higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

INSTALLATION RULES
(First Paper)

23 JULY 2018

This marking guideline consists of 7 pages.

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QUESTION 1: OCCUPATIONAL HEALTH AND SAFETY ACT 85 OF 1993: GENERAL DUTIES OF EMPLOYERS REGARDING THEIR EMPLOYEES

1.1 As far as is reasonably practicable, a working environment that is safe and without risk to the health of his/her employees (2)

1.2 1.2.1 The system of work, plant and machinery that are, as far as is reasonably practicable, safe without risks to health.

1.2.2 Eliminate or mitigate any hazard or potential hazard to the safety or health of employees, before resorting to PPE

1.2.3 Training and supervision as may be necessary to ensure as far as is reasonably practicable, the health and safety of his/her employees at work

1.2.4 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✓

(4 × 2) (8)
[10]

QUESTION 2: SANS 10142 OF 2008: ANNEXURE D –EXAMPLE OF ASSESSING ESTIMATED CONNECTED LOAD

2.1 Area = 400 m²
SO = 8 000 W × 0,5 = 4 000 W✓
Lights = 12 × 400 W × 0,5 = 2 400 W✓
Air conditioner = 2 × 2 000 W × 1 = 4 000 W✓

SO + lights + air conditioners = 10 400 W✓
Total power of installation = 23 V × 60 A = 13 800 W✓
Reserve power = 13 800 W – 10 400 W
= 3 400 W✓

Power per heater = 1 000 W × 0,5 = 500 W
Therefore 3 400 W/500 W = 6 heaters ✓ (7)

2.2 Lights CB = 2 400 W/230 V = 10,43 A
Use a 15 A circuit breaker. ✓ (1)

2.3 Remaining power = 3 400 W – 3 000 W = 400 W
1 × light = 400 W × 0,5 = 200 W ✓
Therefore: 400 W/200 W = 2 lights ✓ (2)
[10]

QUESTION 3: SANS 10142-1 OF 2008: ANNEXURE G – EXAMPLES OF DETERMINING THE CONDUIT SIZE REQUIRED FOR SINGLE-CORE CABLES OF DIFFERENT SIZES

3.1 6 mm² = 22 × 2 = 44
4 mm² = 17 × 4 = 68
4 mm² ECC = 17 × 1 = 17
2,5 mm² ECC = 14 × 2 = 28
Total K-value = 157✓✓✓ (3)

Therefore use a 32 mm conduit (Table 6.24)✓✓ (2)

3.2
- For each single-core cable and bare conductor, take the value of the C from table 6.23.
- Appropriate to the nominal cross-sectional area of each conductor.
- Add up all the values of C.
- From table 6.24, select the conduit size that has a value K
- at least equal or higher to the value determined by adding all the values of C. (5)

[10]

QUESTION 4: SANS 10142–1 OF 2008: SCOPE

4.1
- Residential premises
- Commercial premises
- Public premises
- Industrial premises
- Prefabricated buildings
- Fixed-surface installations on mining properties
- Construction and demolition site installations
- Agricultural and horticultural premises
- Caravan sites and similar sites
- Marinas, pleasure craft and houseboats
- Medical locations
- Exhibitions, fairs and other temporary installations
- Extra low-voltage lighting installations
- Electrical installations for street lighting and street furniture
- Equipment enclosures (structures that provide physical and environmental protection for telecommunication equipment) (Any 5 × 1) (5)

4.2
- Electric traction equipment
- Automotive electrical equipment (excluding the caravan part of a roving vehicle)
- Electrical installations onboard ships
- Electrical installations in aircraft
- Electrical installations for underground and open-cast mining operations
- Telecommunication, television and radio circuits (excluding the power supply to such equipment)
- Lightning protection of buildings and structures. NOTE: The installation of surge protection is not compulsory, but where it is installed, compliance with ANNEXURE L is required.
- Extra low-voltage control circuits between different parts of machinery or system components, forming a unit that is separately installed and derived from an independent source or an isolating transformer (excluding ELV lighting circuits) (Any 5 × 1) (5)

[10]

QUESTION 5: SANS 10142–1 OF 2008 - DEFINITIONS

5.1 Appliance that is normally not moved or cannot easily be moved while in operation

5.2 Cable that has a covering of metallic wires or galvanised steel wires or steel tape as protection against mechanical damage

5.3 Cable that has a sheath of metal to exclude moisture from the conductors and their insulation

5.4 Report that is issued by a registered person in respect of an electrical installation or part of an electrical installation

5.5 Arrangement of conductors for the purpose of carrying an electric current

5.6 Conductor that is supported above the ground and that is exposed directly to open air

5.7 Protective conductor (PE) provided for protective equipotential bonding

5.8 Machine or device for converting one form of electrical power to a different form of electrical power

5.9 Provision of electric connections between conductive parts intended to achieve a substantially equal potential

5.10 Open or enclosed route or support such as a rack, tray, ladder, ducting, trunking, sleeving or conduit that is intended to contain conductors or cables

(10 × 1) **[10]**

QUESTION 6: SANS 10142-1 OF 2008: SPECIAL INSTALLATIONS OR LOCATIONS: BATHROOMS, SHOWERS, SPAS, ETC.

