higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

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NATIONAL CERTIFICATE

SPECIALISED ELECTRICAL INSTALLATION CODES

(Second Paper)

(8080644)

3 April 2019 (X-Paper)
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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
SPECIALISED ELECTRICAL INSTALLATION CODES
(Second 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. Write neatly and legibly.

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QUESTION 1: HEALTH AND SAFETY ACT, ACT 85 OF 1993 - ELECTRICAL MACHINERY REGULATION 2011

1.1 State what the following terms mean according to the Occupational Health & Safety Act, Act 85 of 1993 - Electrical Machinery Regulations 2011

1.1.1 Earthed

1.1.2 Accreditation authority

(2 × 2) (4)

1.2 State SIX responsibilities or duties of employers and/or users of electrical machinery in hazardous locations according to Electrical Machinery Regulation 2011 (9) (6)

1.3 According to 18 (1) of Electrical Machinery Regulation (2011)

An employer or user shall cause - roofs, gutters, downpipes and waste pipes on premises to which electrical energy is supplied to be earthed, *except* –

State THREE *exceptions* to the above regulation. (3)

[13]

QUESTION 2: SANS 10086-3:2014: THE INSTALLATION, INSPECTION AND MAINTENANCE OF EQUIPMENT USED IN EXPLOSIVE ATMOSPHERES PART 3: REPAIR AND OVERHAUL OF EQUIPMENT

TABLE 1 below represents a matrix of the relevant standards that a master installation electrician must be familiar with to enable him/her to assess the compliance of specialised electrical installations in hazardous locations.

From the list below select the terms/phrases that are missing from TABLE 1.Write only the term/phrase next to the question number (2.1–2.10) in the ANSWER BOOK.

- SANS 10108 and SANS 60079-10-1
- Classification of surface dust areas
- SANS 10108 and SANS 60079-14
- Ex Equipment certification requirements
- SANS 10086-1, SANS 60079-14, SANS 10142-1 and SANS 60079-14
- Installations in underground mines
- Inspection and maintenance of surface installations.
- SANS 10142-1
- Wiring of premises
- SANS 10086-1, SANS 60079-14, SANS 10142-1 and SANS 60079-14

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-1	2	3
INDUSTRIAL CLASSIFICATION	**INDUSTRIAL DESCRIPTION**	**STANDARDS**
AREA CLASSIFICATION	Classification of surface gas areas	**2.6**
	2.1	SANS 10108 and SANS 60079-10-2
EQUIPMENT SELECTION	Equipment selection	**2.3**
	2.8	SANS 10108 and ARP 0108
INSTALLATION (ERECTION)	Surface installations including surface installations on mines	**2.10**
	2.7	SANS 10086-2
Inspection and maintenance	**2.2**	SANS 10086-1 and SANS 60079-17
2.9	Low-voltage installations	**2.4**
Repair	Repair of equipment used in explosive atmospheres	**2.5**
These standards shall be complied with.		

(10 × 1) **[10]**

QUESTION 3: GENERAL

3.1 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'True' or 'False' next to the question number (3.1.1–3.1.10) in the ANSWER BOOK.

3.1.1 A certificate of compliance can be issued for an electrical installation in potentially hazardous locations which have not been zoned (classified) yet.

3.1.2 A qualified electrical engineer with 10 years' experience in the chemical engineering field may issue a certificate for a specialised electrical installation without being a registered person.

3.1.3 Any change or alteration to the production process that influences the classification of the hazardous location will affect the electrical certificate of compliance for the particular installation.

3.1.4 MOS Act (Machinery Occupational Safety Act) was incorporated into the OHS Act (Act 85 of 1993).

3.1.5 The Minister of Safety and Security presides over the jurisdiction of the OHS Act?

3.1.6 The chief inspector of occupational health and safety is responsible for ensuring that all places of employment comply with the requirements in the act as far as a safe working environment is concerned. This includes underground mine activities as well.

3.1.7 The abbreviation GME which sometimes appear on explosion protected equipment represents Government Mining Equipment.

3.1.8 Any person suitably qualified or a person deemed competent enough by the owner or user of the installation or a hazardous location classification committee may classify areas containing flammable atmospheres into different zones?

