higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

SPECIALISED ELECTRICAL INSTALLATION CODES
(Second Paper)

1 AUGUST 2019

This marking guideline consists of 6 pages.

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

1.1
1.1.1 Accreditation authority
1.1.2 Approved inspection authority for electrical installations
1.1.3 Electrical certificate of compliance
1.1.4 Electrical contractor
1.1.5 Electrical tester for single phase
1.1.6 General control
1.1.7 Installation work
1.1.8 Registered person
1.1.9 Point of supply
1.1.10 Point of outlet
1.1.11 Point of control
1.1.12 Point of consumption
1.1.13 Supplier

(13 × 1) (13)

1.2 No person shall sell or market in any manner whatsoever such article, substance, plant, machinery or health and safety equipment unless it complies with that requirement. (3)

1.3 Shall ensure, as far as is reasonably practicable, that nothing about the manner in which it is erected or installed makes it unsafe or creates a risk to health when properly used. (2)

[18]

QUESTION 2: SANS 60079-10: CLASSIFICATION OF HAZARDOUS AREAS

High ventilation (VH):✓ Can reduce the concentration at the source of release virtually instantaneously, resulting in a concentration below the lower explosive limit.✓

Medium ventilation (VM):✓ Can control the concentration, resulting in a stable zone boundary, whilst the release is in progress and where the explosive gas atmosphere does not persist unduly after the release has stopped.✓

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

QUESTION 3: SANS 10142 PART 1, 2017: THE WIRING OF PREMISES (LOW-VOLTAGE INSTALLATIONS)

3.1
- Accessible components are correctly selected.
- All protective devices are of correct rating and capable of withstanding the prospective fault level.
- Conductors are of the correct rating and current-carrying capacity for the protective devices and connected load.
- Components have been correctly installed.
- Disconnecting devices are correctly located and all switchgear switches the phase conductors.
- Different circuits are separated electrically.
- The connection of conductors and earthing and bonding are mechanically sound and electrically continuous.
- Circuits, fuses, switches, terminals, earth-leakage units, circuit breakers and distribution boards are correctly and permanently marked or labelled.
- In respect of the electrical installation, fire barriers have been erected, precautions taken against spread of fire and effects of heat.
- Safety and emergency lighting and signs are functioning correctly.
- The installation including all accessible components comply with SANS 10142-1 (SABS 0142-1).
- The installation complies with the general safety principles of SANS 10142-1 (SABS 0142-1) and is reasonably safe. (12)

3.2
- Continuity of bonding
- Resistance of earth continuity conductor
- Continuity of ring circuits (if applicable)
- Earth-loop impedance test (Any 3 × 1) (3)

[15]

QUESTION 4: SANS 60079 PART 17: ELECTRICAL INSTALLATIONS INSPECTION AND MAINTENANCE IN HAZARDOUS LOCATIONS AND SANS 60079 PART 19: REPAIR AND OVERHAUL FOR APPARATUS USED IN EXPLOSIVE ATMOSPHERES (OTHER THAN MINES OR EXPLOSIVES)

4.1
4.1.1 Portable
4.1.2 12 months
4.1.3 Frequently
4.1.4 Visually

(4 × 1) (4)

4.2
- Is of at least equivalent strength
- Does not result in a greater leakage rate of protective gas
- Does not restrict the flow of protective gas into or through the enclosure
- Is not shaped or fitted so as to permit the potentially explosive atmosphere to enter the enclosure
- Is not of a construction which would result in stagnant volumes of atmosphere inside the enclosure
- Does not reduce the rate of heat dissipation from the enclosure or its content, so that it no longer complies with its temperature class (6)

4.3
- The resistance of each winding should be measured at room temperature and verified.
- In the case of three-phase windings, the resistance of each phase or between line terminals should be balanced, as far as is reasonable.
- An insulation resistance test should be applied to measure the resistance between the windings and earth, between windings where possible, between windings and auxiliaries and between auxiliaries and earth.
- The minimum test voltage of 500 V DC is recommended.
- Minimum acceptable insulation resistance values are a function of rated voltage, temperature and type of apparatus and whether the rewind is partial or complete.
- NOTE - The insulation resistance should not be less than 20 MQ at 20 °C on a completely rewound apparatus intended for use up to 660 V.
- A high-voltage test, in accordance with the relevant apparatus standard, should be applied between windings and earth, between windings where possible and between windings and auxiliaries attached to the windings.
- The transformer or similar apparatus should preferably be energised at rated supply voltage.
- The supply current, secondary voltage and current should be measured.
- The measured value should be compared with that derived from the manufacturer's data, where available and in three-phase systems should be balanced in all phases, as far as is reasonable.
- High-voltage (for example 1 000 V AC 11 500 V DC and above) and other special apparatus may require additional tests.
- This should be the subject of the repair or overhaul contract (Any 6 × 1) (6)

