marking is incomplete or there is doubtful applicability to the particular hazard, it should not be used and it should either be submitted for testing or certification (or both), or its use should be immediately discontinued.

ANNEX D: Documentation required for the certification of a cap lamp

(normative)

D.1 General

D.1.1 A manufacturer or supplier who applies for certification, shall submit a comprehensive set of documentation to the relevant ATL**,** in which the complete cap lamp is fully described in terms of its design and operation. Specific detail shall be provided on the design and performance of the critical components of the cap lamp with regard to its safety and durability in use and operation.

D.1.2 The information described in D.2 to D.6 shall be included. Each system or part shall be described in sufficient detail to enable the ATL to clearly interpret its relevance and expected performance when tested in accordance with this recommended practice.

D.2 The cap lamp as a unit

A detailed description shall be given of the design and operation of the cap lamp as a unit when assembled and ready for use. This description shall include the following:

a) the type of power source, and its capacity when tested in accordance with this recommended practice; the useful burning time per shift, and its expected useful life;

b) the type of light source, its current drain from the power source, its mode of failure, and its expected useful life;

c) the method(s) of protection employed to render the cap lamp safe, in accordance with this recommended practice, for the duration of its operational life; the location of any electronic circuitry or other such protection devices, and the type of enclosure surrounding such circuitry and devices;

d) the method of charging, the type of charging connection, and the voltage and current required;

e) if allowance has been made for the fitment of any other devices to the cap lamp, the safe location, and if required, the maximum safe current drawn by such devices;

f) a risk assessment covering all the applications and environments in which the cap lamp will operate;

g) a full set of material safety data sheets covering all the materials used in the cap lamp, including clear instructions for the emergency treatment of users injured and for the safe disposal of all materials, in accordance with SANS 14001; and

h) a copy of the supplier's methods and related material used in the training of both users of the cap lamp and the lamp room personnel maintaining it.

D.3 The light source

The following information shall be included in the description of the light source:

a) a detailed description of the type of light source and the associated optic system;

b) where available, results of any prior tests already performed in order to prove the compliance of the light source to this recommended practice;

c) a comprehensive description and drawings showing the mounting of the light source within the headpiece to assess its durability under operating conditions;

d) in the event of the light source being a light emitting diode, a full description of the thermal design of the light source assembly to enable the ATL to clearly interpret and assess the expected performance of the light source; and

e) the normal failure mode of the light source; factors affecting its life and the measures taken in the design to address these factors.

D.4 The headpiece

The following information shall be included in the description of the headpiece:

a) a full description of the enclosure with special reference to the methods of sealing, as well as achieving the mechanical strength, in order to conform to the requirements of this recommended practice;

b) descriptions of the method by which the cable is anchored in the headpiece; the operation of the switch, if located on the headpiece and if supplied, as well as the means of locking the bezel ring against tampering; and

c) the size, finishing and type of glass used in the headpiece.

D.5 The power source

The following information shall be included in the description of the power source:

a) a full description of the container, lid and enclosure(s), including its method of fitment by the user and the materials used, with emphasis on its safety performance under normal and difficult working conditions;

b) a full description, with appropriate drawings, showing the location of the battery and, if so designed, the location of protective circuits and device that render the cap lamp safe, in accordance with this recommended practice, as well any other devices that may be fitted to the cap lamp;

c) a full description, with appropriate drawings, showing the location and method of termination of the power and other leads that exit from the power source, including any seals, as appropriate; and

d) a full description of the type of battery used and, if appropriate, any safety devices and circuits included therein.

D.6 The cable

The following information shall be included in the description of the cable:

a) copies of the relevant test reports of the cable used, if already available from the manufacturer;

b) details of the colours and function of the various cores as well as their respective cross sectional areas; and

c) the means by which the cable is anchored to the headpiece and power source.

D.7 Duration of trial testing

The period of trial testing shall be a minimum of 70 000 hours on a mine being used by various job categories and under the harsh conditions encountered by these persons.

ANNEX E: New cap lamps for miners

(normative)

E.1 General

The procedure for performing field trials when having newly designed cap lamps approved for general use in mines is given in E.2 and E.3. This recommended practice defines the minimum exposure levels and reporting detail to ensure a satisfactory and reasonably representative test to gauge the acceptance and durability of new lamps and evaluate the support provided by the supplier.

E.2 Requirements

E.2.1 General

E.2.1.1 It is the prerogative of the regulator to determine the number of mines and the type of mines in which the field trial shall be conducted, as well as the duration of the trial. This may vary subject to the degree of change the lamp represents from that which is currently in use, its features and technology, and its risk profile. It is however recommended that the test period be four to six months and that at least twenty shafts from ten different mines be involved. It is also recommended that at least 50 lamps to 100 lamps be used for the trial.

