Eskom	Standard	Technology

Title: **Hazardous Locations Standard**

Unique Identifier:	**240-56536505**
Alternative Reference Number:	**N/A**
Area of Applicability:	**Engineering**
Documentation Type:	**Standard**
Revision:	**2**
Total Pages:	**35**
Next Review Date:	**October 2021**
Disclosure Classification:	**CONTROLLED DISCLOSURE**

APPROVED FOR AUTHORISATION
☑ TECHNOLOGY ENGINEERING
DOCUMENT CENTRE ☎ X4962

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1. INTRODUCTION

The Occupational Health and Safety Act enjoin employers to be committed in providing safe and healthy working conditions for its employees. Eskom has seen a need to develop a document which contains general and specific information relating to the management of hazardous locations within Eskom Holdings. This document defines the minimum requirements which different Eskom sites have to meet in order to comply with the Occupational Health and Safety Act.

In terms of the Occupational Health and Safety Act 85 of 1993 (OHS Act), Electrical Machinery Regulation Section 9, all equipment installed in hazardous (flammable liquid and dust) locations shall comply with the minimum requirements of the relevant standards.

A hazardous location is regarded as different to other locations due to the possibility of explosions, fire or damage to plant and injuries to people due to electrical sparks, flammable gases, dust, vapours or mists, fibres suspended in the air, lighting, and heat generated in conductors and equipment, static power, friction and generation of toxic or explosive gasses.

2. SUPPORTING CLAUSES

2.1 SCOPE

The scope of this document captures the requirements as stated in the OHS Act [1], Electrical Machinery Regulations Section 9, regarding electrical machinery in hazardous locations for Eskom Holdings.

2.1.1 Purpose

The purpose of this standard is to guide all persons responsible for the specification, design, construction, commissioning, operating, maintenance and modification of electrical equipment in areas classified as hazardous locations for Eskom Holdings to ensure compliance to OHS Act [1] and all applicable regulations.

2.1.2 Applicability

This document shall apply throughout Eskom Holdings Limited Divisions.

2.2 NORMATIVE/INFORMATIVE REFERENCES

2.2.1 Normative

[1] Occupational Health and Safety Act 85 of 1993, Electrical Regulations 9

[2] SANS 10086-1 The installation, inspection and maintenance of equipment used in explosive atmospheres Part 1: Installations including surface installations on mines

[3] SANS 10087-3 The handling, storage, distribution and maintenance of liquefied petroleum gas in domestic, commercial, and industrial installations Part 3: Liquefied petroleum gas installations involving storage vessels of individual water capacity exceeding 500 L

[4] SANS 10089-3 The petroleum industry Part 3: The installation, modification, and decommissioning of underground storage tanks, pumps/dispensers and pipework at service stations and consumer installations

[5] SANS 10108 The classification of hazardous locations and the selection of equipment for use in such locations

[6] SANS 10142-1 The wiring of premises Part1: Low Voltage Installations

[7] SANS 10142-2 The wiring of premises Part 2: Medium – Voltage installations above 11kV AC not exceeding 22 kV AC and up to and including 3 MVA installed capacity

[8] SANS 60079-0 Explosive atmospheres - Part 0: Equipment - General requirements

[9] SANS 60079-10-1 Explosive atmospheres Part 10-1: Classification of areas - Explosive gas atmospheres

[10] SANS 60079-10-2 Explosive atmospheres Part 10-2: Classification of areas - Combustible dust atmospheres

[11] SANS 60079-14 Explosive atmospheres Part 14: Electrical installations design, selection and erection

[12] SANS 60079-17 Explosive atmospheres Part 17: Electrical installations inspection and maintenance

[13] SANS 60079-19 Explosive atmospheres - Part 19: Equipment repair, overhaul and reclamation

[14] 240-103031952 Application of Certificate of Compliance (CoC) and Safety Clearance Certificate on Electrical Installations in Generating Power Plant Work Instruction

[15] 240-76619615 Classification of Battery Rooms Procedure

[16] 36-681 Generation Plant Safety Regulations

2.2.2 Informative

[17] ISO 9001 Quality Management System

[18] ISO 18001 Occupational Health & Safety Management System

[19] ISO 14001 Environmental Health & Safety Management System

[20] 240-53114026 Project Engineering Change Management Procedure

[21] 240-53114002 Engineering Change Management Procedure

[22] 240-53113685 Design Review Procedure

[23] 240-72100555 The Engineering Management Framework and Operating Model Guideline

[24] SANS 1020 Power-operated dispensing devices for flammable liquid fuels

[25] SANS 10086-3 The installation, inspection and maintenance of equipment used in explosive atmospheres Part 3: Repair and overhaul of equipment

[26] SANS 10087-1 The handling, storage, distribution and maintenance of liquefied petroleum gas in domestic, commercial, and industrial installations Part 1: Liquefied petroleum gas installations involving gas storage containers of individual water capacity not exceeding 500 L and a combined water capacity not exceeding 3 000 L per installation

[27] SANS 10087-8 The handling, storage, distribution and maintenance of liquefied petroleum gas in domestic, commercial and industrial installations Part 8: Filling containers for LP gas operated fork lift vehicles in-situ

[28] SANS 10123 The control of undesirable static electricity

[29] SANS 10199 Reduction of explosion hazards presented by electrical equipment - Segregation, ventilation and pressurization

2.3 DEFINITIONS

Definition	Description
Boiling Point	The temperature of a liquid boiling at an ambient pressure of 101.3 kPa. **Note:** For liquid mixtures, the initial boiling point should be used. Initial boiling point is used for liquid mixtures to indicate the lowest value of the boiling point for the range of liquids present, as determined in a standard laboratory distillation without fractionation.
Certificate of Compliance	a) A certificate with unique number obtainable from the chief inspector, or a person appointed by the chief inspector, in the form Annexure1 of Electrical Installation Regulation, and issued by registered person in respect to an electrical installation or part of an electrical installation. b) A certificate of compliance issued under Electrical Installation Regulations, 1992.
Competent Person According to SANS 10108	The definition of "Competent Person" as per SANS 10108 [5] reads as follows: Person who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.
Explosive Atmosphere	Mixture with air, under atmospheric conditions, of flammable substances in the form of gas or vapour or mist or dust or fibre (or a combination of these) in which, after ignition, combustion spreads throughout the whole mixture. **Note –** Although a mixture which has a concentration above the upper explosive limit (UEL) is not an explosive gas atmosphere, it can readily become so and, in certain cases for area classification purposes, it is advisable to consider it as an explosive gas atmosphere.
Explosive Limits	**Lower explosive limit (LEL)** – The concentration of flammable gas or vapour in air below which the gas atmosphere is not explosive. **Upper explosive limit (UEL)** – The concentration of flammable gas or vapour in air above which the gas atmosphere is not explosive.
Flammable Gas or Vapour	Gas or vapour which, when mixed with air in certain proportions, will form an explosive gas atmosphere.
Flammable Liquid	A liquid capable of producing a flammable vapour under any foreseeable operating conditions.
Flammable Material	A material which is flammable of itself, or is capable of producing a flammable gas, vapour or mist.
Flammable Mist	Droplets of flammable liquid, dispersed in air so as to form an explosive atmosphere
Flashpoint	The lowest liquid temperature at which, under certain standardised conditions, a liquid gives of vapours in a quantity such as to be capable of forming ignitable vapour/ air mixture.
Hazardous Location / Area (dust)	Area in which combustible dust, in the form of a cloud is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of equipment NOTE 1 - Hazardous areas are divided into zones based upon the frequency and duration of the occurrence of explosive dust atmospheres. NOTE 2 - The potential of creating an explosive dust cloud from a dust layer also needs to be considered.
Hazardous Location / Area (on account of explosive gas atmospheres)	An area in which an explosive gas atmosphere is or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of equipment.
Ignition Source	Any part or process that is able to cause an ignition of an explosive atmosphere.