4.4 4.4.1 Inspection which identifies, without the use of access equipment or tools, those defects, such as missing bolts, which will be apparent to the eye. (2)

4.4.2 Inspection which encompasses those aspects covered by a visual inspection and, in addition, identifies those defects, such as loose bolts, which will be apparent only by the use of access equipment, for example steps (where necessary) and tools. (2)

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4.4.3 Inspection which encompasses those aspects covered by a close inspection and, in addition, identifies those defects, such as loose terminations, which will only be apparent by opening the enclosure, and/or using, where necessary, tools and test equipment. (3)

[23]

QUESTION 5: SANS 10089 – 2 THE PETROLEUM INDUSTRY PART 2: ELECTRICAL AND OTHER INSTALLATIONS IN THE DISTRIBUTION AND MARKETING SECTOR

5.1 Apparatus in which parts of the apparatus that can ignite an explosive atmosphere are placed in an enclosure✓ that can withstand the pressure developed during an internal explosion of an explosive mixture✓ and that prevents the transmission of the explosion to the explosive atmosphere surrounding the enclosure✓ (3)

5.2 Electrical apparatus in which measures are applied to prevent, with a minor degree of security, the possibility of excessive temperatures✓ and of the occurrence of arcs or sparks in the interior and on the external parts✓ of an electrical apparatus that does not produce them in normal service✓ (3)

5.3 A circuit in which any spark, arc or thermal effect,✓ whether produced normally (for example, by breaking or closing of the circuit) or accidentally (for example, by a short circuit or an earth fault),✓ is incapable, under prescribed test conditions, of causing ignition of a prescribed gas or vapour✓ (3)

5.4 Electrical apparatus that is suitable for use in a hazardous location and in which all the circuits are intrinsically safe,✓ or electrical apparatus that is designed to form part of an intrinsically safe system✓ (2)

5.5 A system that is certified by an approved testing/certification body and that comprises electrical apparatus and interconnecting wiring✓ in which any spark or thermal effect in any part of the system intended for use in a hazardous location is incapable,✓ under prescribed test conditions, of causing ignition of a prescribed gas or vapour✓

NOTE: An intrinsically safe system is also incapable of igniting atmospheres that contain prescribed flammable dusts or fibres. (3)

5.6 Electrical apparatus that, in normal operation and in the absence of electrical and mechanical failure,✓ cannot, because of its construction, method of operation or its enclosure, ignite mixtures of air and prescribed flammable gases or vapours✓ (2)

5.7 Electrical apparatus of which the enclosure is so filled with a material in a finely granulated state✓ that any arc occurring within the enclosure will not ignite the surrounding atmosphere and ignition will not be caused either by flame or excessive temperature of the surfaces of the enclosure✓ (2)

[18]

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

6.1 separated
6.2 opposite
6.3 separation
6.4 different
6.5 can
6.6 can
6.7 opposite
6.8 within
6.9 created
6.10 reunite
6.11 separation
6.12 discharge

(12 × 1) **[12]**

QUESTION 7

The cable capacitance is then 180 times 30 pF, equalling 0,0054 μF.

Now, let's put the numbers into the equations to see if these two devices are compatible for use as an intrinsically safe system. The equations, again, are stated here and the numbers substituted into the equation. If all the equations are satisfied as 'True' the two devices can be used as an intrinsically safe system.

7.1 $V_{oc} \leq V_{max}$ 26 V $\leq$ 22 V False – NOT SUITABLE

7.2 $I_{sc} \leq I_{max}$ 172 mA $\leq$ 160 mA False – NOT SUITABLE

7.3 $C_a \geq C_i + C_{cable}$ 0.12 μF $\geq$ 0,02 μF + 0.054 μF True – SUITABLE

7.4 $L_a \geq L_i + L_{cable}$ 3.2 mH $\geq$ 0.00 mH + 0.00 mH True – SUITABLE

(4 × 2) **[8]**

TOTAL: 100

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