higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

SPECIALISED ELECTRICAL INSTALLATION CODES
(First Paper)

23 JULY 2018

This marking guideline consists of 8 pages.

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QUESTION 1: OCCUPATIONAL HEALTH AND SAFETY ACT, ACT 85 OF 1993 – ELECTRICAL INSTALLATION REGULATIONS

1.1.1 True
1.1.2 False
1.1.3 False
1.1.4 False
1.1.5 True
1.1.6 False
1.1.7 False

(7 × 1) (7)

1.2.1 five
1.2.2 hazards
1.2.3 the new electrical installation regulations became law.

(3 × 1) (3)
[10]

QUESTION 2: SANS 10142–1 : 2012: MEDICAL LOCATIONS

2.1 2.1.1 Part of the medical electrical equipment which comes into physical contact with the patient for the equipment to necessarily perform its function in normal use, or the equipment can be brought into contact with the patient, or needs to be touched by the patient. (2)

2.1.2 Medical location where no applied parts are intended to be used. (2)

2.1.3 Medical location where applied parts are intended to be used in applications such as in an intra-cardiac procedure, in an operation and an operating theatre, and in vital treatment where discontinuity or failure of the supply can cause danger to life. (3)

2.2 A green signal lamp to indicate normal operation and a yellow signal lamp to signal when the minimum value set for the insulation resistance is reached. It must not be possible for this light to be cancelled and disconnected.
An audible alarm that sounds when the minimum value set for the insulation resistance is reached. The audible signal may be silenced. The visual signal shall revert to green and the audible alarm will automatically reset on the removal of the fault condition. (3)
[10]

QUESTION 3: SANS 60079–0 : 2012 ELECTRICAL APPARATUS FOR EXPLOSIVE GAS ATMOSPHERES PART 0 – GENERAL REQUIREMENTS

3.1 Shall not contain more than 15% in total mass of aluminium, magnesium and titanium, and 6% in total of magnesium and titanium. The above requirement does not apply to group-1 surveying instruments carried by people. (2)

3.2 Shall be capable of being padlocked in the open position. Provision shall be made to enable short-circuit and earth-fault relays, if used, to latch out. If the switchgear has a local resetting device which is accessible from the outside of the enclosure, its access cover shall have a special fastener. (2)

3.3 They are interlocked mechanically, electrically or otherwise designed so that they cannot be separated when the contacts are energised. The contacts cannot be energised when the plug and socket are separated or fixed together by means of special fasteners and the apparatus marked with the separation marking as required. (4)

3.4 It shall not depend on just one screw. A single eyebolt may be used only if this is an integral part of the luminaire, for example by being cast or welded to the enclosure or, if threaded, the eyebolt is locked by a separate means against loosening when twisted. (2)

[10]

QUESTION 4: **SANS 60079 PART 10–1 : 2010 CLASSIFICATION OF HAZARDOUS AREAS WITH EXPLOSIVE GAS ATMOSPHERES**
AND
SANS 60079 PART 10–2 : 2009: CLASSIFICATION OF AREAS WHERE COMBUSTIBLE DUSTS ARE OR MAY BE PRESENT

4.1 First of all it is necessary to determine the grade of release in accordance with the definitions by establishing the likely frequency and duration of the release. Having established the grade of the release it is necessary to determine the release rate and other factors which may influence the type and extent of the zone. Continuous grade of release refers to a release which is continuous or is expected to occur frequently or for long periods. Primary grade of release can be expected to occur periodically or occasionally during normal operation. Secondary grade of release is not expected to occur in normal operation and, if it does occur, is likely to do so only infrequently and for short periods of time. Release rate refers to the quantity of flammable gas or vapour emitted per unit time from the source of the release. The likelihood of the presence of an explosive gas atmosphere and hence the type of zone depends mainly on the grade of release and the ventilation. (6)