E.2.1.2 In order for the lamps to undergo a representative test, the supplier may not do any repairs or maintenance work on any lamp during the test period, other than as agreed beforehand between the supplier and the regulator at the time of application for testing. Any repair or maintenance work deemed to be the responsibility of the lamp-room personnel may only be done by that personnel and shall be recorded as such in the relevant lamp room evaluation report.

E.2.1.3 Should any changes or modifications to the lamp be necessary during the trial period, the supplier shall immediately notify the regulator thereof and the regulator will rule whether the trial may continue or be restarted in order for such changes to be included in a representative trial.

E.2.1.4 Any modifications to an approved lamp shall be submitted for certification by an ATL. Following such certification, the lamp shall be presented to the regulator for a decision as to whether the changes are of a nature that require new field trials to be conducted before accepting it into the range of approved lamps.

E.2.1.5 No approval other than the written approval from the regulator will entitle a supplier to field trial any new cap lamps in mines or submit lamps to mines for evaluation.

E.2.2 Approval

No new lamps may be taken underground without the following prior written approvals having been obtained from

a) an authorised representative of the regulator of mines (see foreword); approval will be limited to one type of lamp for a specified period, and

b) an authorised representative of each of the mines at which the trials are to be performed.

E.2.3 Applicability

This recommended practice applies to all new lamps that have not previously been approved for general use in mines, as well as any lamps previously approved but that have been subsequently modified to the extent that, in the opinion of the regulator, their operation is likely to be significantly affected.

E.2.4 Documentation

When applying to the regulator for approval to trial a lamp, the following documentation shall be provided:

a) a certificate from a test laboratory stating that the subject lamp has been tested and approved in accordance with SANS 1438;

b) a general description of the cap lamp's overall design, enclosure, power source, light source, headpiece and charging system;

c) a detailed description of the power source type, its safety features, its capacity, method of mounting and connections;

d) a detailed description of the light source, its light output profile and intensity, and the input power supply to it; where applicable, the latter should include an explanation of the voltage or current regulation and the shape and frequency of the applied voltage;

e) a detailed description of the headpiece and the components mounted inside it, the seals used to prevent any ingress of water or dust and its method of fixing to the helmet;

f) a detailed description of the charger used, the cap lamp's connection to the charger and if applicable, the location and description of any circuitry used to modify or control the charging input voltage;

g) a detailed description of the protective circuitry which renders the cap lamp intrinsically safe, in accordance with the applicable standard;

h) a material safety data sheet (MSDS) covering all the elements of the cap lamp, including all precautionary measures for their safe use as well as their final disposal, in accordance with SANS 14001;

i) a comprehensive risk analysis covering all possible risks that may apply in the use, failure, repair and maintenance of the cap lamp;

j) a list of the mines or shafts where the supplier intends to test the cap lamp and the sequence in which these tests will be done;

k) a date when the supplier will be ready to commence the field trials; and

l) a copy of all the documentation that the supplier intends using in performing the test as described herein, and including the following:

1) the training material for the care and maintenance of the cap lamps, including those sections of the risk analysis which have a bearing on such maintenance;

2) the training material for the use of the cap lamps, including those sections of the risk analysis which have a bearing on such use;

3) the assessment form in which the users will record their evaluation of the performance of the cap lamp while in use; this form shall include the questions listed in the sample user's evaluation form given in annex F;

4) the assessment form in which the lamp-room personnel will record their evaluation of the maintenance requirements of the lamp and the level of support provided by the supplier; this form shall include the questions listed in the sample lamp room's evaluation form, given in annex G;

5) the documentation with which the test lamps are issued to, and returned from, the mine; this shall include a summary of any incidents as recorded by the mine liaison officer; and

6) the record sheets used to monitor the performance of the individual lamps, including breakages and failures as well as repairs affected by both the lamp-room and the supplier.

E.3 Trial procedure

E.3.1 Prior agreement shall be obtained from the mines regarding the following:

a) the shafts at which the trials are to be performed;

b) the period required to do the trials at the mine; and

c) the mining representatives assigned to liaise with the supplier for the duration of the trials.

E.3.2 The supplier shall ensure the mine liaison officers are fully briefed on all aspects of the use, maintenance and safety of the test lamp, and to obtain a signed receipt for all documentation provided.

E.3.3 The supplier shall ensure that the lamp room personnel of the shafts involved in the trials are fully trained in the care, charging, support and maintenance of the lamps to be tested.

E.3.4 The supplier will likewise ensure that the assigned users are fully trained and competent in the use and safety of the lamps.

E.3.5 In order for the trial to be representative, the following should be noted:

a) Preferably all, but at least half of the members in a mining team should wear test lamps at any time. This is to prevent any possible shortcomings in the test lamp being compensated for by the lamps currently being used in the mine.

b) Users should use the test lamps for a continuous period lasting for at least two working weeks.

c) Lamps should be tested in a fully representative cross section of mining applications and conditions. This includes as a minimum, drilling, stoping, inspection and maintenance.

d) The period of use (shift burning time) should be fully representative of the operational requirements of the mine.

