higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T880**(E)**(J23)T

NATIONAL CERTIFICATE

INSTALLATION RULES
(First Paper)

(11040412)

23 July 2018 (X-Paper)
09:00–12:00

This question paper consists of 6 pages and 1 addendum.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
INSTALLATION RULES
(First Paper)
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Start each question on a NEW page.
5. Even though NOT explicitly stated in a question, ALL answers must comply with the relevant codes and/or requirements of the SANS publication (latest edition) and the Occupational Health and Safety Act regulations.
6. The answers need NOT be word-perfect in all aspects according to the publications, however, candidates must fully understand the content of the relevant publications.
7. The necessary tables are supplied on the ADDENDUM (attached).
8. Candidates must pass PAPER 1 and PAPER 2 with 50% each. Both examination papers may be written during the same examination period. However, candidates need not pass both examinations during the same trimester, but the second examination must be passed within 12 months of the first otherwise both examinations must be rewritten. If a candidate obtains 75 out of 100 marks in ANY ONE of the examinations, he/she will be permanently exempted from rewriting that examination. An appropriate statement will be issued. For accreditation purposes ALL candidates must meet the requirements prescribed by the Department of Labour.
9. NO condonations will be considered.
10. Answers must be calculated to 2 decimal places.
11. Write neatly and legibly.

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

Complete the following sentences by only writing the missing information next to the question number (1.1 and 1.2.1–1.2.4) in the ANSWER BOOK.

1.1 Every employer shall provide and maintain ... (2)

1.2 Without derogating from the generality of an employer's duties under Subsection 1, the matters which those duties refer to include in particular:

1.2.1 The provision and maintenance of ...

1.2.2 Taking such steps as may be reasonably practicable to ...

1.2.3 Providing such information, instructions …

1.2.4 Taking all necessary measures to ensure …

(4 × 2) (8)
[10]

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

Carefully read the following statement and answer the questions. Show ALL the calculations.

A 25 × 16 metre hall has a 230 V distribution board protected by a 60 A, 6 kA 2-pole circuit breaker isolator, with SIX 16 A double-switched socket outlets, TWELVE 400 watt high-bay light fittings and TWO 2 kW air-conditioner units.

2.1 Calculate the number of 1 kilowatt heaters that can be added/connected to the installation. (7)

2.2 If all lights are supplied from the same circuit breaker, what will be the minimum size of the circuit breaker? (1)

2.3 Calculate the number of 400 W high-bay light fittings that can be added, if the heaters mentioned in QUESTION 2.1 are added to the installation. (2)
[10]

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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 Calculate the conduit size required to accommodate the following circuit:

- Stove circuit using 6 mm² conductors (3)
- TWO socket outlet circuits using 4 mm² for each circuit. Use minimum required ECC. (2)

3.2 Explain how the answer in QUESTION 3.1 was determined by using the table(s) provided on the ADDENDUM (attached). (5)

[10]

QUESTION 4: SANS 10142–1 OF 2008: SCOPE

Give FIVE applications to which this part of SANS 10142:

4.1 Applies

4.2 Does not apply

(5 × 2) **[10]**

QUESTION 5: SANS 10142–1 OF 2008 - DEFINITIONS

Give the definition of each of the following:

5.1 Stationary appliance

5.2 Armoured cable

5.3 Unarmoured metal-sheathed cable

5.4 Test report

5.5 Circuit

5.6 Aerial conductor

5.7 Protective bonding conductor

5.8 Converter

5.9 Equipotential bonding

5.10 Wireway

(10 × 1) **[10]**

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

6.1 Give the degree of protection against ingress of water for the following zones:

6.1.1 Zone 0

6.1.2 Zone 1

6.1.3 Zone 2

6.1.4 Zone 3

(4 × 1) (4)

6.2 MEDICAL LOCATIONS

6.2.1 Describe FOUR electrical characteristics of the insulating monitoring device that monitors the IT supply systems in Medical Locations, Group 2. (4)

6.2.2 Name TWO main configurations of socket outlets at each patient's bed or place of treatment. (2)

[10]

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

7.1 State THREE requirements of an installation of a heating unit embedded in the floor of Zone 1 and 2. (3)

7.2 State THREE methods on how a fixed water heater for a swimming pool or spa shall be installed. (3)

7.3 State whether the following statements are TRUE or FALSE. Choose the answer and write only 'True' or 'False' next to the question number (7.3.1–7.3.4) in the ANSWER BOOK.

7.3.1 Switchgear not built into the sauna heater shall be placed outside the enclosure of the location.

7.3.2 Only heat resistant socket outlets shall be installed in the sauna.

7.3.3 A temperature-limiting device shall be installed, capable of disconnecting the supply to the sauna heater when the temperature measured in Zone 3 exceeds 170 °C.

7.3.4 A luminaire shall only be installed in Zone 1 and the light switch shall be outside the enclosure.

(4 × 1) (4)

[10]

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

8.1 State SEVEN requirements regarding socket outlets that supply caravans. (7)

8.2 State THREE requirements regarding the earth-continuity conductor in the supply to a mobile home. (3)

[10]

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

9.1 SUPPLEMENTARY EQUIPOTENTIAL BONDING

Name FIVE parts located in the patient environment that needs to be connected to the insulated supplementary equipotential bonding conductors and the equipotential bus bars for the purpose of equalising the potential difference in Medical Locations,6 Groups 1 and 2.

9.2 DIAGRAMS, DOCUMENTATION AND OPERATING INSTRUCTIONS

Plans of the electrical installation together with records, diagrams and modifications thereto, and also instructions for operation and maintenance, shall be provided for the user.

Elaborate on the relevant documentation required.

(5 × 2) **[10]**

QUESTION 10: SANS 10198–2 OF 2004: POWER CABLES OF RATING NOT EXCEEDING 33 kV: SELECTION OF CABLE TYPES AND METHODS OF INSTALLATION

10.1 Briefly describe the scope for the above SANS. (3)

10.2 State THREE important aspects to be considered when cables are installed. (3)

10.3 State FOUR safety requirements to be considered when cables are installed in the air (above ground). (4)

[10]

TOTAL: 100

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ADDENDUM: TABLES

SANS 10142-1: 2003

EDITION 1.1

Table 6.23 — Values of *C* for conductor nominal cross-sectional area

1	2
Nominal cross-sectional area of conductor mm²	**Value of *C***
1	8
1,5	10
2,5	14
4	17
6	22
10	30
16	42
25	65
35	84
50	118
70	152

Table 6.24 — Values of *K* for conduit diameter

1	2
Value of *K*	**Conduit diameter** mm
90	20
144	25
240	32
398	40
640	50

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