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4.2 4.2.1 With gases or vapours lighter than air an escape at low velocity will disperse fairly rapidly upwards and the presence of a roof will, however, inevitably increase the area of spread under it. If the escape is at high velocity in a free jet the action of the jet, although entraining air which dilutes the gas or vapour may increase the distance over which the gas/air mixture remains above its lower flammable limit. The pitch of the roof structure must allow for an escape route for the gas atmosphere to escape. The same goes for long overhangs where equipment is located under a covered area. With gases or vapours heavier than air an escape at low velocity will tend to flow downward and may travel long distances over the ground before it is safely dispersed by atmospheric diffusion. Special regard therefore needs to be paid to the topography of any site under consideration and also to surrounding areas in order to determine where gases or vapours might collect in hollows or run down inclines to lower levels. If the escape is at high velocity in a free jet the jet-mixing action by entraining air may well reduce the gas/air mixture to below its lower flammable limit in a much shorter distance than in the case of a low-velocity escape. Consideration should always be given to the possibility that a gas which is heavier than air may flow into areas below ground level like pits or depressions. (4)

4.2.2 The extent of the zone depends on the estimated or calculated distance over which an explosive atmosphere exists before it disperses to a concentration in air below its lower explosive limit. When assessing the area of spread of gas or vapour before dilution to below its lower explosive limit, expert advice should be sought. The extent of the zone is mainly affected by chemical and physical parameters of which some are intrinsic properties of the flammable material and others are specific to the process. For simplicity the effect of each parameter assumes that the other parameters remain unchanged. (3)

4.2.3 The concentration of flammable gas or vapour in air above which the gas atmosphere is not explosive and the concentration of flammable gas or vapour in air below which the gas atmosphere is not explosive. (4)

4.2.4 Natural ventilation
Forced ventilation (2)

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4.2.5 High ventilation (VH)
Can reduce the concentration at the source of release virtually instantaneously resulting in a concentration below the lower explosive limit and a zone of negligible extent results. However, where the availability of ventilation is not good another type of zone may surround the zone of negligible extent.

Medium ventilation (VM)
Can control the concentration resulting in a stable zone boundary whilst the release is in progress. Where the explosive gas atmosphere does not persist unduly after the release has stopped, the extent and type of zone is limited to the design parameters.

Low ventilation (VL)
Cannot control the concentration whilst release is in progress and/or cannot prevent undue persistence of a flammable atmosphere after the release has stopped. (3 × 2) (6)
[25]

QUESTION 5: SANS 61241–4 : 2001 ELECTRICAL APPARATUS FOR USE IN THE PRESENCE OF COMBUSTIBLE DUST PART 4: TYPE OF PROTECTION 'pD'

5.1
- The formation of a dust cloud from any source of release including a layer or accumulation to form an explosive atmosphere (see clause 5). Explosive dust atmospheres are formed from sources of dust release. A source of dust release is a point or location from which combustible dust can be released or raised such that an explosive dust/air atmosphere can be formed. This definition includes layers of combustible dust capable of being dispersed to form a dust cloud. Depending on the circumstances not every source of release will necessarily produce an explosive dust/air mixture. On the other hand, a diluted or small continuous source of release can produce a potentially hazardous dust layer in time.
- The formation of dust layers which are not likely to form a dust cloud and which may ignite due to self-heating or hot surfaces and cause a fire hazard or overheating of equipment. The ignited layer may also act as an ignition source for an explosive atmosphere (see clause 7). In principle the thickness of dust layers outside equipment can be controlled by housekeeping. When giving consideration to the sources of release it is essential to agree to the nature of the housekeeping arrangements for the plant with plant management. The effect of housekeeping on dust layers is discussed in annexure C. For example where the person responsible for the selection of equipment expects the plant to be free from dust layers a maximum permissible layer depth of 5 mm on the surface would be acceptable, so as to take account of any short-term interruption of the cleaning cycle. The risk of fire from hot surface ignition of a dust layer and how the maximum permissible surface temperature of equipment should be selected in order to avoid ignition should be discussed. (2 × 2) (4)

5.2
- The first step is to identify the material characteristics and whether it is combustible. For the purposes of apparatus selection particle size, moisture content, cloud and layer, minimum ignition temperature and electrical resistivity should also be considered.
- The second step is to identify where dust containment or sources of dust release can be present. It may be necessary to consult process-line diagrams and drawings of the plant layout. This step should include the identification of the possibility of the formation of dust layers.
- The third step is to determine the likelihood that dust will be released from those sources and thus the likelihood of explosive dust/air mixtures in various parts of the installation. (3 × 2) (6)

5.3 5.3.1 Where protection is not provided to prevent the ingress of dust following the shutdown or failure of the pressurisation system, a warning label shall be fixed stating that dust shall be removed from the interior prior to switching on the electrical supply. When required by this standard the switching-off of the electrical supply shall require the isolation of all live conductors including the neutral.

