higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

# MARKING GUIDELINE

## NONNATIONAL CERTIFICATE

## INSTALLATION RULES
(First Paper)

**15 NOVEMBER 2019**

**This marking guideline consists of 6 pages.**

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## QUESTION 1: OCCUPATIONAL HEALTH AND SAFETY ACT 85 OF 1993

1.1 Any substance or article as listed in Class 1: Explosives in the South African Bureau of Standards' Code of Practice for the identification and classification of dangerous substances and goods SABS 0225 (2)

1.2 Any article, or combination of articles, assembled, arranged or connected✓ which is used or intended to be used for converting any form of energy to performing work,✓ or which is used or intended to be used, whether incidentally therefore or not,✓ for developing, receiving, storing, containing, confining, transforming, transmitting, transferring or controlling any form of energy✓ (4)

1.3 The anticipation, recognition, evaluation and control of conditions arising in or from the workplace which may cause illness or adverse health effects to persons (2)

1.4 The person who uses plant or machinery for his/her own benefit or who has the right of control over the use of plant or machinery but does not include a lessor of, or any person employed in connection with, that plant or machinery (2)

**[10]**

## QUESTION 2: SANS 10198-2: POWER CABLES OF RATING NOT MORE THAN 33 kV: SELECTION OF CABLE TYPE AND METHOD OF INSTALLATION

2.1
- The cable shall be laid in a pipe to facilitate its replacement at a later date without disturbing the road surface or railway track.
- Pipes shall be of any material that will not collapse in service and should ideally be set in concrete.
- Ferrous pipes can be used for multicore cables but not for individual single-core AC-cables. (3)

2.2 Service tunnels that are provided in power stations and in large industrial complexes may, because of their size, be equipped with cable trays. Make provision at regular intervals (e.g. every 50 m) for cables to cross over from one side of the tunnel to the other and provide adequate drainage for the tunnel. (2)

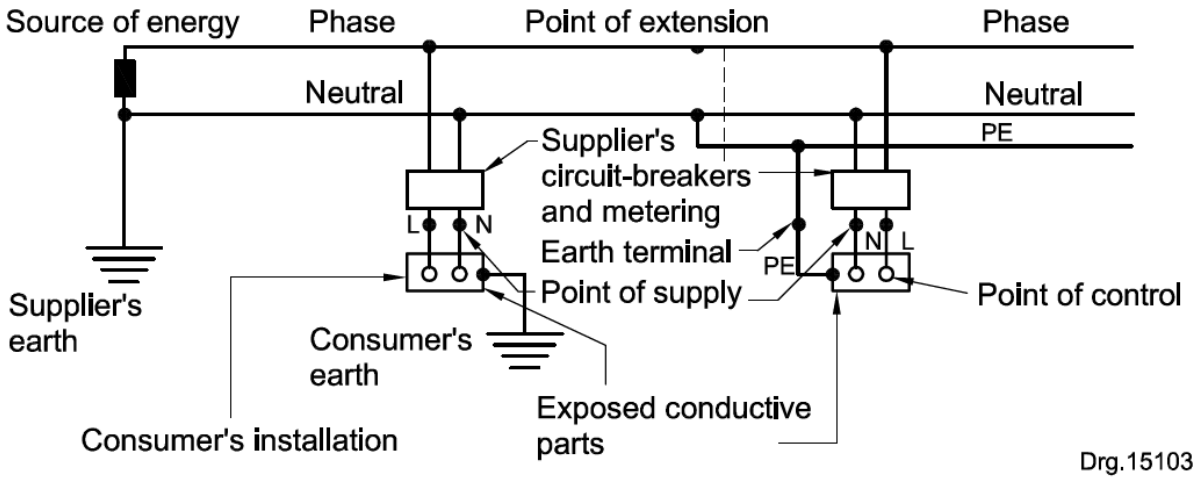
2.3 Ensure that cables installed in vertical or inclined shafts are adequately supported.✓ If the cables are unarmoured or armoured other than with steel wire provide support at vertical intervals not exceeding 2 m.✓ If steel-wire-armoured cables are used, the vertical support interval shall be increased to not more than 5 m.✓ Ensure that the devices used to support the cable are carefully selected and so installed that sufficient force is applied to grip the outer sheath of the cable firmly,✓ but without any undue crushing of the cable.✓ (5)

**[10]**

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## QUESTION 3: SANS 10292 : EARTHING OF LOW-VOLTAGE DISTRIBUTION SYSTEMS

