higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NON-NATIONAL CERTIFICATE: ENGINEERING CERTIFICATE OF COMPETENCY

SPECIALISED ELECTRICAL INSTALLATION CODES
(First Paper)

30 JULY 2018

This marking guideline consists of 8 pages.

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QUESTION 1

1.1 Explosion protected equipment is a grouping for different explosion protection techniques used. Flame proof (Ex d) is but one of these techniques. (2)

1.2 In areas where patients are treated where as part of the treatment, electrical equipment is used in close proximity to the patient (operating theatres, anaesthetising locations and others). (2)

1.3 There is no connection whatsoever between the two markings. (1)

1.4 Class 1 areas are areas where flammable vapours, liquids and gasses are present. Div. 1 means that the atmosphere will contain flammable substances under normal operating conditions. The A identifies the fact that not only is the atmosphere flammable/explosive, but also poisonous for humans. (2)
[7]

QUESTION 2

2.1 MOS Act (Machinery Ocupational Safety Act)

2.2 Department of Labour Directive Occupational Health and Safety

2.3 FALSE

2.4 Government Mining Engineer

2.5 Electrical Machinery and the Electrical Installation Regulations

(5 × 1) **[5]**

QUESTION 3

3.1 YES. The accredited person's signature precedes the other signatures if they do not appear.
In the event where there are no other signatures on the document, the registered person’s signature is enough. (2)

3.2 It depends on the nature of the maintenance. If the maintenance affects changes to the circuit then YES the certificate will become null and void. If the nature of the maintenance does not affect changes or the character of the circuit then NO it will not affect it. It is important to note that the construction work involved during the maintenance activity should not change the character of the circuit as far as safety is concerned. (3)

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3.3 When the installation was done it had to comply with the standards applicable at that time. Therefore when an accredited person has to issue a certificate for the already existing installation it is important to establish the age of the installation so that the person can express an opinion regarding the nature of the installation against the standards applicable when it was constructed. Only when it does and the current fundamental requirements in SANS 101042 Part 1, 2003 have been met can the accredited person after conducting the required inspections and tests declare the installation reasonably practically safe. (3)

3.4
- Additional inspection and test document for a medical location
- Additional inspection and test document for a hazardous location (2)

3.5 3.5.1 SABS 051 (2)

3.5.2 The disposition of a sedated patient regarding notification to someone of electric shock. The possibility of a flammable atmosphere that might develop because of the use of flammable anaesthetic or disinfectant (1)

3.6 3.6.1 False
3.6.2 False

(2 × 1) (2)
[15]

QUESTION 4

4.1 The objectives of continuous supervision are to enable the early detection of arising faults and their subsequent repair. It uses present skilled personnel who are in attendance at the installation in the course of their normal work and who use their skills to detect faults and changes at an early stage. (3)

4.2
- Assess the viability of the continuous supervision concept in light of the competence skills and availability of personnel and their experience in relation to the particular installation.
- Define the equipment to be considered under continuous supervision taking account of environmental conditions, frequency of attendance, special knowledge, work flow and location of equipment.
- Determine the frequency of inspection, the grade of inspection and the content of reporting such as to enable meaningful analysis of equipment performance.
- To ensure that skilled personnel are familiar with the concept of continuous supervision. Together with the needs for any reporting, or analysis function, they need to be familiar with the installation they attend, and also with the inventory of explosion-protected equipment within their area of responsibility.
- They are also responsible for verification and for ensuring that the process of continuous supervision is being adhered to, and that skilled personnel are given adequate time to carry out their inspections, and that skilled personnel are receiving appropriate training and refresher training, that documentation is completed correctly, and that adequate technical support is readily available to the skilled personnel, and that the state of the electrical installation is known. (Any 4 × 1) (4)

4.3
- Correctly terminated in an appropriate enclosure
- Isolated from all sources of power supply and insulated
- Isolated from all sources of power supply and earthed
- If removal is permanent then wiring shall be removed or correctly terminated in an appropriate enclosure. (4)

4.4 4.4.1 Equipment for explosive gas atmospheres having a very high level of protection which is not a source of ignition in normal operation, expected faults or when subject to rare faults. (2)

4.4.2 Equipment for installation in a mine susceptible to fire-damp having a high level of protection which has sufficient security that it is unlikely to become a source of ignition in the time span between there being an outbreak of gas and the equipment being de-energised. (3)

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4.4.3 Equipment for explosive gas atmospheres having a high level of protection, which is not a source of ignition in normal operation or when subject to faults that may be expected, though not necessarily on a regular basis. (2)

4.4.4 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). (2)
[20]

QUESTION 5

5.1 Combustible liquid has a closed-cup flash point at or above 38 °C.

Flammable liquid has a flash point below 38 °C, regardless of its temperature, or a liquid with a flash point at or above 38 °C being handled at temperatures at or above its flash point. (5)

5.2 5.2.1 Primary release is likely to occur periodically or occasionally in normal operation. (As a rough rule of thumb for a continuously operating plant, a release likely to be present for more than 10 but less than 1 000 hours per year should be regarded as primary).