E.3.6 Within 24 hours after completion of the minimum two-week trial period, each user shall complete a user evaluation form. It is the responsibility of the supplier, in cooperation with the lamp-room personnel, to ensure that each user completes this form, and to collect all completed forms for submission to the mine liaison officer.

E.3.7 Likewise, upon completion of the trial at a shaft, the supplier shall ensure that the lamp-room personnel complete the corresponding lamp room evaluation forms and submit these together with the individual user evaluation form, to the mine liaison officer.

E.3.8 During the trial period, the mine liaison officer shall immediately report all incidents involving the test lamps to the inspection authority appointed by the regulator, and enter them into the incident summary form.

E.3.9 At the end of the test period, the mine liaison officer shall compile a summary evaluation form and submit this together with the relevant user and lamp-room personnel report forms to the regional inspector of mines for safe keeping.

E.3.10 Once the trials in a region have been completed, the supplier will advise the regional inspector of mines thereof and the latter shall forward the reports from that region to the regulator's head office for safe keeping.

E.3.11 Once the trial, as originally agreed to with the regulator at the time of application for approval, has been completed, the supplier will advise the regulator that the trial is complete. The regulator shall evaluate the results, and in its sole discretion rule on the outcome thereof. This may include extending the trial period when necessary, or issuing an approval for the future use of the tested lamps in mines, subject to those conditions, as the regulator may deem appropriate. However, should the allowed trial period expire prior to the trial having been completed, the trial shall cease immediately and the supplier shall notify the regulator accordingly. The regulator shall rule on the outcome thereof, which may require that the trial be extended for a further period.

ANNEX F: Sample user's evaluation form

(normative)

The sample test report form given below shall be submitted for each cap lamp, for each user of such cap lamp, when lamps are used on a trial.

Trial test carried out on cap lamp serial no: _____ PN no: _____

Test period: From: _____ / _____ / _____ To: _____ / _____ / _____

At (mine and shaft): _____

For and on behalf of: _____
(Manufacturer)

Employee name …….. CO. no: …….

1	Does the miner's cap lamp give sufficient light?	Yes	No		
2	Have you experienced any problems with the lamp?	Yes	No		
3	How do you rate this lamp against the one currently used?	Better	No		
4	Has the lamp failed while in use?	Yes	No		
5	Has the miner's cap lamp failed while in water?	Yes	No		
6	Have any LED light sources failed while in operation?	Yes	No		
7	Has the miner's cap lamp been difficult to clean?	Yes	No		
8	Has the miner's cap lamp hindered your work?	Yes	No		
9	Do you feel safe while using the miner's cap lamp?	Yes	No		
10	Has the miner's cap lamp ever caught fire or burnt you?	Yes	No		

Signature of user: …….. Date: ……

Name of user (please print): ……

Signature of mine lamp room supervisor: ……

Company stamp:

ANNEX G: Sample lamp room evaluation form

(normative)

G.1 The sample test report given below shall be submitted for each lamp room, by each supervisor of such lamp room, when lamps are used on a trial.

<table>
<tr><td colspan="5">List the serial numbers of the lamps tested on the attached sheet
PN no: _____

Test period: From: _____ / _____ / _____ To: _____ / _____ / _____

At (mine and shaft): _____

For and on behalf of: _____
(Manufacturer)</td></tr>
<tr><td colspan="5">Supervisor name …….. CO. no: ……</td></tr>
<tr><td colspan="3">1 Total number of lamps tested during this test period
2 Number of incidents/complaints reported by users
3 Number of lamps requiring repairs</td><td colspan="2"></td></tr>
<tr><td colspan="2">4 Who repaired these lamps (X)</td><td>Lamp room</td><td>Supplier</td><td>Other</td></tr>
<tr><td colspan="2">5 When compared to the lamps currently in use, is:</td><td>More</td><td>Same</td><td>Less</td></tr>
<tr><td></td><td>the number of reported incidents (X)</td><td></td><td></td><td></td></tr>
<tr><td></td><td>the time to repair the lamps (X)</td><td></td><td></td><td></td></tr>
<tr><td></td><td>the ease of repair of the lamps (X)</td><td></td><td></td><td></td></tr>
<tr><td></td><td>the manpower required to maintain (X)</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">6 What is your overall assessment of these lamps when compared to those currently in use</td><td>Higher</td><td>Same</td><td>Lower</td></tr>
<tr><td></td><td>Overall safety (X)</td><td></td><td></td><td></td></tr>
<tr><td></td><td>Acceptance by the users (X)</td><td></td><td></td><td></td></tr>
<tr><td></td><td>Acceptance by the repairers (X)</td><td></td><td></td><td></td></tr>
<tr><td></td><td>Maintenance cost per month (X)</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">7 If it was your decision, would you change to this lamp? (X)</td><td>Yes</td><td>Unsure</td><td>No</td></tr>
<tr><td colspan="5">Please explain/comment:

Signature of mine lamp room supervisor: ……..</td></tr>
</table>

G.2 The list, given below, of miner's cap lamps tested on the trial shall be completed and submitted to the supervisor.