Definition	Description
Ignition temperature of an explosive gas atmosphere	The lowest temperature of a heated surface at which, under specified conditions, the ignition of a flammable substance in the form of a gas or vapour mixture with air will occur.
Major Incident	Means an occurrence of catastrophic proportions, resulting from the use of plant and machinery, or from activities at a workplace.
Non-hazardous Location / Area (dust)	An area in which combustible dust in the form of a cloud is not expected to be present in quantities such as to require special precautions for the construction, installation and use of equipment.
Non-hazardous Location / Area (on account of explosive gas atmospheres)	An area in which an explosive gas atmosphere is not expected to be present in quantities such as to require special precautions for the construction, installation and use of equipment.
Normal Operation	Situation when the equipment is operating within its designed parameters. NOTE1 – Minor releases of flammable material may be part of normal operation. For example, releases from seals which rely on wetting by the fluid which is being pumped are considered to be minor releases. NOTE 2 – Failures (such as the breakdown of pumps seals, flange gaskets or spillages caused by accidents) which involve urgent repair or shut-down are not considered to be part of normal operation nor are they considered to be catastrophic. NOTE 3 – Normal operation includes start-up and shut-down conditions.
Open Premises	Any space that is substantially open to the outside air and offers no obstruction to the free and natural passage of air through it. **Note:** Such premises may be roofed for weather protection or enclosed (for example, in wire mesh or expanded metal (or both), provided that adequate ventilation exists and the supports for the roof and side enclosures do not at any point materially obstruct the free passage of air to or through any part of the space within.
Release Rate	Quantity of flammable gas, vapour or mist emitted per unit time from the source of release.
Safe Location	A safe location is e.g. Spaces that are unlikely to contain a flammable substance and that are adjacent to a hazardous location but isolated from it by gastight partitions that have no communicating openings; and drying, baking locations that have positive mechanical ventilation adequate to prevent the formation of flammable concentrations of vapour and that have effective interlocks to de-energize all electrical apparatus (other than electrical apparatus approved for zone 1 locations) if the ventilating equipment becomes inoperative.
Sources of Release	Point or location from which a flammable gas, vapour, or liquid might be released into the atmosphere such that an explosive gas atmosphere can be formed.
Vapour Pressure	The pressure exerted when a solid or liquid is in equilibrium with its own vapour. It is a function of the substance and of the temperature.
Ventilation	Movement of air and its replacement with fresh air due to the effects of wind, temperature gradients, or artificial means (for example fans or extractors)

2.3.1 Disclosure Classification

Controlled Disclosure: Controlled Disclosure to External Parties (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

Abbreviation	Description
A	Accountable
AC	Alternating Current
BU	Business Unit
C	Consulted
CoC	Certificate of Compliance
CoE	Centre of Excellence
DMR	Department of Mineral Resources
DoL	Department of Labour
FRF	Fire Resistant Fluid
HAZLOC	Hazardous Locations
I	Informed
IEC	International Electro technical Commission
kPa	Kilo Pascal
kV	Kilo Volt
LEL	Lower Explosive Limit
LPG	Liquid Petroleum Gas
MIE	Master Installation Electrician
MVA	Mega Volt Amp
O & M	Operating and Maintenance
OHS Act	Occupational Health and Safety Act 85 of 1993
PLCM	Project Life Cycle Model
R	Responsible
UEL	Upper Explosive Limit

2.5 ROLES AND RESPONSIBILITIES

Role	Key Differentiators	Definition
CoE Manager	Manages COE Practitioners, Design Engineers and ultimate design authority for this CoE	The COE represents the ultimate engineering authority for design work and is responsible for approving production of Standards. The COE Management role is responsible for and is the custodian of technical knowledge within their engineering domain.
Design Engineering Practitioner	Design (concept, basic or detail) of system and components within a discipline	The role of the discipline Design Engineering practitioner is to perform detail design within his/her field of expertise. He/ she works closely with the other discipline design engineering roles in the production of an effectively integrated project design. He/she may be placed in a design office or be resident on a project site or operational site/region and will execute detail design work. As the registered professional, he/she is ultimately accountable for the technical integrity of the domain design work as delegated.
Site	Construction Site based,	The Site Construction Engineering role is part of the project

Role	Key Differentiators	Definition
Construction Engineering Practitioner	deliver according to design quality assurance, project from construction to finalisation	engineering team and participates in conjunction with other team members of all disciplines in order to assure the technical integrity of a fully functional and operational plant that meets the user requirement and Eskom Engineering expectations and requirements. The Site Construction Engineering role is a key link to facilitate and ensure that the plant, is built and commissioned, is fully aligned with the Design Base, Operating Technical Specifications and the Maintenance Base. The role provides an assurance function.
O&M Engineering	Production focused, incident investigations, advisory role, direct interface with O & M, ensure the asset is operated and maintained within the design base, identify deficiencies within the production place.	The primary role is to review and ensure that the asset is operated and maintained within the design base. i.e. the assets are operated and maintained in line with the OTS and maintenance base to ensure the technical integrity of the asset. He/she shall comply with Engineering strategies, policies and standards. The engineering role will define the requirements for plant design changes and do design when authorised to do so. The engineering role will play a leading role in Plant Occurrences and incident investigations. The engineering role also plays a key role updating the technical plan and asset life cycle plan.
GMR2 / Compliance Management	Appointed	The GMR2 of each Eskom site is accountable for the compliance to the Electrical Machinery Regulations, Section 9 with regards to documentation, inspection, testing and maintenance of electrical equipment in hazardous locations on existing sites.
Risk and Assurance Manager	Appointed	The Risk and Assurance Manager of each Eskom site is accountable to ensure all administrative aspects required by the OHS Act is in place and available.
MIE	Appointed	The appointed MIE for the BU is accountable to issue COC's for all applicable areas at the BU. Verification of all HAZLOC areas must also be done.
Hazardous Location Committee and Chairperson	Appointed and BU based	The Hazloc committee mainly focuses on: • Verification of all Hazloc areas. • Compile files for each Hazloc area with all relevant records and information (which includes demarcation drawings) • Review Statutory PM's on SAP for Visual Inspection Close Inspection and Detailed inspections (2 yearly inspections) The Hazardous Locations Committee and Chairperson make recommendations, in the best interests of the BU, on items in accordance with the Electrical Machinery Regulations 9 of the Act for Electrical Machinery in Hazardous Locations. Ensuring that in addition to the Electrical Machinery Regulation all applicable sections of Plant Safety Regulations, Electrical Installation Regulation, applicable Eskom and applicable SANS are complied with.

