

PRACTICAL GUIDE

LIGHTING OF HAZARDOUS AREAS AND LOCATIONS

Introduction

This practical guide covers the classification of locations in which fires or explosions can occur owing to the presence of flammable gases, vapours, dusts, or fibrous material in air, in order to permit the proper selection of electrical apparatus.

Statutory regulations

- Mine Health and Safety Act, 1996 (Act No. 29 of 1996) (as amended from time to time), regulated by the Chief Inspector of Mines of the Department of Minerals and Energy - To provide for the safety and health of persons in connection with the use of plant and machinery.
- Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) (as amended from time to time), regulated by the Chief Inspector of Occupational Health and Safety of the Department of Labour. – Legal responsibilities are placed on employers, employees, and self-employed persons as well as those who design, manufacture or sell articles for work.
- Explosives Act, 2003 (Act No. 15 of 2003) (as amended from time to time), regulated by Chief Inspector of Explosives of the Department of Labour.

South African National Standard and Specifications

In compiling this practical guide, reference has been made to the following SANS Codes of Practices and Specifications which are applicable to luminaires intended for use in hazardous locations:

2005 – Electrical apparatus for explosive gas atmospheres – Part 0: General

SANS 60079-0: requirements.

SANS 60079-1: 2004 – Electrical apparatus for explosive gas atmospheres – Part 1: Flameproof enclosures “d”

SANS 60079-2: 2001 – Electrical apparatus for explosive gas atmospheres – Part 2: Pressurized enclosures “p”

SANS 60079-7: 2003 – Electrical apparatus for explosive gas atmospheres – Part 7: Increased safety “e”.

SANS 60079-10: 2005 – Electrical apparatus for explosive gas atmospheres – Part 10: Classification of hazardous areas.

SANS 60079-11: 1999 – Electrical apparatus for explosive gas atmospheres – Part 11: Intrinsic safety “I”

SANS 60079-15: 2001 – Electrical apparatus for explosive gas atmospheres – Part 15: type of protection “n”.

SANS 60079-20: 1996 – Electrical apparatus for explosive gas atmospheres – Part 20: Data for flammable gases and vapours relating to the use of electrical apparatus.

SANS 60079-25: 2003 – Electrical apparatus for explosive gas atmospheres – Part 23: Intrinsically safe electrical apparatus.

SANS 60529: 2001 – Enclosures for electrical equipment (classified according to the degree of protection provided by enclosures - IP Code).

SANS 61241-0: 2004 – Electrical apparatus for use in the presence of combustible dust Part 0: General requirements. (all other Parts thereafter – 1 to 18)

ARP 0108 - Regulatory requirements for explosion-protected apparatus.

Classification of hazardous areas and locations

What is a hazardous area?

Areas are defined as hazardous where a danger of explosion exists owing to the presence, or possible presence, of a potentially explosive atmosphere or dust resulting from the processes or activity undertaken in the immediate or surrounding area.

Hazardous areas are “zoned” according to the level of risk.

Hazardous locations

FLAMMABLE FIBRES	FLAMMABLE DUSTS	FLAMMABLE GASES
<p>ZONE 0 Continually explosive</p> <p>ZONE 1 Likely to be explosive under normal operating conditions.</p> <p>ZONE 2 Explosive only under abnormal conditions</p>	<p>ZONE 21 Likely to contain ignitable concentrations in suspension under normal operating conditions</p> <p>ZONE 22 Not likely to contain dust in suspension but where ignitable deposits may create a hazard</p>	<p>ZONE 21 Likely to be contaminated through handling, manufacture or usage</p> <p>ZONE 22 Unlikely to be contaminated since area is used for storage</p>

Classification of explosion protected luminaires

Materials

Luminaires used in hazardous areas will often be exposed to corrosive atmospheres or liquids. Care must be taken to ensure that the luminaire is made from materials which are able to resist the corrosive elements which may be present.

Equipment Protection Concepts

The design of electrical equipment for use in hazardous areas is based on a number of established engineering concepts which are intended to protect against the possibility of explosion.

These concepts are identified by ‘protection symbols’.

Luminaires suitable to use in:

- Zone 0 Intrinsically safe: **Ex i – SANS 60079 – 11: 1999** – The luminaire is incapable of causing ignition of a surrounding gas/air mixture.

- Zone 1 a) Flameproof enclosure: **Ex d – SANS 60079-1: 2004** – The enclosure is designed to withstand and contain an internal explosion of the relevant gas / air mixture without igniting an explosive atmosphere.
- b) Increased Safety: **Ex e – SANS 60079-7: 2003** – The luminaire and internal components do not produce arcs or sparks or reach a temperature which could ignite the gas / air mixture.

Note: Only Ex e luminaires can be used in Zone 1 locations.
- Hydrogen, acetylene and carbon disulphide atmospheres.

- Zone 2 a) The same type as those permissible for Zone 1 locations.
- b) Non-Sparking **Ex n – SANS 60079-15: 2001** – The luminaire does not produce arcs, sparks or dangerous temperatures during normal operation

- Zone 21 Dust proof – **SANS 61241-0: 2004** – Electrical apparatus that prevents the entry of dust in amounts that would be ignitable or that might affect the performance or rating of the luminaire.

- Zone 22 The same type as those permissible for Zone 21 locations.

NOTE: The risk decreases as the Zone number ascends, therefore, equipment which is designed for use in Zone 0 or Zone 1 areas will also be suitable for Zone 2 areas, but, equipment designed only for Zone 2 areas will not be acceptable for Zone 1 or Zone 0 areas.