List of mine cap lamps tested on the trial

Manufacturer: ……

Sheet: ……. of …….

Lamp	Serial number	User number	User number	User number
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				

Signature of mine lamp room supervisor: …….

ANNEX H: Minimum requirements for certification of second-hand Ex equipment without an IA certificate

(normative)

H.1 General

H.1.1 A checklist shall be compiled by the responsible ATL and results shall be recorded. The checklist shall cover the requirements of the protection technique and shall be based on the current or previous version of the applicable Ex standard.

The checklist may also be used as the basis for a repair checklist.

As a guideline, typical minimum requirements are given in H.2.1 to H.2.4.

NOTE: Only design requirements are addressed in this annex.

H.1.2 The responsible ATL shall review and adjust the requirements as required.

H.1.3 Checklists shall include an assessment of the condition of the equipment, as equipment in poor condition is likely to be unsafe.

H.1.4 A repairer shall either be a member of an approved mark scheme with a scope of repair including the type of product being repaired, or shall have the unit(s) being repaired batch tested by an ATL.

H.2 Requirements

H.2.1 Flameproof (Ex d) motors

H.2.1.1 All flameproof joints (including cable entries) shall be measured and shall comply with the required dimensions. This includes the dimensional requirements for joints interrupted by fastener holes.

H.2.1.2 All fasteners used on a flameproof enclosure shall meet the following requirements:

a) the fasteners shall be metric;

b) the fasteners shall not pass through the walls of a flameproof enclosure, unless they form a flameproof joint with the wall and are non-detachable from the enclosure;

c) there shall be sufficient thickness of the material surrounding the hole, i.e. at least 1/3 of fastener diameter with a minimum of 3 mm (both parts); and

d) the fastener holes on flameproof enclosures shall have the property class (for example, 3.6), or yield stress and type of fastener (for example, 180 MPa M12), marked.

H.2.1.3 Special fasteners are those connecting parts of the flameproof enclosure together and shall comply with fastener requirements and the following:

a) the thread tolerance fit shall be 6g/6H (fastener/hole or male/female);

b) the fastener heads shall be hexagon heads or hexagon socket set heads;

c) the length of hole threads shall be at least equal to the major fastener diameter;

d) the threaded hole shall have a thread tolerance class of 6H;

e) the hole under fastener head shall have a clearance of ≤ H13;

f) the hexagon socket set screws shall have a thread tolerance class 6h, and shall not protrude from the bottom of the threaded hole; and

g) for Group 1 only, mechanical protection of the fastener head (for example, shrouding or counter-boring) is required.

H.2.1.4 Cable entries shall meet flameproof joint requirements, and shall be marked with the thread size and type, for example, "½ NPT", "M25".

H.2.1.5 Aluminium frame motors shall not be used in Group I applications.

H.2.1.6 Interconnecting compartments shall be separated.

H.2.1.7 External fans and hoods shall be made of metal or anti-static plastic. This does not apply to Group II motors with a fan tip speed restricted to less than 50 m/s.

H.2.1.8 The minimum clearance between the fan and the hood shall be 1/100th of the fan diameter, ≥ 1 mm, but need not exceed 5 mm.

H.2.1.9 An internal earth point in the terminal box and external bonding point shall be provided.

H.2.2 Non-incendive (Ex nA and Ex e motors)

H.2.2.1 The minimum rotor-stator clearance shall be checked and calculated.

H.2.2.2 The terminal box external IP rating (minimum IP54) shall be checked.

H.2.2.3 An adequate seal shall be in place between the terminal box and the winding compartment (if not, then the complete unit shall be IP54).

H.2.2.4 An approved gasket material shall be used on the terminal box.

H.2.2.5 The gasket shall be fixed to one side.

H.2.2.6 The terminal block shall be certified.

H.2.2.7 Overload protection shall be fitted to Ex e motors.

H.2.2.8 Aluminium frame motors shall not be used in Group I applications.

H.2.2.9 External fans and hoods shall be made of metal or anti-static plastic. This does not apply to Group II motors with a fan tip speed restricted to less than 50 m/s.

H.2.2.10 The minimum clearance between the fan and the hood shall be 1/100th of the fan diameter, ≥ 1 mm, but need not exceed 5 mm.

H.2.2.11 An internal earth point in the terminal box and external bonding point shall be provided.