Table 1: PLCM Role Clarification

PLCM Phase	HAZLOC Step	Roles (R / A / C / I)		Knowledge, Skills and Competencies Required
Pre-Concept & Concept Phase	Identification	R	O&M Engineer	Basic Hazardous Location Awareness Training (one day training)
		A	Design Engineer	
		C/I	Site HAZLOC Committee and Chairperson	

PLCM Phase	HAZLOC Step	Roles (R / A / C / I)		Knowledge, Skills and Competencies Required
Basic Phase	Classification	R/A	Design Engineer	Process governed by System Design CoE in Technology. Classification of hazardous areas or locations shall be carried out by either a qualified engineer, or a competent person who is familiar with the process and equipment, as well as with the safety, electrical, operating and mechanical processes.
		C/I	O&M Engineer	
Detail Phase (Electrical Engineering)	Classification & Selection	R/A	Design Engineer	Detailed Knowledge, Skills and Competencies required as per Table 4. Classification of hazardous areas or locations shall be carried out by either a qualified engineer, or a competent person who is familiar with the process and equipment, as well as with the safety, electrical, operating and mechanical processes.
		C/I	O&M Engineer	
Construction	Installation	R/A	Site Construction Engineer	Detailed Knowledge, Skills and Competencies required as per Table 4.
		C/I	GMR2	
Operating & Maintenance	Inspection & Maintenance	R	O&M Engineer	Detailed Knowledge, Skills and Competencies required as per Table 5.
		A	MIE	
		C	GMR2	
		I	Site HAZLOC Committee and Chairperson	

2.6 PROCESS FOR MONITORING

- Assurance Assessments will be conducted by Risk & Assurance.
- Self-Assessments to confirm regulatory and administrative compliance to the OHS Act.
- Compliance Forum.
- 240-53114026 Project Engineering Change Management Procedure
- 240-53114002 Engineering Change Management Procedure
- 240-53113685 Design Review Procedure

2.7 RELATED/SUPPORTING DOCUMENTS

None

3. HAZARDOUS LOCATIONS STANDARD

3.1 GENERAL

The OHS Act [1] states that no person may use electrical machinery in locations where there is a danger of a fire or explosion owing to the presence, manufacturing, handling or storage of flammable gas, vapours or dust unless the locations where the flammable gas, vapours or dust are classified in accordance with SANS 10108 [5] and the electrical equipment installed in these locations complies with the classification of the locations.

In South Africa, the following legislation and authorities are responsible for the control of hazardous locations:

a) the Mine Health and Safety Act, 1996 (Act No. 29 of 1996), administered by the Chief Inspector of Mines, of the Department of Mineral Resources and Department of Energy;

b) the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), administered by the Chief Inspector of Occupational Health and Safety, of the Department of Labour;

c) the Explosives Act, 2003 (Act No. 15 of 2003), administered by the Chief Inspector of Explosives, of the Department of Labour.

For Eskom the OHS Act is applicable and SANS 10086-1 [2] gives an overview of the requirements to be complied with in terms of the relevant national legislation for installations in explosive atmospheres.

Table 2: Requirements in Accordance with the Relevant National Legislation

Classification	Description	Standards - These standards shall be complied with
Area Classification	Classification of surface gas areas	SANS 10108 and SANS 60079-10-1
	Classification of surface dust areas	SANS 10108 and SANS 60079-10-2
Equipment selection	Equipment selection	SANS 10108 and SANS 60079-14
	Equipment certification requirements	SANS 10108
Installation (erection)	Surface installations including surface installations on mines.	SANS 10086-1, SANS 60079-14 and SANS 10142-1
	Installations in underground mines	SANS 10086-2
Inspection and maintenance	Inspection and maintenance of surface installations	SANS 10086-1 and SANS 60079-17
Wiring of premises	Low-voltage installations	SANS 10142-1
Repair	Repair of equipment used in explosive atmospheres.	SANS 10086-3, SANS 10108 and SANS 60079-19

Eskom must comply with all aspects of the OHS Act [1] as stipulated in Appendix A.

The relevant South African National Standards as listed in Table 2 contain all the required information to comply with the OHS Act. This Eskom standard will document the 5 steps as indicated in Figure 1 to guide all persons responsible for the specification, design, construction, commissioning, operating, maintenance and modification of electrical equipment in areas classified as hazardous locations. The hazardous location steps shall be followed for any new plant, additions to plant, changes or modification to existing plant areas that could be a possible hazardous area.

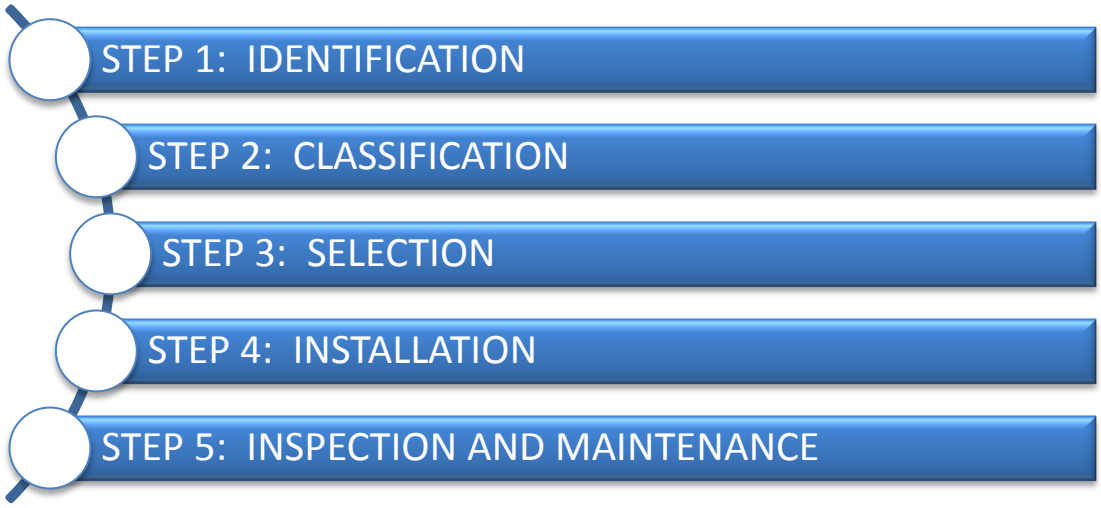

Figure 1: HAZLOC Steps

3.2 STEP 1: IDENTIFICATION

Potentially hazardous areas (refer to definition in section 2.3) shall be identified for all Eskom assets in which fires or explosions can occur owing to the presence of flammable gases, vapours or mists, dusts, or fibres suspended in the air. Any identified potential hazardous area must be classified to determine if it is indeed a hazardous location. Each Business Unit shall identify and compile a list of its particular hazardous locations, both permanent and temporary.

Typical examples of hazardous areas in Eskom are listed in Appendix B.

Dusts, as defined in SANS 60079-10-2 [10], are hazardous because when they are dispersed in air by any means, they form potentially explosive atmospheres. Furthermore, layers of dust may ignite and act as ignition sources for an explosive atmosphere. SANS 60079-10-2 [10] gives guidance on the identification and classification of areas where such hazards from dust can arise.

Hazardous locations shall be identified at each Business Unit and the necessary measures shall be taken to ensure that no health or safety concerns arise from such hazardous locations.

