higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

SPECIALISED ELECTRICAL INSTALLATION CODES
(First Paper)

26 MARCH 2018

This marking guideline consists of 8 pages.

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QUESTION 1

1.1
- Any pit or depression below the level of the hangar floor shall be considered to be a zone-1 location✓
- The space inside a hangar and any adjacent communicating area that is not properly isolated from the hangar, shall be considered to be a zone-2 location up to a height of 450 mm above floor level✓ and the space that is within a horizontal distance of 1,5 m of aircraft power units, aircraft fuel tanks or other components that contain fuel,✓ and that extend from the floor to a height of 1,5 m above the higher of the upper surfaces of wings and the upper surfaces of the engine nacelles✓ shall be considered to be a zone-2 location.✓

NOTE
Adjacent areas in which flammable vapours are not likely to be released such as storerooms and electrical control rooms, need not be classified as hazardous if they are adequately ventilated and effectively isolated from the hangar by walls or partitions. (5)

1.2
- All zone-1 areas Ex e IIB T4 electrical equipment ✓
- All zone-2 areas Ex n IIB T4 electrical equipment ✓
- All safe areas should contain IP 56 enclosures✓ and equipment for cleaning and fire prevention testing exercises (sprinkler system),✓ which according to FAA rules must be conducted regularly.✓ (5)

1.3
- A drawing indicating the zoning of the respective areas✓
- Certificates of conformity for all explosion-prevention technological electrical equipment used in the areas to prove their suitability for use in these areas✓
- The MSDS of all the flammable substances used in the respective areas✓
- A test document containing all the results obtained from the testing that had been done✓
- Evidence of the installation technique as well as the signage identifying the respective zoned areas✓
- Valid Certificates of Compliance for each area (one per DB supplying equipment in the relevant zoned areas)✓ (Any 5 × 1) (5)

1.4

Ex ia	***Ex ib***
Zones which are suitable for use	**Zones which are suitable for use**
Zone 0 ; Zone 1 ; Zone 2	Zone 1 ; Zone 2
✓ ✓ ✓	✓ ✓

(5)

1.5 $\frac{\text{II}}{2}$ or $\frac{1}{2}$ $\frac{2}{3}$ $\frac{\text{G}}{4}$

- Certified to Atex Directive 94/9/EC✓
- Application Group I for Mining: Mining industries have categories M1 (very high level of protection) and M2 (high level of protection)✓
- Application Group II for industries other than mining✓
- Level of protection✓
- Hazardous substances: G = gas or D = dust✓

NOTE 1
Group I (mining) can be further subdivided as follows:
- M1 - Very high level of protection
- M2 - High level of protection

NOTE 2
Levels of protection, for example, indicates suitability for:
- A zone-0 gas hazard OR a zone-20 dust hazard
- A zone-1 gas hazard OR a zone-21 dust hazard
- A zone-2 gas hazard OR a zone-22 dust hazard

These markings do NOT replace, but are IN ADDITION to the existing requirements for the marking of explosion-protected equipment to European Standards (Cenelec). (5)

1.6
- Factory Mutual
- Explosion Prevention Technology (EPT)
- SGS or Explolabs
- Laboratories
- Canadian Standards Association
- BASEEFA
- Mining Equipment Certification Services (MECS)
- Sira Certification Services (SCS)
- SABS

(Any 5 × 1) (5)
[30]

QUESTION 2

2.1 Anybody using or being the owner of an electrical installation must be in possession of a valid certificate of compliance,✓ except when the installation was done before this regulation (23 October 1992).✓ However, the alterations and changes made after the date have to be covered by a certificate.✓ (3)

2.2
- Electrical Installation Regulations
- Electrical Machinery Regulations (2)

2.3
- There are regulations for the protection of workers against buried electrical cables when they dig trenches.
- Temporary electrical installations should be inspected at least once a week.
- Electrical machinery has to be inspected on a daily basis.
- Measures are taken to protect workers against any electrical installation under or over the work site.
- The control of temporary electrical installations is designated to a competent person who is appointed in writing. (5 × 1) (5)

[10]

QUESTION 3

3.1 3.1.1 This part of SANS 10142 covers:
- Circuits supplied at nominal voltages up to and including 1 000 V AC or 1 500 V DC
- Circuits other than the internal wiring of apparatus that operate at voltages exceeding 1 000 V and that are derived from an installation that has a voltage not exceeding 1 000 V AC (2)

3.1.2 True (1)

3.1.3
- Overcurrent
- Overload current
- Short-circuit current
- Single-phasing
- Earth-fault current
- Overvoltage
- Undervoltage
- Incorrect phase rotation
- Fire risk (Any 4 × 1) (4)

3.2 3.2.1 A medical location is intended for the purposes of diagnosis,✓ treatment (including cosmetic treatment),✓ monitoring and care of patients.✓ (3)

3.2.2 Group-0 location: Medical location where no applied part is intended to be used✓

Group-1 location: Medical location where applied parts are intended to be used externally or to any part of the body, but not to the heart✓

