

 Eskom	STANDARD	Camden Power Station
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None

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Functional Area: **All**



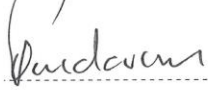
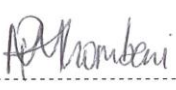
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1. Introduction

In terms of the Occupational Health and Safety Act 85 of 1993, Electrical Machinery Regulation 8, states that all electrical equipment installed in hazardous (flammable liquid and dust) areas shall comply with the minimum requirements of the relevant standards.

2. Supporting Clauses

2.1 Scope

2.1.1 Purpose

The purpose of this document is to identify all hazardous locations at Camden Power Station as set out in the Occupational Health and Safety Act 85 of 1993 (OHS act), Electrical Machinery Regulations, Reg. 9 (Electrical machinery in Hazardous Locations), and shall be applied to all areas that are identified as hazardous locations.

2.1.2 Applicability

This document applies to all areas identified in terms of the Occupational Health and Safety Act (Hazardous Locations Regulations). This document shall apply throughout all facilities, plants and areas at Camden Power Station.

2.1.3 Effective date

The effective date of this document is 24th November 2009 and was applicable since then, including all revisions to date.

2.1.4 Normative References (Eskom documents)

- [1] Hazardous Location Committee Responsibilities and Functions. Document number 240-86239985
- [2] Management of Hazardous Locations. Document number 240-86239967

These documents are indispensable for the application of this document, i.e. documents to be used together with this document.

2.1.5 Informative References (tc)

- [1] SANS 10086-1: Installation, inspection and maintenance of equipment used in explosive atmosphere.
- [2] SANS 10142-1: Wiring of premises
- [3] SANS 1086-1 2003 3.03 The installation, inspection and maintenance of equipment used in explosive atmospheres – Part1: Installations including surface installations on mines.

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- [4] SANS 10086-3 2001 1.01 The installation, inspection and maintenance of equipment used in explosive atmospheres – Part 3: Repair and overhaul of apparatus used in explosive atmospheres
- [5] SANS 10089-2 2007 3.00 The petroleum industry – Part 2: Electrical installations in the distribution and marketing sector
- [6] SANS 10108 2005 5.00 The classification of hazardous locations and the selection of apparatus for use in such locations
- [7] SANS 10123 2001 1.01 The control of undesirable static electricity
- [8] SANS 10142-1 2006 1.05 The wiring of premises – Part 1: Low-voltage installations
- [9] SANS 10313-2 2005 2.00 The protection of structures against lightning
- [10] SANS 60079-9 2005 3.00 Electrical apparatus for explosive gas atmospheres – Part 0: General requirements
- [11] SANS 60079-10 2005 3.00 Electrical apparatus for explosive gas atmospheres – Part 10: Classification of hazardous areas
- [12] SANS 60079-19 1993 1.00 Electrical apparatus for explosive gas atmospheres – Part 19: Repair and overhaul for apparatus used in explosive atmospheres (other than mines or explosives)
- [13] SANS 61024-1 1993 1.00 Protection of structures against lightning – Part 1: General principles
- [14] SANS 61024-1-1 1993 1.00 Protection of structures against lightning – Part 1: General principles – Section 1: Guide A – Selection of protection levels for lightning protection systems
- [15] SANS 61024-1-2 1998 1.00 Protection of structures against lightning – Part 1-2: General principles – Guide B – Design, installation, maintenance and inspection of lightning protection systems
- [16] SANS 61241-0 2005 1.00 Electrical apparatus for use in the presence of combustible dust – Part 0: General requirements
- [17] SANS 61241-1 2005 1.00 Electrical apparatus for use in the presence of combustible dust – Part 1: Protection by enclosures “tD”
- [18] SANS 61241-4 2001 1.00 Electrical apparatus for use in the presence of combustible dust – Part 4: Type of protection “pD”
- [19] SANS 61241-10 2005 1.00 Electrical apparatus for use in the presence of combustible dust – Part 10: Classification of areas where combustible dusts are or may be present
- [20] ARP 0108-3 2007 1.01 Regulatory requirements of explosion-protected apparatus

2.2 Definitions

2.2.1 Explosive Gas Atmosphere:

A mixture with air, under atmospheric conditions, of a flammable material in the form of gas or vapour in which, after ignition, combustion spreads throughout the unconsummated mixture.