H.2.3 Ex tb and Ex tc motors

H.2.3.1 Metal or anti-static plastic fans shall be used, or the fan tip speed shall be ≤ 52 m/s.

H.2.3.2 Light alloy contents shall not be, by mass, more than the following:

a) for EPL Db (tb): 7,5 % in total of magnesium and titanium; or

b) for EPL Dc (tc): there are no requirements except for fans, fan hoods and ventilating screens, which shall comply with the requirements for EPL Db.

H.2.3.3 Interlocking devices used to maintain the explosion protection (for example, thermistor loops for temperature limitation) shall require a proper tool to allow for adjustment or removal.

H.2.3.4 Terminal bushings shall be mounted in such a way that all parts are secured against turning.

H.2.3.5 Terminal compartments shall be dimensioned for

a) sufficient space to readily allow connection of conductors, and

b) to achieve any compulsory clearance and creepage distances.

For LV cage induction motors, the minimum clearances and creepage distances given in table H.1, in accordance with SANS 1804-2, are required.

Table H.1: Minimum clearances and creepage distances for LV cage induction motors

1	2	3	4	5
Supply voltage *E*	**Minimum clearance** mm		**Minimum creepage distance** mm	
V	**Terminal assembly to metal parts**	**Between terminal assemblies**	**Terminal assembly to metal parts**	**Between terminal assemblies**
E ≤ 250	2,5	2,5	3,0	3,0
250 < E ≤ 660	10,0	10,0	12,5	12,5
660 < E ≤ 1 100	14,0	16,0	18,0	20,0

H.2.3.6 Internal earth point in the terminal box and external bonding point shall be provided.

H.2.3.7 For threaded holes for cable glands

a) the thread type and size shall be identified,

b) the thread type and size (for example, M25 or "½NPT") shall be marked on the equipment or shall appear in the installation instructions supplied by the manufacturer, and

c) the holes with parallel threads shall have at least five threads, with a minimum tolerance of medium or fine.

H.2.3.8 The minimum clearance between the fan and the hood shall be 1/100th of the fan diameter, ≥ 1 mm, but need not exceed 5 mm.

H.2.3.9 On large machines, equipotential bonding conductors should be fitted across enclosure joints, and symmetrically placed with respect to the axis of the shaft.

H.2.3.10 All joints in the structure of the enclosure, whether permanently closed or designed to be opened from time to time, shall fit closely together. They shall be effectively sealed against the ingress of dust, and shall meet an ingress protection of at least IP65.

H.2.3.11 The number of engaged threads for all threaded joints employing parallel threads, without an additional seal or gasket, shall be not less than five, with a minimum tolerance of medium or fine.

H.2.3.12 Gaskets under compression in joints may be used to ensure the effectiveness of the enclosure sealing. Gaskets and seals shall be of one-piece continuous construction, i.e. with an uninterrupted periphery. Gaskets shall be secured to one face of the mating surface, either by adhesive or mechanically secured; the design of the enclosure should be such that determination of the correct location of the gaskets can be made.

H.2.3.13 A sealant material (for example, silicone rubber) shall not be used on joints.

H.2.3.14 Cable glands shall be Ex t certified (preferably Ex tb).

H.2.3.15 The temperature rating shall be determined by a full load test without dust, including potential variations of ± 10 %. In addition, the maximum surface temperature may also be determined for a given depth of layer, specified by the manufacturer, which requires the motor to be marked with the symbol "X", to indicate this specific condition of use.

H.2.4 Ex i instruments

H.2.4 All instruments that are second hand and do not have an IA certificate must be sent to an ATL for evaluation. The application must be accompanied with a drawing of the internal components of the instrument and a new IA certificate issued.

ANNEX I: Frequently asked questions regarding certification requirements for equipment forming part of intrinsically safe loops

(informative)

NOTE: Information covering typical scenarios is given in a FAQ format. Consider this information to be a guideline and subject to change.

I.1 The definition of "new" equipment is unclear. Does "new" refer to the purchase date, the import date, the manufacture date, the date of installation, or the date on which the item type is first released in South Africa?

"New" refers to the selling date to the user, keeping in mind that the validity period is now extended to three years.

I.2 What certification is needed for package units versus individual components, for example an imported skid with several pieces of equipment. What about replacement units fitted to the package at a later stage due to wear and tear?

Individual equipment for imported skids has to be certified, but individual certificates need not be issued. The individual certificates will be listed in the package certificate.

The replacement unit needs to be identical to the devices being replaced, unless the package is re-certified by an ATL.

I.3 Exact marking requirements of equipment with the ATL logo and IA certificate number are not clear. The logo of the test houses will prove difficult to add to smaller equipment such as instrumentation. The manner of fixing such markings to the transmitters is problematic, since no physical modification of a housing is allowed after certification, and adhesive markings may not be durable. Alternatives such as metal or plastic tabs attached by means of wire may not meet the requirement for permanent marking.