3.1.9 Unused openings for cable glands or conduit entries in electrical equipment in hazardous locations shall be sealed with resin.

3.1.10 Additional holes may be made into flame-proof enclosures by a certified repairer.

(10 × 1) (10)

3.2 Name TWO documents you will have to add to the certificate of compliance for a specialised electrical installation. (2)

[12]

QUESTION 4: SANS10089 – 2: THE PETROLEUM INDUSTRY, PART 2: ELECTRICAL INSTALLATIONS IN THE DISTRIBUTION AND MARKETING SECTOR

FIGURE 1 and FIGURE 2 below show underground tanks at a petrol filling station. Answer the following questions based on these TWO figures.

FIGURE 1

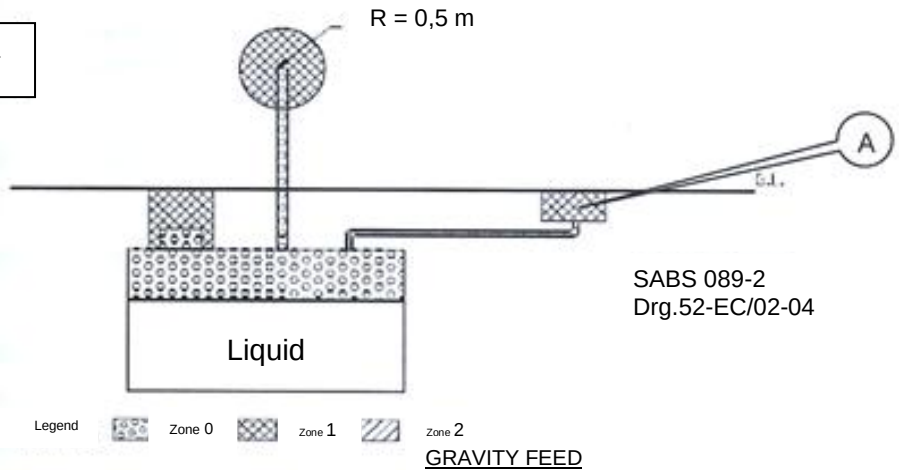
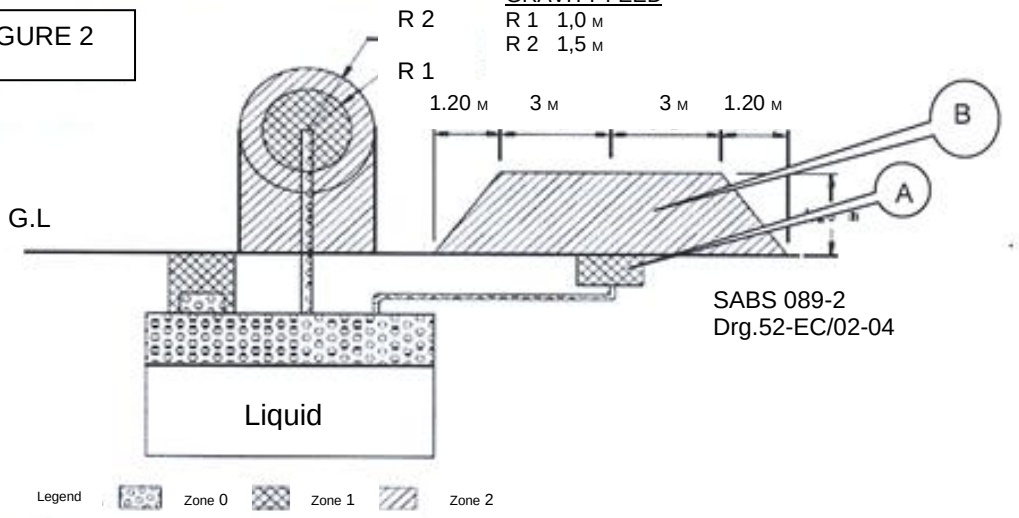


FIGURE 2



4.1 Does FIGURE 1 or FIGURE 2, based on the allocated zoning, represent a storage tank containing a class I flammable liquid at a temperature at or above its flash-point temperature? (1)

4.2 Does FIGURE 1 or FIGURE 2, based on the allocated zoning, represent a storage tank containing a class II or III combustible liquid at a temperature at or above its flashpoint temperature? (1)