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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.

2.2.2 Hazardous Area:

An area in which an explosive gas atmosphere is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of apparatus.

2.2.3 Non-hazardous area:

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 apparatus.

2.2.4 Zones:

Hazardous areas are classified into zones based upon the frequency of the occurrence and duration of an explosive gas atmosphere, as follows:

2.2.4.1 Zone 0:

Locations in which an explosive gas atmosphere is present continuously, or for long periods, in concentrations within the lower and upper limits of flammability. (>1000Hrs. /yr.)

2.2.4.2 Zone 1:

An area in which an explosive gas atmosphere is likely to occur during normal operating conditions, during maintenance operations or during breakdown or faulty operation of equipment or processes.

2.2.4.3 Zone 2:

An area 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.

2.2.5 Source of release:

A point or location from which a flammable gas, vapour, or liquid may be released into the atmosphere such that an explosive gas atmosphere could be formed.

2.2.6 Grades of release:

There are three basic grades of release, as listed below in order of decreasing likelihood of an explosive atmosphere occurring:

2.2.6.1 Continuous grade of release:

A release, which is continuous or is expected to occur for long periods.

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2.2.6.2 Primary grade of release:

A release, which can be expected to occur periodically or occasionally during normal operation.

2.2.6.3 Secondary grade of release:

A release which is not expected to occur in normal operation and if it does occur, is likely to do so only infrequently and for short periods.

A source of release may give rise to any one of these grades of release, or to a combination of more than one.

2.2.7 Release rate:

The quantity of flammable gas or vapour emitted per unit time from the source of release.

2.2.8 Normal operation:

The situation when the equipment is operating within its design parameters.

2.2.8.1 Minor releases:

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.

2.2.8.2 Failures:

Failures (such as the breakdown of pump seals, flanges gaskets or spillage caused by accidents) which involve urgent repair or shutdown are not considered to be part of normal operation.

2.2.9 Ventilation:

Movement of air and its replacement with fresh air (air not contaminated with the explosive substance) due to the effects of wind, temperature gradients, or artificial means (for example fans or extractors).

2.2.10 Explosive limits:

2.2.10.1 Lower Explosive Limit (LEL):

The concentration of flammable gas or vapour in air below which the gas atmosphere is explosive.

2.2.10.2 Upper Explosive Limit (UEL).

The concentration of flammable gas or vapour in air above which the gas atmosphere is explosive.

Notes: For the purpose of this procedure, the terms “explosive” and “flammable” should be considered synonymous.

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2.2.11 Relative density of a gas or a vapour:

The density of a gas or a vapour relative to the density of air at the same pressure and at the same temperature (air is equal to 1.0).

2.2.12 Flammable material:

A material which is flammable it itself, or is capable of producing a flammable gas, vapour or mist.

2.2.13 Flammable liquid:

A liquid capable of producing a flammable vapour under any foreseeable operating conditions.

2.2.14 Flammable gas or vapour:

Gas or vapour which, when mixed with air in certain proportions, will form an explosive gas atmosphere.

2.2.15 Flammable mist:

Droplets of flammable liquid, dispersed in air so as to form an explosive atmosphere.

2.2.16 Flashpoint:

The lowest liquid temperature at which, under certain standardised conditions, a liquid gives off vapours in a quantity such as to be capable of forming an ignitable vapour at the surface of the liquid.

2.2.17 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.

2.2.18 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.

2.2.19 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.

2.3 Abbreviations

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Abbreviation	Explanation
CoC	Certificate of Compliance
EMD	Electrical Maintenance Department
EMF	Electromotive Force
EMR	Electrical Machinery Regulations in term of the Occupational Health and Safety Act and Regulations 82 of 1993
FRM	Fire Risk Management
GMR	General Machinery Regulations in terms of the Occupational Health and Safety Act and Regulations 85 of 1993
Hazloc	Hazardous Location
HOC	Hazardous Occurrence
IP	Ingress Protection
LEL	Lower Explosive Limit
MIE	Master Installation Electrician
MMD	Mechanical Maintenance Department
MSDS	Material Safety data Sheets
OH & S	Occupational Hygiene and Safety
PPE	Personal Protective Equipment
PSM	Power Station Manager
SABS	South African Bureau of Standards
SANS	South African National Standards
UEL	Upper Explosive Limit

2.4 Roles and Responsibilities

Please refer to the following two (2) documents which must be read in conjunction with this document to determine the roles and responsibilities of the personnel involved in the management of Hazardous Locations at Camden Power Station.