SANS 60079-0 gives instructions for the marking of small and very small EPA.

I.4 The certification status of existing ATL approved intrinsically safe loops has to be clarified. These ATL approved loops reference specific models of equipment and specific certificates. For new installations based on the same typical loops, should the typical loops be re-certified? Do they need to be re-certified every time an IA certificate is renewed?

No re-certification of a loop is required.

I.5 The requirement for emergency maintenance replacements needs to be clarified. In a running plant, breakdown of certain equipment may occur and require replacement by identical equipment. Is this equipment considered new? In the case of IS equipment, should the typical loop be re-certified if the original was not based on an IA certificate? This could severely impact on industry.

It is recommended that the maintenance replacement component should be subject to the requirement for an IA certificate. Should it not be possible to obtain an IA certificate due to changes in the safety requirements from the original certification, then an ATL should be consulted to determine if the installation is safe using that component.

No re-certification of replacement equipment is required.

I.6 What is the effect on spares already held in stock? Industry keeps a significant quantity of spare equipment. Some is owned by the plant and some is consignment stock owned by the vendor. Is this stock considered new? Some of it has been in stores for many years. It is also mostly used for identical replacements as discussed in I.5. What are the requirements for IA certification of these items?

It is recommended that items already in maintenance stock before October 2007 should not be considered new.

"New" refers to the selling date to the user, keeping in mind that the validity period is now extended to three years.

I.7 Do IA certificates allow the transfer of "composite" certification? For example, a single transmitter may be supplied with a number of certificates, for example an Ex i certificate and an Ex d certificate.

Composite certification is allowed. Issues such as warranties may make it attractive to obtain certification from the local agent (if one exists), but this is a separate, strictly commercial issue.

I.8 Will the adoption of the IECEx scheme eliminate the need for IA certificates?

No, an IECEx certificate can be used for conversion into a local IA certificate

I.9 Q **Scenario 1**: You have an existing IS Loop that is in operation for e.g. 15 years and the barrier/isolator must be replaced with a different (new) model for some or other reason. Is it necessary to re-evaluate the loop by an ATL (Approved Test Laboratory)?

A YES, the new barrier/isolator must be evaluated for compatibility with the existing IS loop (see A10).

NOTE 1: If the existing Loop is changed without getting the changes re-evaluated by an ATL (Approved Test Laboratory), the loop may no longer be safe and will no longer be legal.

The following is required for this evaluation:
1) IA certificate of the new barrier/isolator
2) Previously acceptable certificate of the field device
3) Cable specifications (parameters)
4) New loop drawing

NOTE 2: In the case where previously acceptable certificate can no longer be obtained but the marking on the device is still intact and clearly legible, a photograph of the label may be submitted as proof of certification and of the entity parameters.

Where the new barrier/isolator with all the same voltage (U_o), current (I_o) and power (P_o) parameters but the capacitance (C_o) and inductance (L_o) have changed (lower than the original barrier/isolator), the following will apply:
If the capacitance or inductance values of the cable / field device combination is more than the barrier/isolator allows, the loop no longer complies to the standards. A safety assessment may be conducted and concession granted by ATL if appropriate (see A.10).

NOTE 3: If the system was evaluated with maximum lengths of cable it is possible that the loop can still pass if the system was not fitted with the maximum length of cable. A simple measure of cable length can be done and the parameter can be re-calculated to determine if the loop will comply with a reduced cable length. In addition, the cable parameters may be physically measured as these values may be less than those originally used.

I.10 Q **Scenario 2**: You have an existing IS Loop that is in operation for e.g. 15 years and the field device must be replaced with a different model for some or other reason. Is it necessary to re-evaluate the loop by an ATL (Approved Test Laboratory)?

A Yes, the new field device must be evaluated for compatibility with the existing IS loop (see A10).

NOTE 1: If the existing Loop is changed without getting the changes re-evaluated by an ATL (Approved Test Laboratory), the loop may no longer be safe and will no longer be legal.

The following is required for this evaluation:

1) Previously acceptable certificate of the barrier/isolator
2) IA certificate of the new field device
3) Cable specifications (parameters)
4) New Loop drawing

NOTE 2: In the case where the previously acceptable certificate can no longer be obtained but the marking on the device is still intact and clearly legible, a photograph of the label may be submitted as proof of certification and of the entity parameters.

I.11 Q **Scenario 3**: You have an existing IS Loop that is in operation for e.g. 15 years and the cable must be replaced with a different model for some or other reason. Is it necessary to re-evaluate the loop by an ATL (Approved Test Laboratory)?

A Yes the new cable must be evaluated for compatibility with the existing IS loop. (see A10)

NOTE 1: If the existing Loop is changed without getting the changes re-evaluated by an ATL (Approved Test Laboratory), the loop may no longer be safe and will no longer be legal.