6.1 6.1.1 IP X7
6.1.2 IP X5
6.1.3 IP X4
6.1.4 IP 21

(4 × 1) (4)

6.2 MEDICAL LOCATIONS

6.2.1
- Has an internal impedance of at least 100 kilohm
- Has n test voltage not exceeding 25 V DC
- Is of a current even under fault conditions not exceeding 1 mA DC
- Shall indicate when the insulation resistance has decreased to 5 kilohm (4)

6.2.2
- Either a minimum of two separate circuits that feed socket outlets
- Each socket outlet shall be individually protected against overcurrent. (2)

[10]

QUESTION 7: SANS 10142–1 OF 2008: SPECIAL INSTALLATIONS OR LOCATIONS: SWIMMING POOLS, PADDLING POOLS, ORNAMENTAL POOLS, SPAS AND FOUNTAINS

7.1
- Operate from a safety supply
- Be covered with an earth metallic grid
- Be covered with an earth metallic sheath (3)

7.2
- In the same way as a nonsubmersible pump
- In the water circulating system and not in the swimming pool itself
- With the supply elements and the circulation pump interlocked (3)

7.3 7.3.1 True
7.3.2 False
7.3.3 False
7.3.4 False

(4 × 1) (4)

[10]

QUESTION 8: SANS 10142–1 OF 2008 – SPECIAL INSTALLATIONS OR LOCATIONS: CARAVAN PARKS, MOBILE HOMES AND MARINAS

8.1
- Be of a 230 V single-phase or 400 V three-phase AC
- Comply with SANS 1239 and have a 6 o'clock earthing position
- Be so arranged that not more than one socket outlet serves one caravan site
- Be so arranged that not more than SIX socket outlets are grouped together
- Have a distribution housing for each socket outlet, the housing providing a degree of protection of at least IP 44
- The degree of protection of at least IP 44 shall not be reduced when a plug is inserted
- Unless the supply is a safety supply, be protected at each distribution-board housing by an earth-leakage protection device that has an earth-leakage tripping current not exceeding 30 mA (7)

8.2
- Shall be a core of the supply cable
- Shall be terminated in the distribution board of the mobile home
- Shall be bonded to the earthing terminal on the chassis of the mobile home

(3 × 1) (3)
[10]

QUESTION 9: SANS 10142–1 OF 2008: SPECIAL INSTALLATIONS OR LOCATIONS: MEDICAL LOCATIONS

9.1
- Protective conductors
- Extraneous conductive parts
- Screening against electrical interface fields
- Connection to screening floor grids
- Patient earth

9.2
- Block diagrams shall show the distribution system of the normal power supply and power supply for safety services in a single-line representation.
- These diagrams shall contain information on the location of the subdistribution board in the building.
- Block diagrams shall show switchgear, control gear and distribution boards.
- These diagrams shall show a single-line representation of the location of the main and subdistribution board.
- Schematic diagrams shall show the insulation monitor systems.

(5 × 2) **[10]**

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QUESTION 10: SANS 10198–2 OF 2008: POWER CABLES OF RATING NOT EXCEEDING 33 kV: SELECTION OF CABLE TYPES AND METHODS OF INSTALLATION

10.1
- Covers criteria to be considered when an electric power cable is being selected
- Gives general introduction to the methods available for the laying of power cables
- Covers cables that comply with the requirements of SANS 97, 1507-1, 1507-6, 1576, 1339, 1418-1 and 1415-2 (3)

10.2
- Minimise the likelihood of damage and consequent failure of the distribution system.
- Ensure as far as possible the safety of personnel working in the area in which the cables are installed.
- Keep the overall cost of the installation to a minimum. (3)

10.3
- There is adequate support for the cables.
- Cables are protected from damage that might be caused by road vehicles, mobile cranes, vandals, etc.
- There is free air circulation around the cables.
- The cables are shielded from the direct rays of the sun. (4)

[10]

TOTAL: 100

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