- [1] Hazardous Location Committee Responsibilities and Functions. Document number 240-86239985
- [2] Management of Hazardous Locations. Document number 240-86239967

2.5 Process for Monitoring

This document will reside at the Camden Documentation Centre and will be issued for review by the Documentation Centre personnel upon expiration of the current document.

2.6 Related/Supporting Documents

- [1] Hazardous Location Committee Responsibilities and Functions. Document number 240-86239985
- [2] Management of Hazardous Locations. Document number 240-86239967

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3. Document Content

3.1 OHS Act Requirements

No person may use electrical machinery in locations where there is danger of a fire or explosion owing to the presence, manufacturing, occurrence, handling or storage of flammable gas, vapours or dust, unless the areas where the flammable gas, vapours or dust are classified in accordance with SANS 0108

and the electrical equipment installed in these areas complies with the classification of the areas. Every user referred to in the above paragraph will be in possession of a certificate by an approved inspection authority stating the classification of the electrical equipment or permanent markings/plates attached on the equipment can be accepted. This certificate states that the equipment has been manufactured and tested for the hazardous articles.

Where diverse machinery such as motor control centres and control apparatus are used, the selection, arrangement, installation, protection, maintenance and working thereof results in no less a degree of safety as when the equipment was used separately.

No adjustments shall be made to machinery in hazardous areas unless the equipment is rendered dead. Where there is a possibility of static built-up under working conditions, the user shall ensure that all electrical equipment and all metal parts are earthed in such a way that all static built-up will be conveyed to the earth mass effectively.

Two yearly inspections shall be carried on this equipment.

A record shall be kept by the Employer of the inspections and testing performed on the equipment.

3.2 SANS Explanations

- **Gas, Vapor and Liquid Environments**

Zone 0 – means areas in which flammable gases or vapors are continuously, or for long periods in concentrations within the lower and upper limits of flammability.

Zone 1 – means areas in which flammable gases or vapours occur intermittently or periodically under normal conditions, or hazardous concentration occurs during repair or maintenance activities, or breakdown or faulty operation of equipment

Zone 2 – means areas in which operations concerned with flammable/explosive gases, vapours or volatile liquids are so well controlled that an explosive or ignitable concentration is only likely to occur under abnormal conditions.

- **Dust Environments**

Zone 20 – means areas in which 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 those where layers of dust of uncontrollable and excessive thickness can be formed (or both).

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Zone 21 – means areas not classified as Zone 20, in which combustible dust, as a cloud, is likely to occur, during normal operation, in sufficient quality to be capable of producing an explosive concentration of combustible dust mixed with air.

Zone 22 – means areas not classified as Zone 21, in which combustible dust, could occur, infrequently, and persist for only short periods, or in which accumulation or layers of combustible dust could be present under abnormal conditions and give rise to combustible mixtures of dust in air. In this case if accumulation or layers of combustible dust are not removed or the removal not assured, the classification shall be Zone 21.

3.3 Explanation of IP ratings

The table below is an extract from SANS 60529/IEC 60529 (SABS IEC 60529).

The IP ratings consist of the letters IP followed by two characteristic numerals. The first characteristic numeral relates to protection against the penetration of solid objects, the second numeral relates to protection against penetration of liquid. The use of X as a first or second characteristic numeral in the text of this part of SANS 10142 (SABS 0142) indicates that there is no requirement for that characteristic numeral.