**Figure 9 — A TN-S system earthing with a TN-C-S system earthing extension**




Drg.15103 **[10]**

## QUESTION 4: SANS 10142-1 OF 2017: ANNEX C: CALCULATION OF ESTIMATED LOAD

4.1 Lights 9 × 50 × 0,5 = 225 W
Plugs 5 000 × 0,5 = 2 500 W
Geyser 2 000 × 1 = 2 000 W
Stove 9 000 × 0,5 = 4 500 W
Heater 500 × 2 × 0,5 = 500 W

Total load = 9 725 W✓✓
I = 9 725/230 = 42,28 A✓✓ (4)

4.2 20% of total load = 12 A✓
Spare capacity = 60 – 42,28 – 12 = 5,72 A✓
2 × 1 000 W oil heater = 500/230 = 2,17 A✓

Total left = 5,72 – 2,17 = 3,55 A✓
1 standard light is 60 W × 0,5/230 = 0,13 A✓
3,55/0,13 = 27,30

27 lights can be added.✓ (6)
**[10]**

## QUESTION 5: SANS 10142-1 OF 2017: ANNEX F: DETERMINING CONDUIT SIZE

5.1 25 mm
5.2 20 mm
5.3 40 mm
5.4 25 mm
5.5 25 mm

(5 × 2) **[10]**

## QUESTION 6: SANS10142-1 OF 2017: ANNEX J: ELECTRICITY-SUPPLY SYSTEMS

6.1 All exposed conductive parts of a consumer's installation are connected to the PEN (protective earth and neutral) conductor via the supply earth terminal.

6.2 The PE (protective conductor), which is connected to the source earth, is either a separate conductor or the armour of the cable if the resistance of the armouring is such that the earth fault-loop impedance complies with the requirements of 8.6.5.

6.3 All exposed conductive parts of a consumer's installation are connected to a consumer's earth electrode which is electrically independent of the source earth.

6.4 The source of energy is either connected to earth through a deliberate-introduced high-earthing impedance or it is isolated from earth. All exposed conductive parts of a consumer's installation are connected to an earth electrode.

6.5 All exposed conductive parts of a consumer's installation are connected to the PEN conductor.

(5 × 2) **[10]**

## QUESTION 7: SANS 10142-1 OF 2008: FUNDAMENTAL REQUIREMENTS

7.1
- Location
- Nature of the building elements for supporting the wiring
- Accessibility of the wiring to persons and livestock
- Voltage
- Electromechanical stresses and thermal effects likely to occur as a result of short-circuits
- Stresses imposed on the wiring during installation and in service (6)

7.2 7.2.1 230 V single-phase (1)
7.2.2 230/400 V three-phase four-wire,✓ tolerance is 10%✓ (3)
**[10]**

## QUESTION 8: SANS 10142-1 OF 2017: BATHROOMS, SHOWERS, SPAS

8.1 Inner edge
8.2 Waste pipe
8.3 Earth metal
8.4 Finished floor level
8.5 2 400 mm
8.6 600 mm
8.7 Zone 0
8.8 Zone 1
8.9 2 500
8.10 Zone 3

(10 × 1) **[10]**

## QUESTION 9: SANS 10142-1 OF 2017: SPECIAL INSTALLATIONS AND LOCATIONS: SWIMMING, PADDLING, ORNAMENTAL POOLS AND FOUNTAINS

9.1
- Comply with SANS 1507
- No exposed metal armouring (2)

9.2
- One appliance only
- No junction boxes for voltages exceeding 12 V
- Only conduits of insulating material (3)

9.3
- Pump casing
- Motor frame
- Metal suction
- Delivery pipes
- Earth-continuity conductor (5)

**[10]**

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## QUESTION 10: SANS 10142-1 OF 2017: SPECIAL INSTALLATIONS AND LOCATIONS: TEMPORARY INSTALLATIONS

10.1 Control and protective switchgear shall be placed in closed cabinets, which can only be opened by a key or a tool, except for the equipment designed and intended to be operated by uninstructed persons. (2)

10.2 The electrical installation shall be inspected and tested (see 8.1.4) and a test report issued, together with a CoC, by the registered person each time after the electrical installation has been assembled on a new site. (2)

10.3 In locations used for animals, supplementary equipotential bonding shall connect all exposed conductive parts and extraneous conductive parts,✓ which can be touched simultaneously, and the protective conductor of the installation.✓ If a metallic grid is laid in the floor, it shall be connected to the local supplementary bonding required for locations where animals are kept.✓ (3)

10.4 An adequate number of socket outlets shall be installed to safely comply with the user's requirements. Floor-mounted socket outlets shall be adequately protected from accidental ingress of water. (2)

10.5 Joints in cables shall be avoided, however if required, they shall be made in an enclosure that affords a degree of protection not less than IP4X. (1)

**[10]**

**TOTAL: 100**

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