3.3 STEP2: CLASSIFICATION

Once the potentially hazardous areas are identified, the OHS Act, Electrical Machinery Regulation Section 9 (See Appendix A) requires the employer to classify these potentially hazardous locations.

The area classification for new plant areas should be carried out when the initial process, instrumentation line diagrams and initial layout plans are available and confirmed before plant start-up. All relevant and available information for existing plant areas shall be used to do the area classification when required.

Classification of hazardous areas or locations shall be carried out by either a qualified engineer, or a competent person who is familiar with the process and equipment, as well as with the safety, electrical, operating and mechanical processes.

Area classification is a method of analysing and classifying the environment where explosive gas, vapours, dusts or fibres atmospheres may occur so as to facilitate the proper selection and installation of apparatus to be used safely in the environment, taking into account gas groups and temperature classes.

Following the initial hazardous area classification, means to improve the area classification (through arrangement design changes, system design changes, ventilation design, location of electrical equipment etc.) needs to be investigated and if feasible implemented.

3.3.1 General Area Classification Methodology

In most practical situations where flammable materials are used, it is difficult to ensure that an explosive gas, vapours, dusts or fibres atmosphere will never occur. It may also be difficult to ensure that apparatus will never give rise to a source of ignition. Therefore, in situations where an explosive gas, vapours, dusts or fibres atmosphere has a high likelihood of occurring, reliance is placed on using apparatus, which has a low likelihood of creating a source of ignition. Conversely, where the likelihood of an explosive gas, vapours, dusts or fibres atmosphere occurring is reduced; apparatus constructed to a less rigorous standard may be used.

It is rarely possible by a simple examination of a plant or plant design to decide which parts of the plant can be equated to the three Zoned definitions as per Table 3. A more detailed approach is therefore necessary and this involves the analysis of the basic possibility of an explosive gas, vapours, dusts or fibres atmosphere occurring.

SANS 60079:10-1 [9] or SANS 60079:10-2 [10] has to be used as the basis for the classification of location where flammable gases; vapours; liquid and dust could be present. Hazardous locations are classified in terms of Zones on the basis of frequency and duration of the occurrence of a flammable atmosphere, as follows:

Table 3: Zone Classification

Gasses, Liquids & Vapours:	
Zone 0	A location in which an explosive gas atmosphere is present *continuously* or for *long periods*.
Zone 1	A location in which an explosive gas atmosphere is *likely to occur* in *normal operation*.
Zone 2	A location in which an explosive gas atmosphere is *not likely to occur* in *normal operation* and, if it does occur, is likely to do so only *infrequently* and will exist for a *short period only.*
Dust	
Zone 20	A location in which an combustible dust, as a cloud is present *continuously* or frequently, during normal operation in sufficient quantity to be capable of producing an explosive concentration of combustible dust mixed with air or where layers of dust of uncontrollable and excessive thickness can be formed or both.
Zone 21	A location in which combustible dust or fibres are in suspension in the air in quantities sufficient to produce an explosive or ignitable mixture and the presence of metallic dust.
Zone 22	A location in which combustible dust or fibres are not normally in suspension in the air or *likely to be* thrown in suspension by the normal operation of the electrical apparatus or plant in quantities sufficient to produce an explosive or ignitable mixture.

The first step is to assess the likelihood of this, in accordance with the definitions of Zones 0, 1 and 2 / Zone 20, 21, 22. Once the likely frequency and duration of release (and hence the grade of release), the release rate, concentration, velocity, ventilation and other factors which affect the type and/or extent of the zone have been determined, there is then a firm basis on which to determine the likely presence of an explosive gas atmosphere in the surrounding areas.

This approach therefore requires detailed consideration to be given to each item of process equipment which contains explosive gas, vapours, dusts or fibres atmosphere, and which could therefore be a source of release.

In particular, Zone 0 and 1 / Zone 20 and 21 areas should be minimised in number and extent by design or suitable operating procedures. In other words, plants and installations shall be mainly Zone 2 / Zone 22 or non-hazardous. Where release of flammable material is unavoidable, process equipment items should be limited to those which give secondary grade releases or, failing this (that is where primary or continuous grade releases are unavoidable), the releases should be of very limited quantity and rate. In carrying out area classification, these principles should receive prime consideration. Where necessary, the design, operation and location of process equipment should ensure that, when it is operating abnormally, the amount of flammable material released into the atmosphere is minimised, so as to reduce the extent of the hazardous area.

The classification of battery rooms will follow the approach as documented in 240-76619615 [15].

The classification of Liquid Petroleum Gas (LPG) installations will follow the approach as documented in SANS 10087-3 [3], Section 17 “Electrical equipment and other sources of ignition”.

The classification of Petrol / Diesel Station installations will follow the approach as documented in SANS 10089-3 [4], Section 13 “Electrical installation”.

3.3.2 Classification of Surface Gas Areas

The classification of surface gas areas shall be done in accordance with SANS 10108 [5] and SANS 60079-10-1 [9]. SANS 60079-10-1 [9] provides all the compliance requirements related to the following aspects:

a) General safety principles and the area classification objectives
b) The area classification procedure incorporating all aspects including:
    I. Sources of release
    II. Type of zone
    III. Extent of zone
        i. Release rate of gas or vapour
        ii. Lower explosive limit (LEL)
        iii. Ventilation
        iv. Relative density of the gas or vapour when it is released
        v. Other parameters to be considered
c) General ventilation including:
    I. Main types of ventilation
    II. Degree of ventilation
    III. Availability of ventilation
d) General documentation requirements including drawings, data sheets and tables

Examples of all aspects of the classification requirements are given in the standard.

All documentation and calculations for area classification shall form part of the CoC (must be available on how the classification was done).

3.3.3 Classification of Surface Dust Areas

The classification of surface dust areas shall be done in accordance with SANS 10108 [5] and SANS 60079-10-2 [10]. SANS 60079-10-2 [10] provides all the compliance requirements related to the following aspects:

a) General area classification aspects

b) The area classification procedure for explosive dust atmospheres incorporating all aspects including:

   I. Source of release

   II. Dust containment

   III. Identification and gradation of source of release

   IV. Zones

   V. Extent of zones

c) Dust layer hazard

d) General documentation requirements including drawings, data sheets and tables

Examples of all aspects of the classification requirements are given in the standard.

All documentation and calculations for area classification shall form part of the test report and CoC (must be available on how the classification was done).

3.4 STEP 3: SELECTION

3.4.1 Equipment Selection

Once potential hazardous areas have been identified and classified in accordance with the standard requirements the equipment selection can be done.

Equipment selection shall be done in accordance with SANS 10108 [5] and SANS 60079-14 [11].

In order to select the appropriate electrical equipment for hazardous areas, the following information is required:

a) Classification of the hazardous area including the equipment protection level requirements where applicable;

b) Where applicable, gas, vapour or dust classification in relation to the group or subgroup of the electrical equipment;

c) Temperature class or ignition temperature of the gas or vapour involved;

d) Minimum ignition temperature of the dust cloud and minimum ignition temperature of the

e) Dust layer;

f) Intended application of the equipment;

g) External influences and ambient temperature.

It is recommended that the equipment protection levels (EPL) requirements are recorded on the area classification drawing.