Table J.1 – International protection ratings – IP ratings					
1	2	3	4	5	6
First characteristic numeral			Second characteristic numeral		
Protection against foreign objects		Meaning for the protection of persons against access to hazardous parts with:	Protection against harmful ingress of water		Meaning for the protection against water
IP Tests			IP Tests		
0	No protection Full penetration of 50 mm	Non-protected	0	No protection	Non-protected
1	diameter of sphere not allowed. Contact with hazardous parts not permitted.	Back of hand	1	Protected against falling drops of water	Vertical dripping
2	Full penetration of 12,5 mm diameter of sphere not allowed. The jointed test finger shall have adequate clearance from hazardous parts.	Finger	2	Protected against vertically falling drops of water with enclosure tilted 15 degrees from the vertical	Dripping up to 15° from the vertical
3	The access probe of 2,5 mm diameter shall not penetrate	Tool	3	Protected against sprays to 60° from the vertical	Limited spraying
4	The access probe of 1,0 mm diameter shall not penetrate	Wire	4	Protected against water splashed from all directions – limited ingress permitted	Splashing from all directions
5	Limited access of dust permitted (no harmful deposit)	Dust protected	5	Protected against low-pressure jets of water from all directions – limited ingress permitted	Hosing jets from all

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6	No ingress of dust	Dust-tight	6	Protected against strong jets of water e.g. for use on ship deck – limited ingress permitted	Strong hosing jets from all directions
			7	Protected against the effects of Immersion between 150 mm and 1 m	Temporary immersion
			8	Protected against long periods of immersion under pressure >1m	Continuous immersion

3.4 Rate of Release (Gas & Vapour Environment - SABS IEC 79-10, 1995)

The rate of release plays a major role in the classification of the plant. The rate of release can be divided into three categories:

Continuous grade of release – means a release that can be experienced periodically or occasionally under normal conditions

It means a release continuously and for extended periods.

- The release referred to is flammable liquids in tanks that have open release to the atmosphere such as petrol/diesel fillings stations, flammable liquids sumps.
- Tanks that is open to the atmosphere such as oil/water separators.
- Continuous release of gas and vapours to atmosphere.

Primary grade of release

It means a release that can be experienced periodically or occasionally under normal conditions.

- This release refers to seals of pumps, compressors or valves of flammable material during normal operation.
- Water drainage points on vessels, which contains flammable liquids, which may release flammable material into the atmosphere while draining off water during normal operation.
- Sample points, which are expected to release flammable material into the atmosphere during normal operation.

Relief valves, vents and other openings, which are expected to release flammable material into the atmosphere during normal operation.

Secondary grade of release - means a release which is not expected to occur in normal operation and if it occurs, will be for short periods.

- This release refers to seals of pumps, compressors or valves of flammable material during normal operations that is not expected.
- Water drainage points on vessels, which contains flammable liquids, which may release flammable material that is not expected into the atmosphere while draining off water during normal operation.
- Sample points, which are expected to release flammable material into the atmosphere during normal operation that is not expected.

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Relief valves, vents and other openings, which are expected to release flammable material into the atmosphere during normal operation that is not expected.

Important Notes

Minor release of flammable material for the wetting of seal's glands is part of normal operation.

Failure of pump gaskets and flanges is not regarded as normal operation.

It is expected that **only secondary grade of release will take place at Camden**. All the systems are closed loop systems and with effective maintenance practices, the classification can be kept as per the attached schedule.

If the release were expected to be continuous, the reader would find that Zone 0 & Zone 1 areas would increase the possibility of explosions.

Demarcation of hazardous locations should be compliance of SANS 10108 Annex D.

4. Reason for Classification in Accordance with SANS 10108

4.1 Conveyor Plants

4.1.1 Classification

The conveyor belts are classified as Zone 22 areas. The conveyors are enclosed and the fact that, dry coal could cause flammable dust to be in suspension. The type of equipment to be installed in these areas will be IP65 rated.

Cleaning the conveyor areas must be maintained. It should be monitored to ensure reclassification to Zone 21 does not become necessary. Thus meaning that the type of electrical equipment to be installed will increase to DIP A20, A21, B20, or B21 with IP 65 enclosures.

The conveyor head pulleys/tipper cars are classified as Zone 21 areas as combustible dust as a cloud is likely to occur.

4.1.2 Alternative to Classification

Sample dust; send to an Approved Test Laboratory. The laboratory will place the dust in suspension the dust ignites, the classification will be forced.

These classifications can be eliminated by means of proper dust extraction system, suppression of the dust in suspension, ventilations and assured cleaning programs to ensure that dust layers will not be excessive.

