higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

SPECIALISED ELECTRICAL INSTALLATION CODES
(First Paper)

15 NOVEMBER 2019

This marking guideline consists of 7 pages.

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QUESTION 1

1.1 1.1.1 A
1.1.2 D
1.1.3 A

(3 × 1) (3)

1.2
- The provision and maintenance of systems of work, plant and machinery that, as far as is reasonably practicable, are safe and without risks to health
- Taking such steps as may be reasonably practicable to eliminate or mitigate any hazard or potential hazard to the safety or health of employees, before resorting to personal protective equipment
- Making arrangements for ensuring, as far as is reasonably practicable, the safety and absence of risks to health in connection with the production, processing, use, handling, storage or transport of articles or substances
- Establishing, as far as is reasonably practicable, what hazards to the health or safety of persons are attached to any work which is performed, any article or substance which is produced, processed, used, handled, stored or transported and any plant or machinery which is used in a business, and he/she shall, as far as is reasonably practicable, further establish what precautionary measures should be taken with respect to such work, article, substance, plant or machinery in order to protect the health and safety of persons and he/she shall provide the necessary means to apply such precautionary measures
- Providing such information, instructions, training and supervision as may be necessary to ensure, as far as is reasonably practicable, the health and safety at work of his/her employees
- As far as is reasonably practicable, not permitting any employee to do any work or to produce, process, use, handle, store or transport any article or substance or to operate any plant or machinery, unless the precautionary measures contemplated in paragraphs (b) and (d), or any other precautionary measures which may be prescribed, have been taken
- Taking all necessary measures to ensure that the requirements of this act are complied with by every person in his/her employment or on the premises under his/her control where plant or machinery is used
- Enforcing such measures as may be necessary in the interest of health and safety
- Ensuring that work is performed and that plant or machinery is used under the general supervision of a person trained to understand the hazards associated with it and who have the authority to ensure that precautionary measures taken by the employer are implemented (Any 8 × 1) (8)

1.3 The approved inspection authority is an extension of the Department of Labour's inspection authority.✓ It may only on request of the department,✓ inspect an electrical installation and provide evidence to the inspectorate of the department regarding the status of the installation.✓ (3)

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1.4
- 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. (Any 4 × 1) (4)

[18]

QUESTION 2

2.1
2.1.1 C
2.1.2 B
2.1.3 B
2.1.4 A
2.1.5 A

(5 × 1) (5)

2.2 TN system (1)

2.3
- Medical locations
- Ships (2)

2.4 TNS system (1)

2.5 Supply earth✓ and consumer earth are not directly connected.✓ (2)

2.6 IT system (1)

[12]

QUESTION 3

3.1 It shall not depend on just one screw. A single eye bolt 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 eye bolt is locked by a separate means against loosening when twisted.✓ (2)

3.2 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 is marked with the separation marking as required.✓ (4)

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3.3 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)

3.4 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)
[10]

QUESTION 4

4.1
4.1.1 A
4.1.2 E
4.1.3 B
4.1.4 C
4.1.5 D

(5 × 1) (5)

4.2 The volume of hydrogen liberated per hour can be calculated using the following equation:

$V = 150 \times 20 \times 0{,}00045 = 1{,}35\ m^3$✓

The volume of the room is 64 m^3. ✓

The volume of the battery and stand is 4,0 m^3. ✓

The volume of air is equal to the volume of the charging station minus the volume of the battery and stand, which is 60 m^3. ✓

Therefore, the percentage concentration of hydrogen gas in the charging station after 1 h of charging would be 1,35/60 × 100 = 2,25%✓ (5)
[10]

QUESTION 5

5.1
- The SANS 0078 series of standards deal with gas installations and more specifically equipment using gas as a fuel. The criteria would be that equipment supplied from portable containers directly coupled to the appliance is not considered part of a hazardous location as defined by the OHS Act.
- However, where the appliances are connected to a gas intake manifold (more than one container is connected to the appliance simultaneously), the installation would be included in the hazardous location/area definition of the OHS Act. (2)

5.2 Zone 0✓ zone 1✓ zone 2✓ (3)

5.3 It prevents corrosion✓ caused by stray electrolytic spray currents✓ resulting in pitting (corrosion)✓ (3)

5.4 Liquid – water✓ Gas generated – hydrogen gas✓ (2)

5.5
- Limiting the quantity applied during a single application to a level which ensures that the grade of ventilation is sufficient to prevent build-up of an explosive air/fuel ratio mixture (keep atmosphere below lower explosive limit (LEL))
- Increase the air exchange ratio to prevent a build-up of an explosive air/fuel ratio mixture (keep atmosphere below LEL (lower explosive limit))
- Remove all electrical equipment to the outside of the spray booth, thus ensuring no possibility of ignition by electrical equipment
- Spray in an open area where there is sufficient free natural ventilation to prevent build-up of an explosive air/fuel ratio mixture (keep atmosphere below LEL (lower explosive limit)) (Any 3 × 1) (3)

5.6 A mixture of fine coal dust✓ and methane gas in the atmosphere✓ (2)

[15]

QUESTION 6

6.1 Zone 20✓
Area in which combustible dust is continuously or frequently present as a cloud✓ during normal operation, in sufficient quantities to be capable of producing an explosive concentration of combustible dust mixed with air, and/or where layers of dust of uncontrollable and excessive thickness can be formed✓
This can be the case inside dust containment areas where dust can, frequently or for long periods of time, form explosive mixtures. This occurs typically inside equipment.✓

Zone 21✓
Area not classified as zone 20 in which combustible dust, as a cloud, is likely to occur during normal operation,✓ in sufficient quantities to be capable of producing an explosive concentration of combustible dust mixed with air.
This zone can include, among others, areas in the immediate vicinity, of powder-filling or -emptying points and areas where dust layers occur and are likely, in normal operation, to give rise to an explosive concentration of combustible dust mixed with air.✓

Zone 22✓
Areas not classified as zone 21 in which combustible dust clouds may occur infrequently✓ and persist for only a short period or in which accumulations or layers of combustible dust may be present under abnormal conditions and give rise to combustible mixtures of dust in air.✓ Where, following an abnormal condition, the removal of dust accumulations or layers cannot be assured, the area is to be classified zone 22.
This zone can include, among others, areas in the vicinity of equipment containing dust, where dust can escape from leaks and form deposits (such as milling rooms in which dust can escape from the mills and then settle).✓ (11)

6.2
- Automatic switch-off✓– An automatic device shall be provided to switch off the electrical supply to the apparatus and initiate an audible or visible alarm when the overpressure and/or protective gas flow fall below the minimum stipulated value. When such switching-off might jeopardise the safety of the installation and safety is otherwise ensured, a continuous audible or visible alarm shall be sounded until pressurisation is restored or other appropriate measures are taken, including switching off with a known delay.✓

- Manual switch-off✓ – If the internal pressure or flow of protective gas falls below the minimum stipulated 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.✓ (4)

[15]

QUESTION 7

7.1
7.1.1 1 MΩ
7.1.2 50 kΩ
7.1.3 unearthed
7.1.4 conductive
7.1.5 conductive
7.1.6 low
7.1.7 created
7.1.8 reunite
7.1.9 separation
7.1.10 discharge

(10 × 1) (10)

7.2
- 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 occurs between the separated charges.
- The discharge occurs in or on a flammable material. (4)

7.3 1 MΩ (1)

[15]

QUESTION 8

8.1 D
8.2 A
8.3 C
8.4 E
8.5 B

(5 × 1) **[5]**

TOTAL: 100

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