3.4.2 Equipment Certification

Equipment certification requirements shall be done in accordance with SANS 10108 [5].

Product conformity for explosion-protected equipment is established through testing and certification by means of

a) Type testing (compulsory for all equipment), and either

b) Batch testing the production units, or

c) Producing production units under an approved product certification scheme.

Department of Mineral Resources (DMR) and / or Department of Labour (DoL) can be contacted to provide all the compliance requirements related to the following aspects:

a) Regulatory requirements for explosion-protected equipment

b) Approved standards, test laboratories and certification bodies

c) Validity of certification

d) Other certification schemes — Operation and acceptability of certificates

e) Apparatus marking

3.5 STEP 4: INSTALLATION

Equipment installation shall be done in accordance with SANS 10086-1 [2], SANS 10142-1 [6] and SANS 60079-14 [11].

Electrical installations in hazardous areas shall also comply with the appropriate requirements for electrical installations in non-hazardous areas. However the requirements for non-hazardous areas are insufficient for installations in hazardous areas.

It is necessary to ensure that any installation complies with the relevant equipment certificate as well as with this standard and any other requirements specific to the plant on which the installation takes place.

Where there is a possibility of static build-up under working conditions, the user shall ensure that all electrical equipment and metal parts are earthed in such a way that all static build-up will be conveyed to the earth mass effectively.

In order to correctly install or extend an existing installation, the following information, additional to that required for non-hazardous areas, is required, where applicable:

Information available at the Business Unit -

a) area classification documents (see SANS 60079-10-1 [9] and SANS 60079-10-2 [10]) with plans showing the classification and extent of the hazardous areas including the zoning (and maximum permissible dust layer thickness if the hazard is due to dust);

b) optional assessment of consequences of ignition;

c) where applicable, gas, vapour or dust classification in relation to the group or subgroup of the electrical equipment;

d) temperature class or ignition temperature of the gas or vapour involved;

e) where applicable, the material characteristics including electrical resistivity, the minimum ignition temperature of the dust cloud, minimum ignition temperature of the dust layer and minimum ignition energy of the dust cloud;

f) external influences and ambient temperature.

Information available for the selected Equipment –

a) manufacturer's instructions for selection, installation and initial inspection;

b) documents for electrical equipment with conditions of use, e.g. for equipment with certificate numbers which have the suffix "X";

c) descriptive system document for the intrinsically safe system houses;

d) manufacturer's/qualified person's declaration.

Information available for the Installation -

a) necessary information to ensure correct installation of the equipment provided in a form which is suitable to the personnel responsible for this activity (see SANS 60079-0 [8], Instructions);

b) documentation relating to the suitability of the equipment for the area and environment to which it will be exposed, e.g. temperature ratings, type of protection, IP rating, corrosion resistance;

c) the plans showing types and details of wiring systems;

d) records of selection criteria for cable entry systems for compliance with the requirements for the particular type of protection;

e) drawings and schedules relating to circuit identification;

f) records of the initial inspection.

g) installer's/qualified person's declaration

NOTE: Records of inspection for assemblies or pre-installed items can be accepted as part of initial inspection records.

3.5.1 Certificate of Compliance

All hazardous locations installations shall be issued with Certificate of Compliance by a person registered as a Master Installation Electrician in terms of regulation 11(2) of Electrical Installation Regulations in OHS Act, for the verification and certification of the construction, testing and inspection of hazardous location installation.

Detailed requirements of a test report and CoC as well as the authority to issue a test report and a CoC is elaborated on in Section 8.8 and Annex P of SANS 10142-1 [6]. Also refer to 240-103031952 [14], The Eskom CoC Works Instruction for additional details.

3.6 STEP 5: INSPECTION AND MAINTENANCE

Regular inspections and maintenance of the various hazardous locations are to be carried out in accordance with the statutory requirements. Inspections are to comply with regulatory requirements SANS 10086-1 [2] as well as SANS 10086-3 [25]. Inspections and maintenance schedules captured in SANS 60079-17 [12] (Table 1, 2 and 3) are to be used for carrying out the inspections.

For the purposes of inspection and maintenance, up-to-date documentation including any modification records, of the following items shall be available:

a) zone classification of areas and, if included, the equipment protection level (EPL) required for each location (see SANS 60079-10-1 [9] and SANS 60079-10-2) [10],

b) for gases: equipment group (IIA, IIB or IIC) and temperature class requirements,

c) for dusts: equipment group (IIIA, IIIB or IIIC) and maximum surface temperature requirements,

d) equipment characteristics e.g. temperature ratings, type of protection, IP rating, corrosion resistance,

e) records sufficient to enable the explosion protected equipment to be maintained in accordance with its type of protection (see SANS 60079-14 [11]), (for example list and location of equipment, spares, certificates, technical information),

f) copies of previous inspection records,

g) copy of the additional initial inspection records as detailed in SANS 60079-14 [11].

Requirements for other documentation that may be necessary are provided in SANS 60079-14 [11] and SANS 60079-19 [13].

The inspection activity shall be sufficiently independent of any immediate demands of maintenance and/or other activities so as not to prejudice the reliability of any report findings from the inspection.

To ensure that the installations are maintained in a satisfactory condition for continued use within a hazardous area, either

a) regular periodic inspections, or

b) continuous supervision by skilled personnel,

and, where necessary, maintenance shall be carried out.

NOTE: In the case of dusts, fibres or flying's, housekeeping can influence the inspection and maintenance requirements.

The types of inspections include:

a) Initial inspections used to check that the selected type of protection and its installation are appropriate based on detailed inspections. The requirements are covered in IEC 60079-14 [11].

b) Periodic inspections which may be visual, close or detailed in accordance with SANS 60079-17 [12] Tables 1, 2, and 3, or modified tables, as appropriate.

c) Sample inspections which may be visual, close or detailed in accordance with SANS 60079-17 [12] Tables 1, 2, and 3, or modified tables, as appropriate. The size and composition of all samples shall be determined with regard to the purpose of the inspection.

Sample inspections should not be expected to reveal faults of a random nature, such as loose connections, but should be used to monitor the effects of environmental conditions, vibration, inherent design weakness, etc.

d) Continuous supervision utilizing the visual or close inspections in accordance with SANS 60079-17 [12] Tables 1, 2, and 3, or modified tables, as appropriate. Where the installation falls outside the capability for continuous supervision it shall be subject to periodic inspection.

The results of all inspections shall be recorded and retained, and may lead to a need for further actions.

It is Eskom's responsibility to ensure that the area classification remains up-to-date; either by reviews at regular intervals or as part of change management, to ensure that all modifications to the plant or mine that could affect the area classification are taken into account.

3.7 DEMARCATION OF HAZARDOUS LOCATIONS

Hazardous locations shall be marked as per standard SANS 10108 [5] to indicate danger to personnel.

Hazardous locations shall to the greatest extent practical, be made secure from entry by unauthorised personnel, and access control implemented as necessary.

3.8 TRAINING

Knowledge, skills and competency requirements for the various roles involved in hazardous locations are defined in SANS 60079-14 [11], SANS 60079-17 [12] and SANS 60079-19 [13].

Personnel shall be trained to be equipped with the necessary skills and competencies based on the role that they are fulfilling within the area of hazardous locations.