Not all the alternatives are to be installed, but merely a combination of alternatives, such as dust suppression and cleaning or dust extraction and cleaning etc.

4.2 Mills

No classifications is needed around the mill; however the top of the mill where accumulation is possible without regular cleaning operation will render this a Zone 22 area.

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The inside of the mill if temperature probes are installed will not be negotiable and therefore Zone 20 will be applicable. Unless installed inside pocket.

4.3 Chemical Stores

The Laboratory Gas storage area and Flammable Substance storage area is also classified as Zone 2 areas.

4.4 Petrol/Diesel Pump

Petrol and diesel pump installations are classified as Zone 0, 1 & 2. Internal tank level indications are classified as Zone 0.

The area, 5m high and 2,5 high and 5m horizontal shall be a Zone 2 area.

The pump hose shall be earthed to prevent static charge built-up.

4.5 Fuel Pump Houses

4.5.1 LP Fuel Oil Pump House is classified and Associated Piping

The LP Fuel Oil Pump House is classified as a Zone 2 area. This is because the LP Fuel Oil Pump House is enclosed with no forced removal of air that might contain fumes from the fuel oil.

The other reason for this classification is the fuel oil pumps that are installed inside the Fuel Oil Pump House.

4.5.2 Fuel Oil Storage Tanks

No Classification needed externally to the tanks and surrounding area.

The tanks internally in the case of level tank indicators are classified as Zone 0 due to the fact that vapour will be present continuously.

4.5.3 HP Fuel Oil Pump House and Associated Piping

The HP Fuel Oil Pump House is classified as a Zone 2 area. This is because the HP Fuel Oil Pump House is enclosed with no forced removal of air that might contain fumes from the fuel oil.

No classification of this area if extraction fans are installed as per the specifications of SANS 0108.

Exchange air at a rate of 5m³ per hour. Non-sparking fans to be installed as a minimum requirement. The other certain issue is the fact that this Pump House uses heaters to heat the fuel oil up to certain temperature (Well below vaporising and flash point temperatures) before it is pumped to the boilers.

The other reason for this classification is the fuel oil pumps that are installed inside the Fuel Oil Pump House.

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4.6 Oil Burners

The oil burners will be classified as Zone 2 areas. However, due to the presence of propane gas and the possibility of fuel oil vapour, at the point of release only. This area must be monitored closely to determine if it will be necessary to expand the border of this area.

To avoid the installation of Zone 2 panels, it is recommended that the electrical equipment be moved outside the hazardous area. The distance of the panels away from the oil burners is dependant on the amount of release rate of the gas and or vapour.

4.7 Hydrogen Production, Unitised Hydrogen Driers and Associated Plant/Piping

The Hydrogen Production plant and unitised hydrogen driers areas will be classified as Zone 0 areas. The associated plant and piping will be classified as Zone 2 areas; the generator is excluded as the seals are achieved via the seal oil.

Hydrogen becomes violently explosive between 4% and 74% per volume. The reason for flameproof classification is due to the storage pressure and the dangers attached to hydrogen.

The installation of all equipment filled with hydrogen must be in such a way that if leaks occur, the hydrogen will quickly and rapidly disperse into the atmosphere without reaching the explosive limits.

NOTE: Hydrogen and air mixed in hydrogen concentrations of between 4 % and 75 % (by volume) is explosive, and burning is enhanced by oxygen enrichment.

4.8 Battery Rooms

Battery Rooms are classified as Zone 2 areas if they are equipped with functional extraction fans installed as per the SANS 10108 specifications. The position of the extraction fans must be such that they are mounted in the highest point of the battery room. If the room is pressurized, care must be taken to ensure that the rate of air exchange is in compliance with SABS IEC specification.

24V Batteries are pressurized and therefore need no extraction.

4.9 Large Transformers

No classification of this area is required.

4.10 Gas Bottle Storage

Gas bottles should be stored in areas free of moisture and direct sun light.

All enclosed gas bottle storage areas, equipped with ventilation fans (as per SANS 10108 specification), will be regarded as Zone 2 areas. The necessary care should be taken to ensure that no static build-up occurs.