What is required for this evaluation:

1) Previously acceptable certificate of the barrier/isolator
2) Previously acceptable certificate of the field device
3) New Cable specifications (parameters)
4) New Loop drawing

NOTE 2: In the case where the previously acceptable certificate can no longer be obtained but the marking on the device is still intact and clearly legible, a photograph of the label may be submitted as proof of certification and of the entity parameters.

I.12 **Scenario 4**: You have an existing IS loop that has been in operation for 15 years and the barrier is replaced by a later model barrier with all the same parameters (U,I and P) except the capacitance and inductance have changed, i.e. they are now lower than the original barrier. Is it necessary to have the loop re-evaluated by an ATL?

Yes, it is necessary.

The reason for the re-evaluation is to confirm that the later barrier will be compatible with the existing cable and field device combination. If the capacitance or inductance of the cable/field device combination is more than the barrier allows, the loop no

longer complies. A different barrier, cable or even field device can be used to get the loop re-approved.

If the system was evaluated with maximum lengths of cable it is possible that the loop can still pass if the system was not fitted with the maximum length of cable. A simple measure of cable length can be done and the parameter can be re-calculated to determine if the loop will comply with a reduced cable length. In addition, the cable parameters may be physically measured as these values may be less than those originally used.

ANNEX J: Minimum requirements for an Accredited Test Laboratory to be approved

(normative)

J1. When a test laboratory intends to be accredited to test against a standard then the test signatory is required to have the following:

- experience at a test laboratory in the testing of equipment to that standard;
- evaluation of results of tests conducted by the signatory of another test laboratory

J2 The new test laboratory must have the following equipment and the necessary calibration certificates:

General - 60079-0	
Resistance to impact	required
Drop test	required
Degree of protection	required
Measurement for maximum surface temperature	required
Thermal endurance to heat	required
Thermal endurance to cold	required
Surface resistivity	required
Measurement of capacitance	
Flameproof - 60079-1	
Determination of explosion pressure (reference pressure)	required
Overpressure test (static)	required
Overpressure test (dynamic)	
Test for non-transmission of internal ignition	required
Tests of ability of enclosure to withstand pressure (breathing and draining devices)	
Thermal tests (breathing and draining devices)	
Test for non-transmission of internal ignition (breathing and draining devices)	
Pressurization - 60079-2	
Maximum overpressure test	required
Leakage (other than static pressurization)	
Static pressurization	required
Purging test for pressurized enclosures (where the protective gas is air)	required
Purging test for pressurized enclosures (where the protective gas is inert)	required
Purging test for pressurized enclosures (where the protective gas may be either air or an inert gas with a density equal to air ± 10%)	required
Filling procedure test for a pressurized enclosure protected by static pressurization	required

Purging and dilution test for pressurized enclosure with an internal source of release	required
Pressurized enclosures where the flammable substance has less than 2% (V/V) oxygen and the protective gas is inert	required
Pressurized enclosures with pressurization by continuous flow, containment system with less than 21% (V/V) oxygen and the protective gas is inert	required
Pressurized enclosure where the flammable substance is not a liquid, pressurization by continuous flow and the protective gas is air	required
Verification of minimum overpressure	required
Overpressure test (infallible containment system)	required
Infallibility test (infallible containment system)	required
Overpressure test for a containment system with limited release	required
Verifying ability of the pressurized enclosure to limit internal pressure	required
Powder filling - 60079-5	
Pressure type test of enclosure (type verification)	required
Flammability of materials	
Dielectric strength test of the filling material	required
Maximum temperatures	required
Routine pressure test of enclosures (routine verification)	required
Dielectric strength test of the filling material (routine verification)	required
Increased safety - 60079-7	
Dielectric strength	required
Rotating electrical machines	
Measuring instruments and instrument transformers	
Transformers other than instrument transformers	
Secondary batteries	
General purpose connection and junction boxes	required
Resistance heating devices and resistance heating units	
Terminal insulating material test	required
Intrinsic safety - 60079-11	
Spark ignition assessment	required
Temperature test	required
Voltage test	required
Small component ignition test	required
Tests for cells and batteries	required
Mechanical test - casting compound	required
Mechanical test - partitions	required
Test for apparatus containing piezoelectric devices	required
Type test for diode safety barriers and safety shunts	
Cable pull test	required
Dielectric strength test	required

Mechanical test - sealing of components before encapsulation	required
Transformer test	required
Type of protection "n" electrical apparatus - 60079-15	
Test for enclosed-break devices and non-incendive components	required
Test for sealed devices and encapsulated devices	required
Tests for restricted-breathing enclosures	required
Mechanical shock test for batteries	
Insulation resistance test for batteries	
Additional ignition tests for large or high-voltage machines	
Protection by encapsulation - 60079-18	
Test on the compound - water absorption	required
Test for resettable thermal protective device	required
Conditioning / Thermal cycling	required
Sealing test for build-in protective devices	required

ANNEX K: Validity of IA certificates

(normative)

K1 All electrical equipment used as Explosion Protected Equipment (EPA) must have an Inspection Authority (IA) certificate.

