

## DSEAR and ATEX

DSEAR stands for the Dangerous Substances and Explosive Atmospheres Regulations 2002. Whilst these regulations cover many different substances, this technical paper discusses just the two common ones:

- Flammable/explosive liquids and gases
- Explosive dusts

The regulations also require you to consider combinations of dangerous substances, but this is excluded from this technical paper. Note that, for reasons of brevity, this technical paper does not cover everything. Refer to Ref 1 for more details.

### What are the risks?

All flammable liquids are also present as a vapour. Between the lower explosive limit (LEL) and upper explosive limit (UEL) for a specific vapour, it can be ignited. Below the LEL, there is an insufficient concentration of the vapour to sustain combustion; above the UEL, there is so much of the vapour that there is insufficient oxygen to sustain combustion. So, the concern is with vapours which may be present in concentrations between their LEL and UEL.

With all solids, combustion occurs at the surface. With dust, there is a high surface area, so any combustible material present as dust has the potential to release a lot of energy and this may occur suddenly. In such a case, this is an explosion. When an initial dust explosion occurs, it has the potential to disturb other dusts which may have built up, thereby leading to a secondary explosion which may have greater destructive power than the initial one. Whilst there are other materials, regard all carbon-based dusts including flour and paper, as having the potential to explode. Note that the fineness, and therefore the surface area, of the dust affects its potential to explode.

### DSEAR risk assessment

This must include:

- a) The hazardous properties of the substance;
- b) Information on safety provided by the supplier, including that from any relevant MSDS;
- c) The circumstances of the work including—
  - (i) The work processes, substances used and their possible interactions;
  - (ii) The amount of the substance involved;
  - (iii) The effect of combined substances
  - (iv) The arrangements for the safe handling, storage and transport of dangerous substances and of waste containing dangerous substances;
- d) Activities, such as maintenance, where there is the potential for a high level of risk;
- e) The effect of control measures;
- f) The likelihood that an explosive atmosphere will occur and its persistence;
- g) The likelihood that ignition sources, including electrostatic discharges, will be present and become active/effective;
- h) The scale of the anticipated effects of a fire or an explosion;
- i) Any places which could be connected via openings to places in which explosive atmospheres may occur.

### Risk reduction

The risk must be eliminated or reduced for far as is reasonably practicable, with elimination of the dangerous substance being the most preferred route. If this is not possible, then the following hierarchy shall be applied:

- a) Minimisation of the quantity of the dangerous substance
- b) Avoidance or minimisation of its discharge
- c) The control of its release at source
- d) The prevention of the formation of dangerous atmospheres, including the use of ventilation<sup>1</sup>, or the prevention of the accumulation of dust by sufficient duct velocity and/or cleaning.
- e) Ensuring the release of any dangerous substance is safely contained and removed to a safe place
- f) The avoidance of ignition sources, including electrostatic discharge

<sup>1</sup> Refer to L138 (Listed below under References) - 209 to 235 for guidance on ventilation

**Mitigation**

Where there is still the potential for a fire or explosion, you must put in place the following measures where reasonably practicable:

- a) Reducing the number of employees exposed
- b) The avoidance of propagation of fires
- c) The provision of explosion pressure release arrangements
- d) The provision of explosion suppression equipment
- e) The provision of plant which is constructed to withstand an explosion, and
- f) The provision of suitable PPE

**Zones**

The following zones apply where explosive vapours or gases above their LEL could be present or dust is present. Note that there is normally no LEL limit for dust, though there is sometimes information available on specific dusts. However, it is wise to consider that layers or heaps of dust react in the same way as a cloud of dust.

You must classify each zone.

Zone	Definition
0	A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapour or mist is present continuously or for long periods or frequently
1	A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapour or mist is likely to occur in normal operation occasionally.
2	A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapour or mist is not likely to occur in normal operation but, if it does occur, will persist for a short period only.
20	A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is present continuously, or for long periods or frequently.
21	A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur in normal operation occasionally.
22	A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is not likely to occur in normal operation but, if it does occur, will persist for a short period only

If you can be sure that the substance when present is always at concentration considerably lower than its LEL, then the steps required by DSEAR are not required. However, it is wise to formally record how you came to this conclusion, such as referring to reports on concentration measurements or comparisons with similar operations elsewhere.

**Emergency arrangements**

You need to have in place appropriate emergency measures, some of which may be specific to the hazardous nature of the substance.

**ATEX**

This is the common name for the directives that govern the suitability of electrical equipment for different zones. The relationship is as follows:

Zone	ATEX Category	Comment
0 or 20	1	
1 or 21	2	Cat 1 equipment may also be used
2 or 22	3	Cat 1 or Cat 2 equipment may also be used

Note that there is some flexibility in what equipment may be used, but it is normally best to use equipment which meets the above categories.

**References**

1. There is excellent advice in the DSEAR ACOP which can be purchased as a hard copy from the HSE or downloadable at no cost at [www.hse.gov.uk/pubns/priced/L138.pdf](http://www.hse.gov.uk/pubns/priced/L138.pdf)
2. Explosive Atmospheres - Classification of Hazardous Areas (Zoning) and Selection of Equipment <http://www.hse.gov.uk/fireandexplosion/zoning.pdf>