4.11 Oil Tanks (Turbine Generator, SFP and Bulk Storage and Coal Lab)

The internal tank is classified as a Zone 0 area.

No classification needed for surrounding areas; however, when large quantities are handled, additional ventilation should be used, as per SANS 10108 specification.

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4.12 Sewerage plant

Considering the 'hazardous areas' as defined in Electrical Wiring Regulations as potentially explosive atmospheres the sewer plant falls within this scope. A sewer plant is commonly associated with the possible presence of methane or hydrogen sulphide (H₂S) gas that give rise to potentially explosive conditions.

The Raw Sewerage basement pump station is classified as a Zone 2 area.

4.13 Ammonia Dilution Plant

Ammonia Dilution Plant is considered a Zone 2 area as defined in Electrical Wiring Regulations as potentially explosive atmospheres.

The area further requires to be a separated or enclosed area, and requires to be fenced off with locked entry gate. This will protect people from hazardous substances, and protect the hazardous substance from unauthorized access.

4.14 Caustic and Sulphuric Acid Bulk Storage Tanks

These areas are considered safe areas as defined in Electrical Wiring Regulations as potentially explosive atmospheres. The area further requires to be a separated or enclosed area, and requires to be fenced off with locked entry gate. This will protect people from hazardous substances, and protect the hazardous substance from unauthorized access.

5. Classification of Hazardous Areas – Dust Environments

ELECTRICAL EQUIPMENT IN HAZARDOUS AREAS - ZONING CLASSIFICATION

ITEM	AREA	ZONING	ELECTRICAL EQUIPMENT	OTHER REQUIREMENTS	RISK by not COMPLYING
1	Overland Conveyors: 1. Conveyor and Head End 2. Tail End	Zone 22 Zone 21	IP 65 enclosures DIP with IP 65 enclosures	N/A 5m Around head pulley	The risk of an explosion in the case of equipment failure
2	Coal Staiths: 1. Conveyor and Head End 2. Tail End	Zone 22 Zone 21	IP 65 enclosures DIP with IP 65 enclosures	N/A 5m Around head pulley	The risk of an explosion in the case of equipment failure
3	Incline Conveyor: 1. Conveyor and Head End 2. Tail End	Zone 22 Zone 21	IP 65 enclosures DIP with IP 65 enclosures	N/A 5m Around head pulley	The risk of an explosion in the case of equipment failure
4	Coal Bunkers (Mills): 1. Conveyor and Head End 2. Tail End	Zone 22 Zone 21	IP 65 enclosures DIP with IP 65 enclosures	N/A 5m Around head pulley	The risk of an explosion in the case of equipment failure

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5	Mills: 1. Outside Mill 2. Inside Mill	Zone 22 Zone 20	IP 65 enclosures DIP with IP 65 enclosures	Outside fixed to mill N/A	The risk of an explosion in the case of equipment failure
6	Chemical Store (Laboratory and WTP)	Zone 2	Non-sparking (Exn IIA T2)	Separate if reaction is caused between different chemicals	The reaction could cause flammable gases that can cause an explosion
	Chlorine gas storage/usage	None	No Classification	Well ventilated, leakage detection a requirement	Risk of inhaling Chlorine gas