4.3 Explain the difference between a *combustible liquid* and a *flammable liquid*. (6)

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4.4 Explain the difference between *class II* and *class III products*. (5)

4.5 Name any FOUR types of explosive protection equipment (Ex) suitable for use in the area marked 'A'. (4)

4.6 Name the types of explosive protection equipment (Ex) suitable for use in the area marked 'B'. (2)

4.7 Which SANS standard deals with the maintenance and repair of electrical equipment located in a zoned area at petrol stations? (1)

4.8 If a road tanker is used to fill the tanks in FIGURE 1 and FIGURE 2, what essential measures must be taken before commencing with the off-loading process? (3)

4.9 Describe how the tanks in FIGURE 1 and FIGURE 2 should be earthed. (Both tanks are made of steel and covered on the outside by fibreglass.) (3)

4.10 Cathode protection is widely used in the petro-chemical industry.

Briefly explain the principle of this protection method. (4)

[30]

QUESTION 5: SANS 10086–1:2011 (FRONT-END STANDARD TO SANS 60079 PART 14 AND PART 17) – THE INSTALLATION, DESIGN, SELECTION AND ERECTION AS WELL AS THE INSPECTION AND MAINTENANCE OF EQUIPMENT USED IN EXPLOSIVE ATMOSPHERES

5.1 Define the following terms:

5.1.1 Explosive atmosphere (2)

5.1.2 Exposed conductive part (2)

5.1.3 Extraneous conductive part (1)

5.2 In order to select the appropriate apparatus for hazardous areas, certain information is required.

State the information that you would provide to a supplier when ordering the apparatus. (4)

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5.3 State the system earthing you would use in hazardous locations in the following instances:

5.3.1 If a … system is used it shall only be a TN-S system.

5.3.2 If a … system is used, then it shall be protected by a residual current device.

5.3.3 An insulation monitoring device shall be provided to indicate the first earth fault when using a/an … system.

(3 × 1) (3)

5.4 To allow work to be carried out safely, suitable means of isolation must be provided.

State the requirements regarding which conductors must be isolated in the following configurations:

5.4.1 Three-phase supply

5.4.2 Single-phase supply

(2 × 1) (2)

5.5 There are specific requirements for the installation of equipment in hazardous locations as far as the aspects below are concerned. Write short notes on the requirements for EACH of the following aspects:

5.5.1 The gas used in the Exp type of protection systems must satisfy at least eight characteristics before it can be used for this purpose.

State FOUR of these characteristics (4)

5.5.2 Which ONE of the following two sets of equations is used to determine whether an intrinsic-safe loop is safe?

Write only the letter (A or B) of the correct set of equations next to the question number (4.6.2) in the ANSWER BOOK.

A $U_i \geq U_o$
$I_i \geq I_o$
$P_i \geq P_o$

B $U_i \leq U_o$
$I_i \geq I_o$
$P_i \geq P_o$ (1)

5.5.3 The earthing of intrinsic-safe circuits shall be done using one of two methods. (1)

5.5.4 The marking of the intrinsic-safe circuits if all intrinsic-safe circuit cables or all cables of non-intrinsic safe circuits are of the armoured, metal sheathed or screen type. (1)

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5.5.5 Marking of intrinsic-safe circuit conductors or cables when colour is used (1)

5.5.6 Luminaires with fluorescent lamps and electronic ballast with areas/atmospheres requiring T5 and T6 category equipment (1)

5.5.7 Making of additional holes in Exd type enclosures (2)

5.5.8 Unused openings in Ex enclosures (1)

5.5.9 Unused cable cores (2)

5.5.10 Protection of stranded ends of cable cores or conductors (2)
[30]

QUESTION 6: SANS 60079 PART 19: REPAIR AND OVERHAUL OF APPARATUS USED IN EXPLOSIVE ATMOSPHERES (OTHER THAN UNDERGROUND MINES AND EXPLOSIVE FACTORIES)

6.1 Explain the term *reclamation* used as a method to carry out repairs on explosion-protected electrical equipment. (3)

6.2 On some explosion-protected equipment the 'x'-mark forms part of the markings on the equipment.

Explain what this mark means. (2)
[5]

TOTAL: 100

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