K2 The IA certificate for a piece of equipment or a machine or assembly must list the IA certificate numbers and details of the individual EPA components or equipment installed on that equipment, machine or assembly.

K3 All IA certificates have a validity period which is reflected on the IA certificate.

K4 All GME certificates previously numbered V or VM have expired in October 2010 and therefore no new equipment may have any of these numbers displayed on them.

K5 For equipment that is still in use and has not been refurbished, overhauled or repaired, the original IA certification is still valid.

K6 Refurbished includes that the EPA that has been stripped and installed is the original IA certified components / equipment.

K7 Overhauled/repaired means that the EPA has been stripped and reworked (e.g. Resoldering on intrinsic safety boards, skimming of flameproof enclosure surfaces, tapping or threading of entries in EPA enclosures, changing of internal components in EPA equipment, etc.).

K8 Overhaul or repair of EPA Equipment or machines must be carried out by an approved mark holder or recertified by an Accredited Test Laboratory (See SANS 10086-3 “The installation. Inspection and maintenance of equipment used in explosive atmospheres”).

K9 If equipment that has been overhauled or repaired is labelled with the V or VM number, this piece of equipment must be recertified by an accredited test laboratory and labelled with an IA certificate number.

K10 When equipment is sold by a mine to another mine the mine that is selling the equipment takes the responsibility of Section 21 of the MHSA. According to Section 21, that means that the seller (as the supplier) must ensure that the equipment is safe to use if used as prescribed and that all the EPA equipment has valid certification.

K11 Equipment may be inspected by competent personnel, but IA certificates may only be issued by an ATL.

K12 An ATL can only carry out batch testing of equipment for a specific standard / Ex technique if that ATL has been SANAS accredited to test and certify to that standard. The batch testing can only be carried out against a valid IA certificate.

K13 If an ATL is carrying out conversion certification i.e. The conversion of overseas certification to a national IA certificate, the ATL must be SANAS accredited for that Ex technique.

ANNEX L: Diesel engines requirements for use on mines

(normative)

L1 All proto type diesel engines (Diesel engines that are to be used in a hazardous location)must be tested by an accredited test laboratory to SANS standard SANS 868-1-1: 2005 (Ed 1.00) "Compression-ignition engine systems and machines powered by such engine systems, for use in mines and plants with explosive gas atmospheres or explosive dust atmospheres or both Part 1-1:Hazardous locations in underground mines - Basic explosion protected engines", SAMS 868-1-2:2014(Ed 1.01)) "Compression-ignition engine systems and machines powered by such engine systems, for use in mines and plants with explosive gas atmospheres or explosive dust atmospheres or both Part 1-2: Hazardous locations in underground mines - Explosion protected engine systems" and SANS 868-1-3 :2013 (Ed1.01) "Compression-ignition engine systems and machines powered by such engine systems, for use in mines and plants with explosive gas atmospheres or explosive dust atmospheres or both Part 1-3: Hazardous locations in underground mines – Machines"

L2 All diesel engines that will be used underground and not used in a hazardous location must be tested by an Accredited test laboratory to a SANS standard 868-4:2005 (Ed 1.01) "Compression-ignition engine systems and machines powered by such engine systems, for use in mines and plants with explosive gas atmospheres or explosive dust atmospheres or both Part 4: Non-hazardous locations in underground coal mines". The IA certificate is unique to this vehicle and must accompany the vehicle and be available on the mine.

L3 If the vehicle that will be entering a hazardous location has any electrical circuits these must be tested by an Accredited Test Laboratory and comply to the following;

a) SANS 60079-0 2012 (Ed 5) ""Explosive Atmospheres Part 0: Equipment-General Requirements"; and
b) intrinsically safe according to SANS 60079-11 2012 Explosive atmosphere Part 11: Equipment protected by intrinsic safety; or
c) be isolated if the flammable gas level in the area is detected as 1.2% or higher level.

These certificates must accompany the application for the "D" number issued by the Mine Health and Safety Inspectorate.

L4 All flame proof vehicles that have been tested and issued with a D number may be manufactured by a manufacture that has a valid recognised mark scheme from an accredited mark scheme system. If the manufacture is not in possession of a mark scheme then each vehicle will require that the accredited test laboratory evaluated the vehicle against the certificate issued for that vehicle.

L5 Any repairs or component changes must be carried out by the original holder of the IA certificate or a company approved by that manufacture to carry out such repairs..