

Dangerous Substances and Explosive Atmospheres (DSEAR)

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Relevant Legislation

Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) and the following Approved Code of Practice (ACOP):

- *L138: Storage of Dangerous Substances and Explosive Atmospheres, 2013*

Classification, Labelling and Packaging Regulation (CLP)

Construction (Design and Management) Regulations 2007 (CDM2015)

Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996 (EPS).

Introduction

DSEAR was introduced in order to provide protection against certain risks, such as fire or explosion. These risks may arise from the use of, creation of, or storage of dangerous substances in the workplace.

The regulations apply to any substance or preparation (mixture of substances) which because of its properties or the way it is used could expose employees to harm from fires and explosions. Such substances or preparations include:

- petrol
- liquefied petroleum gas (LPG)
- paints
- varnishes
- solvents
- dusts.

DSEAR details the minimum standards required for the protection of employees whilst using, handling and storing dangerous substances. They also require employers to provide protection where explosive atmospheres are present, or have the potential to be present, in the workplace.

It is acknowledged that dangerous substances are used within certain Directorates of the County Council. However, the majority of control measures for dealing with such substances will already be in place, as much of the basic requirements of DSEAR are based upon pre-existing "best practice".

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Dangerous Substances

A "dangerous substance" means:

- a substance or preparation which is explosive, oxidising, extremely flammable, highly flammable or flammable, whether or not that substance or preparation is classified under CLP.
- a substance or preparation that due to its physico-chemical or chemical properties and its use or presence in the workplace creates a risk.
- any dust whether in the form of solid particles, fibrous material or otherwise which can form an explosive mixture with air or an explosive atmosphere.

In general terms, to determine whether dangerous substances are present in the workplace, employers will need to carry out the three following steps:

- Step 1: check whether the substance or preparation has been classified under CLP, as detailed above.
- Step 2: assess the physical and chemical properties of the substance and the work processes involved to see whether the work activity creates a potential for fire, explosion or similar event.
- Step 3: check to see if the work activity involves the creation or handling of potentially combustible or explosive dusts.

Risk Assessment

Where a dangerous substance is present or is liable to be present in a workplace, the employer must ensure a suitable and sufficient risk assessment is carried out. This will identify employees, contractors and any other persons who may be affected by the work process or task, and should be carried out before any activities involving dangerous substances commence. In addition, if the process or task involves construction work then CDM2007 will apply. This means that the assessment and control measures could form part of the Client's pre-construction information pack and/or form a part of the construction phase health and safety plan.

The diagram on page 13 contains a checklist which allows managers to determine whether the process or preparation falls under the definition of a dangerous substance.

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Any persons carrying out such a risk assessment should consider the following:

- the hazardous properties of the substance
- safety information provided by the supplier, including that contained in any materials safety data sheet (MSDS)
- the circumstances of the work, including the processes and substances being used and their possible interactions, the amount of substance involved, the risk presented from using combinations of dangerous substances and the arrangements for handling, storing and transporting such substances
- activities, such as maintenance, where there is the potential for high level of risk
- the effects of measures already in place to control or prevent risks
- the likelihood that an explosive atmosphere will occur and its persistence
- the likelihood that ignition sources, including electrostatic discharges, will be present and become active and effective
- the scale of anticipated effects of a fire or explosion
- any places which are or can be connected via openings to places where explosive atmospheres may occur
- any additional safety information that may assist in completing a suitable and sufficient assessment

The risk assessment should be reviewed when:

- there is a reason to suspect the assessment is no longer valid, or
- there has been a significant change in the matters to which the risk assessment relates including when the workplace, work processes, or organisation of the work undergoes significant changes, extensions or conversions.

Control and Mitigation Measures

Where the risk of dangerous substances cannot be completely eliminated through substitution, employers should use a combination of control and mitigation measures to ensure the safety of employees and others (for example, substituting a dangerous substance with a less hazardous substance or by

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redesigning the work process so that it is less dangerous). Where this cannot be done, the following measures need to be considered:

- reduce the quantity of dangerous substances to a minimum
- avoid or minimise release of a dangerous substance
- control the release of a dangerous substance at source
- prevent the formation of an explosive atmosphere
- collect and contain releases
- avoid ignition sources
- avoid adverse conditions (for example high temperatures)
- segregate incompatible substances
- reduce to a minimum the number of employees (and others who may be at risk) exposed
- provide measures to avoid the propagation of fires or explosions
- provide explosion pressure relief, explosion suppression or plant which can withstand an explosion
- provide suitable personal protective equipment.

