

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 contained 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 luminaires does not produce arcs, sparks or dangerous temperatures during normal operation.

- Zone 21 Dust Ignition 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.

CLASSIFICATION OF GAS GROUPS AND SURFACE TEMPERATURES

Atmospheres contained hazardous gases or vapours will vary in danger potential dependent on the explosive properties of the mixture.

Gases are therefore “grouped” according to the amount of energy produced by an explosion of the gas and air mixture.

Flameproof Ex d luminaires are divided into the following main groups:

| GROUP 1 |
|---|
| Mining: Enclosures intended for use underground in hazardous areas i.e. Methane (fire damp) |

| GROUP 2 |
|---|
| Industry: Enclosures intended for use in explosive atmospheres experienced above ground subdivided into three groups, namely IIA, IIB and IIC |

The classification of the surface temperatures and gas are essential safety considerations. For this reason, in addition to gas groups, flammable mixtures, as applicable for Ex e and Ex n luminaires are placed in broad temperature bands.

| | | | | | |
|------------|---|--|--|--------------|-------------------|
| IIA | Ammonia Acetone Carbon-monoxide Propane iso-Octane Benzene Zylene Methyl acetate Ethyl acetate N-Propyl acetate Methanol | N-Butyl Amyl acetate Chloroethylene Ethanol Iso-Butanol N-Butanol Amyl-alcohol Decane Butane | Heptane Hexane Cyclohexane Petrol Diesel fuel Aviation fuel Heating oils | Acetaldehyde | Ethylnitrate |
| IIB | Coal Gas (town gas) | Ethylene Ethylene-oxide | | Diethylene | |
| IIC | Hydrogen | Acetylene | | | Carbon-disulphide |

Equipment which is certificated as Gas Group 1 is suitable for use with Gas Groups IIA, IIB and IIC.