

Gases, vapours, mists and dusts can all form explosive atmospheres with air.

The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) place duties on employers to eliminate or control the risks from explosive atmospheres in the workplace and uses Hazardous area classification to identify places where, because of the potential for an explosive atmosphere, special precautions over sources of ignition are needed to prevent fires and explosions.

Hazardous Area Definition: A place where an explosive atmosphere may occur in quantities that require special precautions to protect the health and safety of workers.

Non-Hazardous Area Definition: A place where an explosive atmosphere is not expected to occur in quantities that require such special precautions

Special Precautions Definition: precautions to control potential ignition sources within a hazardous area, particularly in relation to the construction, installation and use of equipment.

Explosive Atmosphere Definition: a mixture of dangerous substances with air, under atmospheric conditions, in the form of gases, vapours, mist of dust in which, after ignition has occurred combustion spreads to the entire unburned mixture.

Atmospheric conditions Definition: are commonly referred to as ambient temperatures and pressures. That is to say temperatures of -20°C to 40°C and pressures of 0.8 to 1.1 bar.

ATEX

ATEX is the name commonly given to the two European Directives for controlling explosive atmospheres:

- Directive 99/92/EC (also known as 'ATEX 137' or the 'ATEX Workplace Directive') on minimum requirements for improving the health and safety protection of workers potentially at risk from explosive & atmospheres. (Regulations 7 & 11 of DSEAR)
- Directive 94/9/EC (also known as 'ATEX 95' or 'the ATEX Equipment Directive') on the approximation of the laws of Members States concerning equipment and protective systems intended for use in potentially explosive atmospheres.

Employer Duties under DSEAR

Under the DSEAR regulations, employers have a specific duty to eliminate or control the risks from dangerous substances by:

1. Identifying Hazardous areas using the above definitions.
2. Further classify these Hazardous Areas into Zones, distinguishing between places that have a high chance of an explosive atmosphere occurring and those places where an explosive atmosphere may only occur in abnormal circumstances.

Hazardous Area Zones:

Flammable Gases and Vapour's

- Zone 0 An area in which an explosive atmosphere is constantly present, or present for long periods.
- Zone 1 An area in which an explosive atmosphere is likely to occur in normal operation.
(Rough Guide: 10 hours or more / year but less than 1,000 hours / year)
- Zone 2 An area in which an explosive atmosphere is not likely to occur in normal operation and if it occurs it will exist only for a short time.
(Rough Guide: Less than 10 hours / year)

Combustible Dusts

- Zone 20 An area 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 in a mixture with air.
- Zone 21 An area, in which combustible dust, as a cloud, is occasionally present during normal operation, in a sufficient quantity to be capable of producing an explosive concentration of combustible dust in a mixture with air.
- Zone 22 An area, in which combustible dust, as a cloud, may occur infrequently and persist for only a short period, or in which accumulations of layers of combustible dust may give rise to an explosive concentration of combustible dust in a mixture with air.

This classification determines the controls needed on potential sources of ignition that may be present or occur in that area.

BS EN 60079/10 – basic principles of area classification for gases and vapours.

BS EN 61241/3 – basic principles of area classification for dusts.

Hazardous Area Equipment Selection Explained

The selection of electrical apparatus should be in accordance with the following:

- Classification of the hazardous area.
- Temperature class or ignition temperature of the gas, liquid, vapour's, mist, dust or fibre.
- Where applicable, the gas, vapour or dust classification in relation to the group or subgroup of the electrical apparatus.
- External influences and ambient temperature

(Equipment and Protective Systems for Use in Potentially Explosive Atmospheres Regulations 1996 (as amended) - EPS)

Equipment Marking:

Standardised marking identified equipment suitable for a specific location;

- Ex symbol in a hexagonal – equipment is built to the requirements of EPS
- Equipment category number
- The letter G and/or D depending on whether it is intended of use in gas or dust atmospheres
- T – temperature rating

Equipment Categories

Flammable Gases and Vapour's

Zone 0

Zone 1

Zone 2

Combustible Dusts

Zone 20

Zone 21

Zone 22

Equipment Category

Category 1 - equipment intended for high-risk areas where an explosive atmosphere is present long periods.

Category 2 - equipment intended for medium-risk areas where an explosive atmosphere may occur under normal operating conditions.

Category 3 - equipment intended for areas where an explosive atmosphere is only likely under abnormal circumstances.

Apparatus Selection According To The Ignition Temperature Of Gas Or Vapour

The equipment must be selected so that its maximum surface temperature will not reach the ignition temperature of any gas or vapour that may be present.

Temperature Class of Electrical Apparatus

T1
T2
T3
T4
T5
T6

Maximum Surface Temperature of Electrical Apparatus

450°C
300°C
200°C
135°C
100°C
85°C

Ignition Temperature of Gas or Vapour

>450°C
>300°C
>200°C
>135°C
>100°C
>85°C

If the marking of the electrical apparatus does not include an ambient temperature range, the apparatus is only for use within an ambient temperature range from -20°C to + 40°C.

Apparatus Selection According To Apparatus Grouping

The grouping of gases and vapour's are classified into Group I and Group II categories.

Group I is relevant to atmospheres containing firedamp (a mixture of gases, composed mostly of methane, found underground in mines).

Group II is intended for use in all other places with potentially explosive atmospheres. Group II electrical apparatus with types of protection 'd' and 'i' are further subdivided into apparatus group IIA, IIB or IIC. Electrical apparatus with type of protection 'n' may also be subdivided if it contains certain devices or components.

Gas/Vapour Subdivision

IIA (typical gas propane)
IIB (typical gas ethylene)
IIC (typical gases acetylene and hydrogen)

Apparatus Subgroup Permitted

IIA, IIB or IIC
IIB or IIC
IIC