5.3.2 The design of a pressurisation system relies on the principle that a failure of the pressurisation automatically disconnects the system from the electricity supply and/or initiates alarms. To guard against the possibility that electrical apparatus protected by pressurisation may cause an explosion in the case of the protective gas supply failure, measures shall be incorporated to take into account the characteristics of the apparatus, prevailing environmental conditions and the use of devices for monitoring and warning purposes.

5.3.3 The enclosure shall be cleaned before the electrical supply to the system is connected or restored in order to remove any accumulated combustible dust left in the enclosure after either accidental failure of the pressurisation system or normal shutdown. The manufacturer shall provide the necessary instructions to the user detailing the requirements for cleaning the enclosure.

5.3.4 Flow-monitoring devices provided for the operation of the alarm and electrical trip devices shall operate when the pressure within the enclosure falls below the permitted minimum value or exceeds the permitted maximum pressure and shall be located at the outlet. If the internal pressure or flow of protective gas falls below the minimum prescribed value a signal which is immediately apparent to the operator shall indicate the loss of pressure. The pressurisation system shall be restored as soon as possible or else the electrical supply shall be switched off manually.

5.3.5 Visible or audible alarms shall be located where they will immediately be seen or heard by the responsible personnel who will take the necessary action.

(5 × 2) (10)

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5.4 A minimum overpressure of 50 Pa (0,5 mbar) relative to external atmosphere. (1)

5.5 5.5.1 The pressurised enclosure shall be filled with an inert gas in a non-hazardous area using procedure specified by the manufacturer.

5.5.2 The minimum level of overpressure shall not be less than 50 Pa above the external pressure under the most onerous conditions specified for normal service.

5.5.3 A protective gas shall be used for maintaining pressurisation in the enclosure. The gas shall not, by reason of its chemical characteristics or the impurities that it may contain reduce the level of protection below the sought after level, or affect the satisfactory operation and integrity of the apparatus. Means for removing any oil or moisture or other undesirable impurities from the protective gas shall be provided as necessary. The manufacturer shall specify the protective gas and any permitted alternatives. The protective gas may also serve other purposes like cooling of the apparatus. When an inert gas is used a risk of asphyxiation exists and therefore a suitable warning should be affixed to the enclosure.

5.5.4 The temperature of the protective gas shall not normally exceeds 40 °C at the inlet of the enclosure. In special circumstances a higher temperature may be permitted or a lower temperature may be required and then the temperature shall be marked on the enclosure.

(4 × 1) (4)
[25]

QUESTION 6: SANS 10123 : 2014 THE CONTROL OF UNDESIRABLE STATIC ELECTRICITY

6.1
6.1.1 separated
6.1.2 opposite
6.1.3 separation
6.1.4 different
6.1.5 can
6.1.6 can
6.1.7 opposite
6.1.8 within
6.1.9 created
6.1.10 reunited
6.1.11 separation
6.1.12 discharge

(12 × 1) (12)

6.2
- An effective means exists for generation of static electricity.
- A means exists for the accumulation of the separated charges and attaining sufficient potential difference between them.
- A static discharge having sufficient energy for ignition (see section 4), occurs between the separated charges.
- The discharge occurs in or on a flammable material. (4)

6.3 6.3.1 Arc
6.3.2 Spark
(2 × 1) (2)

6.4 If the total resistance between the object and earth exceeds 1 MΩ install a separate earthing conductor. If the object has a very large capacitance to earth any accumulated electrostatic charges are usually of low voltage, even if the resistance to earth exceeds 1 MΩ.
In such cases, give proper consideration to the maximum possible charging rate and install an earthing conductor if considered necessary. (1)

6.5 1 MΩ (1)
[20]

TOTAL: 100

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