Table 4: Knowledge, Skills and Competencies Required for Electrical Installation Design, Selection and Erection

SANS 60079-14 Electrical Installations Design, Selection and Erection	
Role	**Knowledge, Skills and Competencies**
Responsible persons Such persons shall confine their involvement to the management of competent operatives conducting selection and erection duties and not engage themselves directly in the work without ensuring their practical skills at least meet the requirements given for Operatives / technicians (selection and erection).	Responsible persons who are responsible for the processes involved in the design, selection and erection of explosion protected equipment shall possess, at least, the following: a) general understanding of relevant electrical engineering; b) understanding and ability to read and assess engineering drawings; c) practical understanding of explosion protection principles and techniques; d) working knowledge and understanding of relevant standards in explosion protection; e) basic knowledge of quality assurance, including the principles of auditing, documentation, traceability of measurement and instrument calibration.
Operatives / technicians (selection and erection)	Operatives/technicians shall possess, to the extent necessary to perform their tasks, the following: a) understanding of the general principles of explosion protection; b) understanding of the general principles of types of protection and marking; c) understanding of those aspects of equipment design which affect the protection concept; d) understanding of content of certificates and relevant parts of this standard; e) general understanding of inspection and maintenance requirements of SANS 60079-17; f) familiarity with the particular techniques to be employed in the selection and erection of g) equipment referred to in this standard; h) understanding of the additional importance of permit to work systems and safe isolation in relation to explosion protection.
Designers (design and selection)	Designers shall possess, to the extent necessary to perform their tasks, the following: a) detailed knowledge of the general principles of explosion protection;

SANS 60079-14 Electrical Installations Design, Selection and Erection	
Role	**Knowledge, Skills and Competencies**
	b) detailed knowledge of the general principles of types of protection and marking; c) detailed knowledge of those aspects of equipment design which affect the protection concept; d) detailed knowledge of content of certificates and relevant parts of this standard; e) understanding of practical skills for the preparation and installation of relevant concepts of protection; f) detailed knowledge of the additional importance of permit to work systems and safe isolation in relation to explosion protection; g) detailed knowledge of the particular techniques to be employed in the selection and erection of equipment referred to in this standard; h) general understanding of inspection and maintenance requirements of SANS 60079-17.

Table 5: Knowledge, Skills and Competencies Required for Electrical Installations Inspection and Maintenance

SANS 60079-17 Electrical Installations Inspection and Maintenance	
Role	**Knowledge, Skills and Competencies**
Responsible persons and technical persons with executive function Such persons shall confine their involvement to the management of skilled personnel and competent operatives, conducting inspection and maintenance duties and not engage themselves directly in the work without ensuring their practical skills at least meet the requirements given for Operatives/technicians (inspection and maintenance).	Responsible persons and technical persons with executive function who are responsible for the processes involved in the inspection and maintenance of explosion protected equipment shall possess, at least, the following: a) general understanding of relevant electrical engineering; b) practical understanding of explosion protection principles and techniques; c) understanding and ability to read and assess engineering drawings; d) working knowledge and understanding of relevant standards in explosion protection, particularly SANS 60079-10-1, SANS 60079-10-2, SANS 60079-14 and SANS 60079-19; e) basic knowledge of quality assurance, including the principles of auditing, documentation, traceability of measurement and instrument calibration.
Operative/technician (inspection and maintenance)	Operatives/technicians shall possess, to the extent necessary to perform their tasks, the following: a) understanding of the general principles of explosion protection; b) understanding of the general principles of types of protection and marking; c) understanding of those aspects of equipment design which affect

SANS 60079-17 Electrical Installations Inspection and Maintenance	
Role	**Knowledge, Skills and Competencies**
	the protection concept; d) understanding of certification and relevant parts of this standard; e) understanding of the additional importance of permit to work systems and safe isolation in relation to explosion protection; f) familiarity with the particular techniques to be employed in the inspection and maintenance of equipment referred to in this standard; g) comprehensive understanding of the selection and erection requirements of SANS 60079-14; h) general understanding of the repair and reclamation requirements of SANS 60079-19.

Table 6: Knowledge, Skills and Competencies Required for Equipment repair, overhaul and reclamation

SANS 60079-19 Equipment Repair, Overhaul and Reclamation	
Role	**Knowledge, Skills and Competencies**
Responsible persons Such persons shall confine their involvement to overhaul, repair and reclamation in the nominated areas of competence and not engage themselves in modifications of explosion protected equipment without expert guidance.	“Responsible persons" who are responsible for the processes involved in the overhaul, repair and reclamation of specific types of explosion protection of explosion protected equipment, shall possess, at least, the following: a) general understanding of relevant electrical and mechanical engineering at the craftsperson level or above; b) practical understanding of explosion-protection principles and techniques; c) understanding and ability to read and assess engineering drawings; d) familiarity with measurement functions, including practical metrology skills, to measure known quantities; e) working knowledge and understanding of relevant standards in the explosion protection field; f) basic knowledge of quality assurance, including the principles of traceability of measurement and instrument calibration.
Operatives	Operatives shall possess, to the extent necessary to perform their tasks, the following: a) understanding of the general principles of types of protection and marking; b) understanding of those aspects of equipment design which affect the protection concept; c) understanding of examination and testing as related to relevant parts of this standard;

SANS 60079-19 Equipment Repair, Overhaul and Reclamation	
Role	**Knowledge, Skills and Competencies**
	d) ability to identify replacement parts and components authorized by the manufacturer; e) familiarity with the particular techniques to be employed in repairs referred to in this standard.

There are various service providers in South Africa providing training on the various knowledge, skills and competencies stated above. The relevant training should be identified and attended accordingly.

Appropriate refresher training shall be given to such personnel on a regular basis at intervals, which should not exceed two years. Records shall be kept of the training attendance. Employees are to be made aware of the courses and procedures available and provision for their training and re-training made and managed.

4. AUTHORISATION

This document has been seen and accepted by:

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5. REVISIONS

Date	Rev	Compiler	Remarks
November 2012	0	M. Khumalo	Draft document for Review created from GGPP 0772
May 2013	1	M. Khumalo	Final Document for Publication
October 2016	1.1	M. André	Contents rewritten to provide clear guidance to all individuals involved in and responsible for Hazloc.
October 2016	1.2	M. André	Final Draft for Formal Comments Review Process
December 2016	1.3	M. Andre	Final updated Draft after Comments Review Process
December 2016	2	D. Monyane	Final Rev 3 Document for Authorisation and Publication

6. DEVELOPMENT TEAM

The following people were involved in the development of this document:

- Gert-Daniel Scholtz
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- Mishack Mdluli
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- Fanie Fouche

7. ACKNOWLEDGEMENTS

- Marlize André

APPENDIX A: ELECTRICAL MACHINERY REGULATION – SECTION 9 ELECTRICAL MACHINERY IN HAZARDOUS LOCATIONS

Section 9:

(1) No person may use electrical machinery in locations where there is danger of fire or explosion owing to the presence, occurrence or development of explosive or flammable articles, or where explosive articles are manufactured, handled or stored, unless such electrical machinery, with regard to its construction relating to the classification of the hazardous locations in which it is to be used, meets the requirements of a safety standard incorporated for this purpose in these regulations under section 36 of the Act.