6. Classification of Hazardous Areas – Gas and Vapor Environments

ITEM	AREA	ZONING	ELECTRICAL EQUIPMENT	OTHER REQUIREMENTS	RISK by not COMPLYING
1	Petrol / Diesel Filling Stations: 1. Level detection inside tanks 2. The pump	Zone 0 Zone 1	Intrinsic Safe (IS) Flameproof (Exd IIA T1) Non-sparking (Exd IIA T1)	N/A 1,5m Vert. 2,5m Horis. 5m Horis. 0,5m Vert.	Failure to comply can result in and explosion due to static charges, non-compliant equipment, etc.
2	Fuel Oil Tanks: 1. Inside tank 2. Outside tank 3. Inside bund walls	Zone 0 Zone 2 Zone 2	Intrinsic Safe (IS) Non-sparking (Exn IIA T2) Non-sparking (Exn IIA T2)	N/A If well ventilated If well ventilated	Failure to comply can result in and explosion due to static charges, non-compliant equipment, etc.
3	LP Fuel Pump House: 1. LP Pump House 2. Piping 3. Delivery to Tanks	Zone 2 Zone 2 Zone 2	Non-sparking (Exn IIA T2) Non-sparking (Exn IIA T2) Non-sparking (Exn IIA T2)	N/A 1m sphere at all joints dispensing hose earthed	Failure to comply can result in and explosion due to static charges, non-compliant equipment.
4	HP Fuel Pump House: 1. HP Pump House 2. Piping	Zone 2 Zone 2	Non-sparking (Exn IIA T2) Non-sparking (Exn IIA T2)	N/A 1m sphere at all joints	Failure to comply can result in and explosion due to static charges, non-compliant equipment.
5	Oil Burner Levels: 1. Oil Burners 2. Oil Burner Piping 3. Propane Installation 4. Propane Piping	Zone 2 Zone 2 Zone 2 Zone 2	Non-sparking (Exn IIA T2) Non-sparking (Exn IIA T2) Non-sparking (Exn IIA T1) Non-sparking (Exn IIA T1)	Within 5m 1m sphere at all joints within 5m 1m sphere at all joints	Zoning only at point of release. Exn IIA T2 equipment were installed and ads on to protection.
6	H₂ Unitised Plants: 1. H ₂ Drier 2. H ₂ Filling Station 3. All H ₂ piping 4. H ₂ C&I equipment	Zone 2 Zone 2 Zone 2 Zone 2	Flameproof (Exd IIC T4) Flameproof (Exd IIC T4) Flameproof (Exd IIC T4) Flameproof (Exd IIC T4)	1m sphere	Failure to comply can result in and explosion due to static charges, non-compliant equipment.
7	Generator: Below Generator Stator Choke Chamber Generator Star Point	Zone 2 Zone 2 Zone 2	Flameproof (Exd IIC T4) Flameproof (Exd IIC T4) Flameproof (Exd IIC T4)	Cover all pocket areas Total area Total area	H ₂ can be trapped in pockets and can be ignited via electrical equipment

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9	Battery Rooms: Inside Battery Room Extraction Fan Outlet	Zone 2 Zone 2	Non-sparking (Exn IIC T4) Non-sparking (Exn IIC T4)	Ensure roof slopes outlet Mounted at highest point	H ₂ can be trapped in pockets and can be ignited via electrical equipment
10	Unit/Gen Transformers: Closed up	No Classification	No Classification	None	None
	Unit/Gen Transformer: O/C and opened	Zone 2	Flameproof (Exd IIC T4)	Adequately ventilated	Open flames or sparks can cause an explosion
11	Storage of Gas Bottles: Propane G/B Store Hydrogen G/B Store Acetylene G/B Store	Zone 2 Zone 2 Zone 2	Non-sparking (Exn IIA T1) Non-sparking (Exn IIA T4) Non-sparking (Exn IIA T2)	Do not store any flammable gas in an enclosed area with Oxygen	Open flames or sparks can cause an explosion
12	Oil Tanks: Internal – All Oil Tanks External – All Oil Tanks All Piping	Zone 0 Zone 2 Zone 2	Intrinsic Safe (IS) Non-sparking (Exn IIA T1) Non-sparking (Exn IIA T1)	3m all directions 1m sphere	Open flames or sparks can cause an explosion
13	Raw Sewerage basement pump station:	Zone 2	Flameproof (Exn IIC T1)	Adequately ventilated	Open flames or sparks can cause an explosion
14	Ammonia Dilution Plant	Zone 2	Flameproof (Exn IIA T1)	Fenced off and control access	Open flames or sparks can cause an explosion

7. Acceptance

This document has been seen and accepted by:

Name	Designation	Signatures
Ntombi Nkabinde	Operating Manager (acting)	
Augustine Sebothoma	Maintenance Manager	
Chris Mogudi	Electrical Maintenance Manager	
Mokgoba Mathabatha	Chemical Services Manager	

8. Revisions

Date	Rev.	Compiler	Remarks
27 Apr 2015	2	Gerhard Botma	Doc was due for Review
1 Mar 2011	1	Linda Maqashalala	It was due for next Review.
24 Nov 2009	0	Unknown	Original Issue

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9. Development Team

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10. Acknowledgements

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