General Safety Measures

Employers are also required, so far as is reasonably practicable, to provide a number of general safety measures to reduce the risks from dangerous substances. These should be appropriate to the nature of the activity or operation that is taking place. The general measures detailed in the schedule are:

- ensuring that the workplace is designed, constructed and maintained so that risks are reduced
- ensuring that work processes are designed, constructed, installed, assembled, provided and used so as to reduce risk.

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- maintaining work processes in good repair, efficient order and efficient state
- ensuring that plant and equipment is safe if the power fails, has a manual override and dissipates accumulated energy during an emergency shutdown
- having a system of work and written instructions for the work
- having a permit to work where the work is carried out in hazardous places or involves hazardous activities.

Storage of Dangerous Substances

Any place identified as a potential storage area for dangerous substances must be included in the risk assessment. The assessment should identify measures to avoid or minimise the potential risks of spillage or release, minimise the risk of fire or explosion, protect the storage area from fire, and mitigate the consequences of any of these events. All storage areas should be separated from:

- site boundaries
- occupied buildings
- process areas
- sources of ignition
- other dangerous substances.

For Internal storage of gases and liquids a dedicated building or separate room within a building should be used. This should either be separated from other buildings or be of fire-resisting construction.

Only the minimum amount of dangerous substances needed to carry out the work activity should be kept in the working area. In addition, for flammable liquids with a flashpoint above the maximum ambient temperature (normally 32°C), the amount which can be stored is up to 250 litres.

For extremely flammable and highly flammable liquids and flammable liquids with a flashpoint below the maximum ambient temperature, the amount that may be stored is 50 litres.

In addition managers need to consider the general guidance detailed below:

- segregate and adequately separate incompatible substances
- provide good ventilation where flammable liquids or gases are stored

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- clearly identify all stores, tanks, containers or vessels
- when being transferred all substances should be carried in closed vessels or conveyed in closed systems (such as pipelines)
- control sources of ignition
- minimise the quantity of dangerous substances stored in workrooms or process areas
- adequately secure and maintain storage areas
- store and dispose of dangerous substances classified as waste in line with appropriate environmental legislative requirements.

Maintenance and DSEAR

Managers should assess the risks and implement suitable control measures:

- where maintenance, repair work or cleaning procedures are to be undertaken and involve the use of dangerous substances, or
- whilst working where substances are used, stored and produced, or
- where plant and equipment has contained a dangerous substance.

The following actions should be taken depending on the degree of risk:

- for low-risk activities a suitable system of work should be introduced with adequate supervision and written instructions
- for medium-risk activities (for example, small quantities of substances do not present a hazard) a safety method statement should be produced
- for high-risk activities (for example, where a mistake could result in serious injury) a permit-to-work system should be introduced.

High-risk activities in respect of maintenance repair work or cleaning will require a permit to work. These will be activities which could lead to immediate or serious injury and include:

- hot work on plant or equipment remaining in situ which contains, or has contained, a dangerous substance

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- hot work in the vicinity of plant or equipment which contains a dangerous substance that may be threatened in the event of a fire outbreak
- hot work or the introduction of a source of ignition into an area which is normally designated hazardous due to the presence of an explosive atmosphere
- confined space work where the confined space contains or has contained a dangerous substance
- breaking into or opening plant and equipment which contains, or has contained, a dangerous substance.

Explosive Atmospheres

DSEAR defines an explosive atmosphere as a mixture, under atmospheric conditions, of air and one or more dangerous substances in the form of gases, vapours mists or dusts in which, after ignition has occurred, combustion spreads to the entire unburned mixture.

DSEAR requires that areas where explosive atmospheres may occur are classified into non-hazardous and hazardous workplaces:

Non-hazardous Workplace

A non-hazardous workplace is one where an explosive atmosphere is not expected to occur in such quantities as to require special precautions, for example, a small spillage from a bottle of solvent.

Hazardous Workplace

A hazardous workplace is one where an explosive atmosphere may occur in such quantities that it requires special precautions to protect the health and safety of the workforce. Once an area has been identified as hazardous it should be classified into zones, based on the frequency and persistence of the potential explosive atmosphere. These workplaces and zones should be identified as part of the overall risk assessment.