(2) Every user referred to in subregulation (1) shall be in possession of a certificate in a form acceptable to the chief inspector which has been issued by an approved inspection authority, in which it is certified that the electrical machinery referred to in terms of subregulation (1) has been manufactured and tested for the groups of dangerous articles in terms of the safety standard which has been incorporated in these regulations for this purpose under section 36 of the Act: Provided that in lieu of such certificate an inspector may approve permanent labelling on such machinery which contains all the relevant information.

(3) When diverse items of electrical machinery such as motors, cables and control apparatus are used together to form an electrical installation, the user shall ensure that the selection, arrangement, installation, protection, maintenance and working thereof results in no less a degree of safety than when the individual items of such machinery are used separately.

(4) The user shall use electrical machinery to which this regulation applies only under such conditions and in such surroundings as are prescribed in the safety standard referred to in subregulation (2).

(5) No person shall effect repairs or adjustments to or otherwise work on electrical machinery under conditions envisaged by subregulation (1) unless such machinery has been rendered dead and effective measures have been taken to ensure that such machinery remains dead.

(6) Wherever there is a possibility of the formation of static electricity under working conditions, the user shall earth all metallic structures, machine parts, pneumatic conveyor ducts and pipelines conveying flammable articles and the like, or take such other measures as may be necessary to effectively prevent the formation of electric sparks.

(7) The user shall cause all electrical machinery to which this regulation applies to be examined and tested at intervals not exceeding two years by a person who is competent to express an opinion on the safety thereof.

(8) The person carrying out the examination referred to in subregulation (7) shall enter, sign and date the results of each such examination in a record book which shall be kept by the user for this purpose: Provided that where such machinery is subject to adverse climatic or physical conditions the frequency of such examinations shall be increased to intervals of no longer than one year or such shorter period as circumstances may necessitate.

APPENDIX B: LIST OF SOME EXAMPLES OF POSSIBLE HAZARDOUS LOCATIONS

1. PERMANENT

a. Hydrogen plant building, bulk storage and bottles
b. Gas distribution systems (Hydrogen and L.P.G.)
c. Battery rooms
d. Liquid petroleum gas (LPG) storage
e. Bulk fuel oil storage
f. Turbine lubricating oil storage
g. Seal oil plant
h. Sewerage plant digesters
i. Diesel fuel storage
j. Petroleum storage
k. Fire resistant fluid (FRF) storage
l. Main stores. (Flammable and toxic fluids storage)
m. Hazardous waste site
n. All Coal plant areas including stockyards
o. Laboratory: chemical and gas storage
p. X-Rays. (Bunker coal level detection)
q. Chlorine Storage
r. Pulverised Fuel System
s. Water Treatment Plant
t. Reverse Osmosis Plant
u. Waste Water treatment Plant
v. Cooling Water treatment Plant

2. TEMPORARY

a. Chemical off-loading areas
    i. Ammonia
    ii. Caustic
    iii. Acids
    iv. Chlorine
b. L P G off loading
c. Bulk fuel oil off loading
d. Turbine lubricating oil off loading
e. Diesel and petrol off loading

f. F R F transfers to storage
g. Hazardous waste transfers.
h. Coal bunker and staith lashing
i. X Ray areas (outages)
j. Paint spray booths
k. Burner testing rig or areas
l. Hydrazine transfer areas

APPENDIX C: HAZARDOUS LOCATION SELF ASSESSMENT

The following questionnaire was developed to assist all persons responsible for Hazloc at Generation Business Units to be able to self-asses if all requirements are in place for the existing plant areas. The self-assessment consists of the following sections:

A. Management Responsibility
B. Plant
C. Flammable Substances
D. Protective Measures
E. Equipment
F. Documentation
G. Inspections
H. Maintenance Systems
I. Training
J. Test Equipment and Tool
K. Other

A. MANAGEMENT RESPONSIBILITY

Item	Question	Reference Document
1	Is the Power Station Manager appointed to oversee hazardous locations in his area of responsibilities, or has it be delegated to the GMR 2.1.	Section 44 (OHS Act)
2	Has a responsible person (RP) for Hazardous locations been appointed?	Eskom PSR GMR 2(10.a)
3	Do the station have a Master installation electrician (MIE) employed on site?	EIR Section 5 (4.) Registered Person in control
4	If no MIE on site, who would issue the certificates of compliance in the Hazardous Locations?	
5	Are all electrical contractors used, especially for work in classified areas, registered annually with the DOL ECB? (Copy of up-to-date membership certificate)	NEC Contract EIR 6(2.)
6	Is the person working in a hazardous area registered as an accredited Registered person in terms of the Act (DOL) MIE	EIR 6
7	Was a work group (people from all sections) appointed d to determine all possible hazardous locations and list all possible non-compliances? (Copy of work group session meetings)	EMR 9.1 Identify and classify potential areas

Item	Question	Reference Document
8	Are all personnel working in hazardous locations trained and authorized?	Competence of staff SANS 10086:2 Section 4.5.2
9	Has a person been appointed to draw-up procedures for these areas? (Name and position.)	GMR 2.7a
10	Is there a valid Certificate of Compliance issued for each electrical installation on site? (as per EIR) and at each point of control .	EIR 7.1
11	Is there a responsible person for the safe keeping of all original certificates and documentation?	GMR 2.7a and EMR 9.9

B. PLANT

Item	Question	Reference Document
1	Have all areas where a danger of fire or explosion exists, been identified?	EMR 9. (1) 240-56536505
2	Have all temporary areas where a danger of fire or explosion exists, been identified?	-
3	Have all these areas been classified as per relevant safety standard? SANS 10108	EMR 9. (1)
4	Do the installations comply with the standards and specification of the regulations as stipulated in (3).	EMR 9. (2)
5	Has the correct electrical equipment been made use of in such and area?	EMR 9. (2) SANS 10108

C. FLAMMABLE SUBSTANCES

Item	Question	Reference Document
1	Flammable Gasses, vapours or dust present.	
2	Are chemical data sheets (MSDS) available on each flammable substance in every classified location?	SANS 10108
3	Are all additional information on substances used, stored, processed or handled, available like: A. Substances ignition levels (L.E.L. and U.E.L.) B. Quantity of substances in area. (% level to air ratio), Operating pressures and maximum quantity during an emergency situation C. Is it known what influence “other” flammable substances in the same area? D. The density of the gas/vapours to air? Are the particle size and the dust/fibre Grouping of the flammable substance also displayed	SANS 10108

	at the entrance?	
4	Is a detailed list of all hazardous substances in each hazardous location available at the entrance?	