5.2.2 Secondary release is unlikely to occur in normal operation and, in any event, will occur infrequently and be of short duration. (As a rough rule of thumb for a continuously operating plant, a release likely to be present for less than 10 hours per year and for short periods only should be regarded as secondary).

(2 × 3) (6)

5.3 5.3.1 Methods should be employed to allow excessive static electricity generated by filters and strainers to dissipate by allowing adequate relaxation time before loading (for example a 30 s piping loop in the case of high purity fuels such as Jet A1). (2)

5.3.2 Bond rails at sidings to the piping flanges and provide flexible clamp-on bonding leads at road tanker top loading to bond the tank to the product piping. Tanks should be bonded before loading. In general, above-ground metallic conductive vessels, tankers (road, rail and sea), piping and other vessels and systems should be well bonded and earthed in order to dissipate any accumulated electrical charge. (3)

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5.3.3 The practice of switch loading, i.e. loading a class II or class III product into a tank or container that has contained a class I product and was not drained, cleaned and made vapour free, should be avoided. (2)

5.3.4 Small (up to 250 ℓ) portable containers could cause a hazard when they are filled. The following should be observed:

- Fixed electrical equipment should be appropriately certified as explosion protected.
- All conductive equipment in contact with the liquid should be earthed with a resistance path not exceeding 10 Ω for an entirely metallic path and 1 MΩ for a partly non-metallic path
- Components should not be insulated by paint layers, in-line sight glasses, etc.
- Drum pumps should be bonded to both the container being emptied and the one being filled; hoses and nozzles should be conductive.
- There should be an adequate relaxation time downstream of filters.
- If switch loading is suspected, care should be taken to use long metallic nozzles, conducting chains, etc.
- Non-metallic containers should not be used for transporting class I products, unless they are specifically approved for that purpose. Refer to SABS 0229 in this regard. (Any 3× 1) (3)

5.3.5 Drum pumps should be bonded to both the container being emptied and the one being filled; hoses and nozzles should be conductive. (2)

5.3.6 Non-metallic containers should not be used for transporting class I products, unless they are specifically approved for that purpose. Refer to SABS 0229 in this regard. (2)

[25]

QUESTION 6

6.1 6.1.1 Lowest temperature of a heated surface at which ignition occurs in a dust layer of specified thickness in contact with heated surface (2)

6.1.2 Lowest temperature of a heated surface at which under specified conditions the ignition of flammable material in the form of gas or vapour in mixture with air will occur in contact with heated surface (3)

6.1.3 Highest temperature attained by an electrical apparatus, under the most adverse conditions by any part or surface of apparatus, which will be able to ignite surrounding atmosphere. (3)

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6.1.4 Liable to introduce a potentioa, generally earth potential, and not forming part of the installation. (2)

6.2 6.2.1 Temperature
6.2.2 Detectors
6.2.3 Inside
6.2.4 Over-temperature tripping device
6.2.5 Failure
6.2.6 Null and void

(6 × 1) (6)
[16]

QUESTION 7

7.1 Means of repair involving, for example, the removal or addition of material to reclaim component parts which have sustained damage, in order to restore such parts to a serviceable condition in accordance with the relevant standard. (3)

7.2 Shows that the equipment is incomplete. This means that on its own the equipment will not offer the protection stated on its marking plate, for example, a switch that needs to be mounted in an enclosure. (2)
[5]

QUESTION 8

The cable capacitance is then 200 times 30 pF, equalling 0,006 μF.

The numbers are pur into the equations to see if these two devices are compatible for use as an intrinsically safe system. If all the equations are satisfied as 'True' the two devices can be used as an intrinsically safe system.

Voc $\leq$ Vmax 28 V $\leq$ 24 V	False	NOT SUITABLE
Isc $\leq$ Imax 192 mA $\leq$ 180 mA	False	NOT SUITABLE
Ca $\geq$ Ci + Ccable 0,13 μF $\geq$ 0,03 μF + 0,006 μF	True	SUITABLE
La $\geq$ Li + Lcable 4,2 mH $\geq$ 0,00 mH + 0,00 mH	True	SUITABLE

[7]

TOTAL: 100

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