higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NONNATIONAL CERTIFICATE

INSTALLATION RULES
(First Paper)

(11040412)

15 November 2019 (X-Paper)
09:00–12:00

This question paper consists of 6 pages and 1 information sheet.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NONNATIONAL 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 publications (latest editions) and the Occupational Health and Safety Act regulations.

6. The answers need NOT be word-perfect in ALL aspects according to the publications, but they must show that the candidate fully understands the context of the relevant question.

7. Candidates must pass both PAPER 1 and PAPER 2 with 50% each. Both examination papers may be written during the same examination period, but candidates need NOT pass both examinations during the same trimester. The second examination must, however, be passed within 12 months of the first, otherwise both examinations must be rewritten. If a candidate obtains 75 of 100 marks in any one of the examinations, he/she will be permanently exempted from rewriting that examination and an appropriate statement will be issued. For accreditation purposes ALL candidates must meet the requirements prescribed by the Department of Labour.

8. NO condonations will be considered.

9. Write neatly and legibly.

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QUESTION 1: OCCUPATIONAL HEALTH AND SAFETY ACT 85 OF 1993

Define each of the following terms:

1.1 Explosives (2)

1.2 Machinery (4)

1.3 Occupational hygiene (2)

1.4 User (2)

[10]

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

Briefly explain how cable installation is done in each of the following cases:

2.1 Outdoor installation in pipes where a cable route crosses a road or railway (3)

2.2 Installation in covered cableways (2)

2.3 Installation in vertical or inclined shafts (5)

[10]

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

Draw a neat, labelled diagram of a single-phase TN-S system earthing with a single-phase TN-C-S system earthing extension. **[10]**

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

A one-bedroom flat is supplied with 230 V and a protection device which is a 60 A double-pole circuit breaker.

You must install the following:

- 9 × 50 W down lights
- 6 × socket outlet points rated at 16 A each
- 1 × 100 ℓ, 2 kW geyser in a ceiling
- 1 × stove with 2 × 1 500 W solid plates, 2 × 2 000 W solid plates and a 2 KW oven
- 2 × 500 W wall-mounted oil heaters in the lounge

4.1 Calculate the estimated connected load in amperes if the floor area is 100 m². (4)

4.2 Calculate the number of standard lights (NOT down lights) that can be added to the kitchen, bedroom passage and bathroom if 2 × 1 000 W oil heaters must be installed in the bedroom and a 20% total-load capacity must be left for future use in this flat. (6)

[10]

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

Give the conduit sizes suitable for each of the following single-core conductor circuits (do NOT show calculations – ALL earth conductors are equal to the phase conductors):

5.1 1 × 4 mm² and 2 × 1,5 mm²

5.2 1 × 6 mm² and 2 × 1,5 mm²

5.3 3 × 4 mm² and 3 × 1,5 mm²

5.4 3 × 1,5 mm² and 1 × 1,5 mm²

5.5 1 × 6 mm² and 1 × 1,5 mm²

(5 × 2) **[10]**

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

Explain the connection configurations of each of the following LV system earthing types (do NOT explain the earthing system):

6.1 TN-C-S

6.2 TN-S

6.3 TT

6.4 IT

6.5 TN-C

(5 × 2) **[10]**

QUESTION 7: SANS 10142-1 OF 2017: FUNDAMENTAL REQUIREMENTS

7.1 Give SIX factors to consider when determining the type of wiring and method of installation. (6)

7.2 State the AC circuit voltage commonly used in South Africa and the tolerance (if applicable) for each of the following:

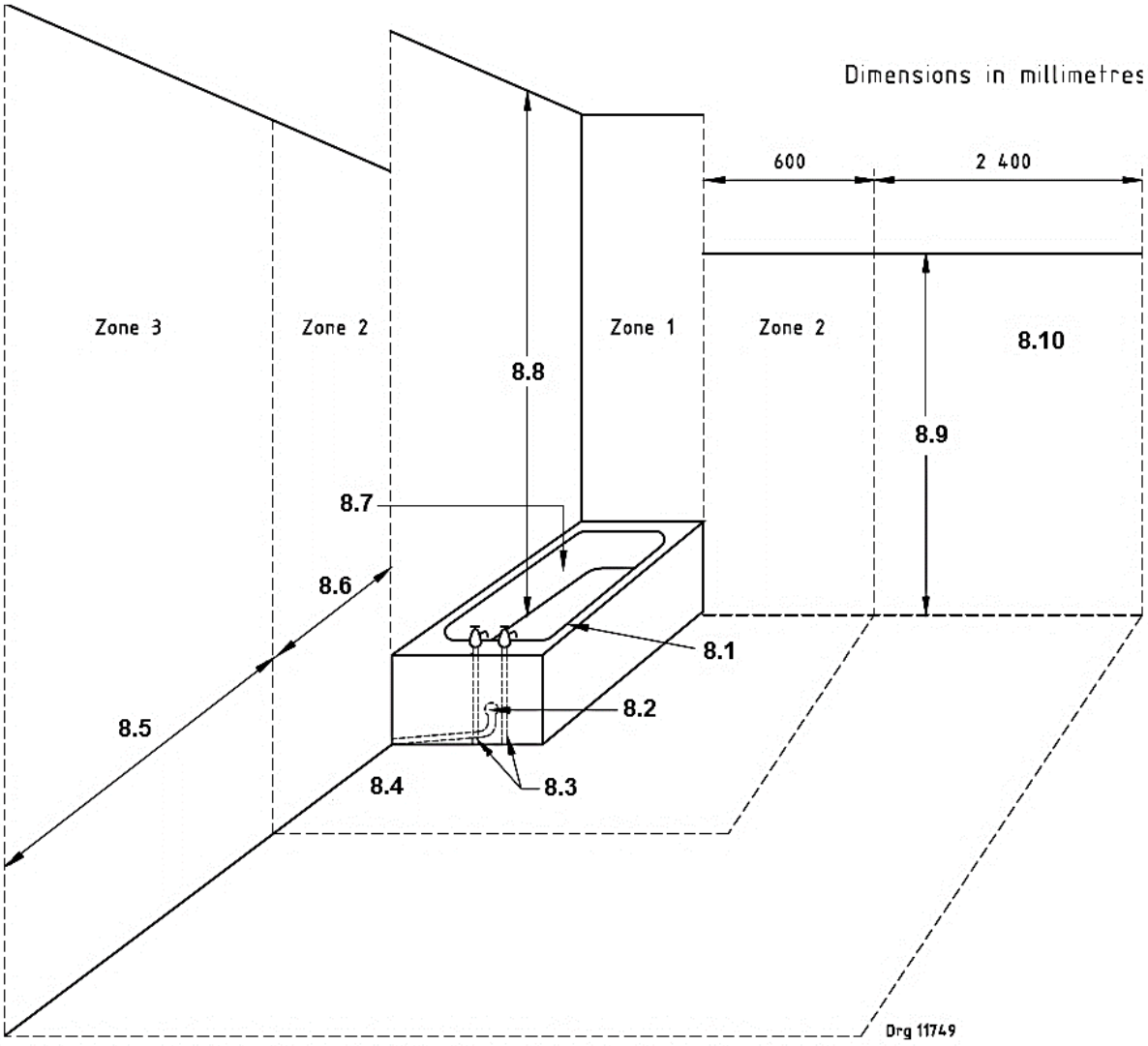
7.2.1 Standard voltage (1)

7.2.2 Declared voltage (3)

[10]

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



Label the drawing by writing only the answer next to the question number (8.1–8.10) in the ANSWER BOOK. (10 × 1) **[10]**

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

9.1 Give TWO requirements regarding cables for wiring systems of pools and fountains. (2)

9.2 Give THREE requirements regarding circuits in Zone 0 or Zone 1. (3)

9.3 List FIVE parts of a nonsubmersible pump that must be bonded together. (5)
[10]

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

Give the requirements regarding each of the following headings:

10.1 General: control and protective switchgear (2)

10.2 General: the electrical installation (2)

10.3 Supplementary equipotential bonding (3)

10.4 Socket outlets and plugs (2)

10.5 When cable joints are made (1)
[10]

TOTAL: 100

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INFORMATION SHEET

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 1,5 2,5	8 10 14
4 6 10	17 22 30
16 25 35	42 65 84
50 70	118 152

Table 6.24 — Values of *K* for conduit diameter

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

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