D. PROTECTIVE MEASURES

Item	Question	Reference Document
1	Job Safety Analysis Do the competent person / contractor perform JSA prior to perform any work	Contractors Documentation
2	Risk assessments Do the competent person / contractor perform risk assessments prior to perform any work	PSR36-681 and Contractors Documentation Safety file EMR 9.8
3	Does the competent person/ contractor take out permits	Eskom PSR 36-681
4	Are the competent person/ contractor authorized to take out permits as per PSR	Eskom PSR 36-681
5	Do the RP wear Arc flash protection clothing when opening the Electrical panels --- 380 V	Eskom GST 36-942
6	Arc flash signs at boundary / equipment room doors.	Eskom GST 36-942
7	Have any Gas detection or monitoring systems been installed in your classified locations? If YES, supply more detail of system?	
8	What other measures have been implemented to reduce risks?	
9	Are fire barriers erected and precautions taken against the spread of fire to these areas? (Approved sealing material used) Are regular inspections conducted to determine if fire barriers are still in place and still effective? (Copy of one conducted)	
10	Is the following information available on your ventilation system: A. What type of ventilation is available? (natural or artificial) B. What is the level of your ventilation? (High, medium or low) C. Does your ventilation have a failure alarm? (Back-up fans/ Electrical interlocks to stop the process) D. How often does cleaning of your filters take place to ensure optimum airflow? E. Has the ventilation calculation and tests been done to determine airflow rate? (Proof) F. How often is cleaning and repairs done on fans, motors and supply boards?	

E. EQUIPMENT

Item	Question	Reference Document
1	Has the correct electrical equipment been made use of in such and area? Are all the equipment approved for use in the area?	EMR 9. (2) SANS 101018
2	Were there any modifications done on any of the apparatus or plant?	Eskom ECM
3	Were there any modifications done on the plant and system processes?	Eskom ECM
4	If no certificate has been supplied is there permanent labelling which has been approved by the Inspector?	EMR 9. (3)
5	Has the user ensured that when various pieces of electrical machinery are made use of the selection /arrangement/protection or working thereof results in no less a degree of safety as when the machinery had been used independently?	EMR 9. (4)
6	In cases where a possibility of static electricity exists, has the appropriate earthing been implemented?	EMR 9. (7)
7	Provide a detailed list of all electrical equipment installed in hazardous area	Eskom SAP PM's
8	Is there an up to date legible schematic electrical wiring diagram in respect of every plant?	
9	Is all equipment in a classified area certified with a certificate from the OEM?	Suppliers /OEM certificate for equipment EMR 9.2
10	Is all the certification available on certified equipment: G. Equipment certification and test certificate with unique number H. SABS approved test certificate I. Repairer's QC and approval certification (where applicable)	EMR 9.3
11	Area classification drawings for all areas exist and up to date?	
12	Is all the following information available on installed certified equipment: A. Equipment Ex certification (protection type) and serial number B. SABS approval mark or reference and IP rating C. Gas grouping and temperature class D. Properly installed as per OEM requirements	
13	Is Quality Control done at regular intervals on all equipment used in the hazardous location? (Produce a QC done.)	
14	What prevention systems are implemented to ensure Ex equipment which are replaced (like globes) their "T" rating aren't being violated (proof on PM schedule)	

F. DOCUMENTATION

Item	Question	Reference Document
1	Consider the Management Responsibility section, are the entire document referred to stored and retrievable?	
2	Is all relevant documentation available including all calculations, for each classified area, from the initial identification of the area up to the final completion upgrading of the area to the required standards?	
3	A. Is the user in possession of a valid certificate issued by an A.I.A for certified equipment installed? B. If no certificate has been supplied, is there permanent labelling which an A.I.A has approved?	
4	Is all the following certification available on certified equipment: A. Equipment certification and test certificate with unique number B. SABS approved test certificate C. Repairer's QC and approval certification.	
5	Has the user ensured that when various parts of electrical machinery are combined used, the selection / arrangement / protection or working there-of results in no less a degree of safety as when the machinery had been used independently, and has obtained the relevant approval documentation?	
6	Have the relevant plant electrical and IS drawings been updated and approved? (Is drawing approved by SANS)	
7	What happens with the original C.o.C after it is completed and given to the responsible person?	
8	Are all classified areas plan drawings demarked into applicable Zones as per SANS 10108.	

G. INSPECTIONS

Item	Question	Reference Document
1	Before any repairs are carried out has an isolation procedure been implemented which will ensure that the machinery is dead?	EMR 9. (6)
2	Has all relevant electrical machinery been visually inspected and tested at intervals not exceeding 2 years, or any other intervals approved by the inspector?	EMR 9. (8)
3	Has all relevant electrical machinery been tested and inspected by a competent person?	SANS 10086:2 Section 4.5.2
4	Has the competent person entered and signed the results of each examination and test into a record book? PM's	EMR 9. (9)
5	Are inspection done according to a check list?	Eskom PM SAP maintenance list SANS 10086-1 (Tables 3,4 & 5)
6	How often are earthing surveys being done in these areas?	EMR 9. (7)
7	Do planned inspections take place to ensure that all equipment maintains compliance to the relevant SANS standards? (Copy of an inspection report)	EMR 9.8
8	Are the types (Initial, Periodic, sample and special) and grades (Visual, close & detailed) of	EMR 9.8

Item	Question	Reference Document
	the inspections done clearly specified on the planned schedule?	
9	Who is responsible for conducting routine inspections in each area? (Provide name and position)	EMR 9.9
10	Are details of Ex equipment inspected at least every two years and on a register? (Provide records.)	
11	Where are these reports kept?	Eskom document control procedure

H. MAINTENANCE SYSTEM

Item	Question	Reference Document
1	Is all planned work in line with the OHSACT requirements?	
2	Are routine inspections PM's in place? (Copy of PM's.)	
3	Are all tasks performed, linked to specific procedures? (Produce list procedures.)	
4	Is there a task description for every task performed in hazardous locations? (Produce list of all tasks.)	
5	Are task observations written for every task in a classified area? (Produce one observation.)	
6	Are task observations linked to PM schedule, and done regularly? (copy of one being done)	
7	Is all history recorded, captured in SAP and analysed to identify problem areas?	

I. TRAINING

Item	Question	Reference Document
1	Does your induction training include basic awareness of where Hazardous locations are on site and the risks involved? (Training manual)	
2	Is formal training given to personnel working in these areas? (Produce training manual and authorization certificate.)	SANS 10086:2 Section 4.5.2
3	Is specialized training provided by/for MIE's and back-up MIE's? (Produce certificate)	
4	Is technical training provided to buyers in terms of hazardous equipment, if not what other system is used to prevent non-compliant material being purchased?	
5	Does your permit system cater for hazardous locations? (Copy of a permit issued, where a gas free certificate or Hot work permit should be was issued.)	

J. TEST EQUIPMENT AND TOOLS

Item	Question	Reference Document
1	Is all test equipment used, compliant to the Eskom standard (Produce list of all test equipment used?)	
2	Are approved tools used? (Provide list of tools.)	
3	Do you make use of portable gas detectors?	

4	Are the portable gas detectors of an approved type? (copy of equipment certificate)	
5	What actions are taken regarding contractor's electrical equipment and tools, before he commences with work on site?	

K. OTHER

Item	Question	Reference Document
1	Safety Signs Are all appropriate safety signs in place (Demarcation)	EMR 4 (2) Visual SANS 10108 Annex E
2	Fire Extinguishers available and serviced	OHS ACT GSR Visual
3	Are "Unauthorized entry" safety signs at appropriate areas	OHS Act GSR Visual
4	Do the station have Access control to hazardous area i.e. (H2 Plant)	Best practice
5	Has a Hazardous Location Classification been listed	
6	Emergency Escape signs visible.	
7	Emergency actions available.	

APPENDIX D: AREA CLASSIFICATION DRAWING EXAMPLES