Group-2 location: Medical location where applied parts are intended to be used in applications such as in an intracardiac procedure,✓ in an operation (in an operating theatre)✓ and in vital treatment where discontinuity (failure) of the supply can cause danger to life✓ (5)

3.3 The first letter of the identification code denotes the relationship of the source of energy to earth:✓ T: one or more parts are connected directly to earth.✓ (2)
[17]

QUESTION 4

4.1 4.1.1 IA certificate – It is a national certificate issued for EPA by an ATL✓ endorsing conformance with the relevant national standards.✓ (2)

4.1.2 ATL (approved test laboratory) – It is a test laboratory that is accredited by the government-endorsed South African accreditation body (SANAS)✓ and appointed by the approving authority to carry out tests specified in the appropriate standards and to issue certificates (known as IA certificates)✓ for explosion-protected apparatus indicating that such apparatus complies with safety requirements and any other requirements of the approving authority.✓ (3)

4.2 4.2.1 Inspection approved (1)

4.2.2 All types of explosion-protected apparatus shall be independently tested and certified by an ATL.
(Self-certification shall not be allowed.) (1)

4.2.3 The IA certificate will ensure that the markings are authentic✓ and that the equipment is safe for use✓ in areas proclaimed by the marking plate.✓ (3)

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4.3 4.3.1 CE mark
4.3.2 EU explosive-atmosphere certification mark
4.3.3 Gas group
4.3.4 Equipment category (M1, M2, 1, 2, or 3)
4.3.5 G = gas

(5 × 1) (5)

4.4
- Equipment description, make and model (or frame size)
- Equipment's unique identification (serial number)
- Electrical input and output data
- Explosion-protection ratings, conditions associated with certification, ATL and certificate number (Any 3 × 1) (3)

[18]

QUESTION 5

5.1 This part of SANS 60079 specifies the general requirements for construction, testing and marking of electrical equipment and Ex components intended for use in explosive gas atmospheres.✓ Unless modified by one of the parts in the SANS 60079 series, electrical equipment complying with this standard is intended for use in hazardous areas in which explosive gas atmospheres, caused by mixtures of air and gases, vapours or mists, exist under normal atmospheric conditions✓ of:

- Temperature -20 °C to +60 °C
- Pressure 80 kPa (0,8 bar) to 110 kPa (1,1 bar)✓
- Air with normal oxygen content, typically 21% v/v (3)

5.2 These maximum surface temperatures shall not exceed:
- 150 °C on any surface where coal dust can form a layer✓
- 450 °C where coal dust is not expected to form a layer (for example, due to sealing or ventilation), provided that the actual maximum surface temperature is marked on the equipment✓

NOTE
When choosing Group-I electrical equipment, the user should take into account the influence and the smouldering temperature of coal dusts if they are likely to be deposited in a layer on surfaces with temperatures above 150 °C. (2)

[5]

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QUESTION 6

6.1 Zone 0: Area atmosphere containing an explosive atmosphere for extended periods
Zone 1: Area containing a flammable atmosphere under normal operating conditions
Zone 2: Area containing a flammable atmosphere under abnormal conditions
Zone 20: Area containing an explosive dust atmosphere for an extended period
Zone 21: Area containing an explosive dust atmosphere under normal operating conditions
Zone 22: Area containing explosive dust, deposited in layers (Any 4 × 1) (4)

6.2 A = Zone 1
B = Zone 2
C = Zone 0
D = Safe zone (4)
[8]

QUESTION 7

7.1 The type of protection, Ex pD, comprises the technique of applying a protective gas to an enclosure in order to prevent the formation of an explosive dust atmosphere✓ inside the enclosure by maintaining an overpressure against the surrounding atmosphere, whereas the type of protection, Ex pG, makes provision for gas atmospheres.✓ (2)

7.2
- Static overpressure is obtained by creating overpressure using a static air source which only discharges when the pressure inside the enclosure drops below the desired pressure.✓
- Continuous flow on the other hand, provides a continuous flow of inert gas or atmosphere to maintain an overpressure inside the enclosure.✓

(2 x 1) (2)
[4]

QUESTION 8

8.1
- Material – The amount of static electricity generated depends on the nature of the surface and on the volume and surface conductivities. These, in turn, usually depend on the moisture content.
- Contact pressure – Increased contact pressure of the rollers generally results in increased static electricity generation.
- Solutions/ink – The presence of colloidal particles in the ink or solutions greatly increases static electricity generation. Coloured inks are prone to generate static electricity owing to the presence of metallic pigments.
- Running speed – High-speed operation results in increased generation of static electricity.
- Running-track and guiding-element surfaces – Rough and nonconductive surfaces on running tracks and guiding elements increase generation of static electricity.
- Humidity – Increased generation of static electricity occurs in atmospheres of low relative humidity.
- Machine characteristics – The degree of generation of static electricity may be influenced by the characteristics of particular types of machines, e.g. additional friction between the running track and the rubber cylinders when the machine is started, or with changes of roller speed (as in photogravure printing machines). (Any 6 × 1) (6)

8.2 The discharge of static electricity could generate enough energy✓ to ignite an explosive atmosphere.✓ (2)
[8]

TOTAL: 100

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