Where such explosive atmospheres may be present, DSEAR makes specific requirements to control the equipment that may be used or the work activities that may be carried out in these areas so as to prevent ignition.

The zone, in turn, defines the requirements for the selection and installation of equipment and the protective systems required to prevent sources of ignition.

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Places that are classified as hazardous should be marked with a triangular, yellow sign with black borders and black "EX" lettering.

HSE recommends applying guidance documents and industry-specific codes to assist with the interpretation of the requirements in respect of defining hazardous areas. All equipment and protective systems selected (unless the risk assessment determines otherwise) must be based upon the requirements of EPS. This uses a standardised marking scheme to assist in identifying equipment that is suitable for specific locations. Furthermore, any work clothing worn by persons in a hazardous zone should be of a type which does not give rise to an electrostatic discharge.

Emergency Procedures

Employers are required to assess the likelihood and scale of effects arising from any foreseeable accident, incident or emergency and put in place adequate arrangements for dealing with those events.

In order to determine what procedures are required, the following factors should be considered:

- the quantity of each dangerous substance
- the work activity involved
- the relevant risk assessment information
- the scale of any potential release
- the interaction between substances
- the effectiveness of the control measures already adopted.

Factors that managers need to take into account by employers when assessing the requirements for emergency arrangements include:

- the properties of the dangerous substance present, their quantities and the way they are used or stored
- the foreseeable types of accident, emergency or other event that may occur and the level of risk presented (for example, the response required to deal with a major fire in an LPG storage area will be different from that required for a small spill of a few litres of flammable liquid)
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- precursors to the end emergency (fire or explosion) involving the dangerous substance (for example, unignited leaks or spills of the substance, or the potential for it arising)
- means of detecting events
- the provision of suitable warning devices (including visual and audible alarms) and communication systems
- the role of non-employees in emergency arrangements
- specific procedures that employees and others should follow in the event of an emergency
- the role, responsibilities and authority of employees who have been allocated specific duties (for example, the person responsible for shutting down equipment or fire wardens ensuring a building is clear)
- equipment and clothing for essential personnel dealing with the event
- procedures for assisting particular groups of people, such as members of the public, visitors to the site or disabled employees

The scale and nature of the emergency arrangements must be proportionate to the risks.

Information for Employees

Employees who may be at risk must be provided with suitable information, instruction and training on precautions and actions they need to take to safeguard themselves and others, including:

- the name of the substance in use and the risks they present.
- access to any relevant safety data sheet.
- details of legislation that applies to the hazardous properties of the substance, and
- the significant findings of the risk assessment.

To a large extent much of the above is already required by existing health and safety legislation. Furthermore, employers are only required to provide information, instruction and training to non-employees when it is necessary to ensure their safety. Any information provided should be commensurate to the level and type of risk.

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Arrangements within Each Directorate

Application of DSEAR

In order to comply with the requirements of DSEAR the relevant Director is responsible for ensuring that suitable and sufficient arrangements are made to fulfil the requirements detailed below:

Assign Responsibilities

Identify the relevant Managers/Supervisors responsible for controlling the work and ensure they are aware of their responsibilities in this regard and that they are competent to discharge them.

Assess the Risks

A risk assessment must be carried out by Managers/Supervisors responsible for establishments or temporary sites where dangerous substances are used or stored

Control Measures

Managers should apply the control measures detailed in this policy section.

Additional Requirements

In workplaces where explosive atmospheres may occur, managers must ensure that the information given above is followed.

Emergency Procedures

Management need to ensure that existing emergency procedures above are supplemented in order to accommodate the additional risks associated with dangerous substances they use or store, should this be necessary.

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Information, Instruction and Training

Managers are required to provide employees who may be at risk with suitable information, instruction and training on precautions and actions needed to safeguard themselves, as indicated above.

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Liquefied Petroleum Gas (LPG)

Information provided in HSE documents CHIS4: Use of LPG in Small Bulk Tanks and CHIS5: Small-scale Use of LPG in Cylinders and the LP Gas Association documents will normally satisfy the requirements of DSEAR. When storing LPG cylinders, the following guidance should be considered:

- Cylinders should be kept in a safe, well-ventilated place.
- Store them in the open air where possible but out of direct sunlight.
- Ensure that the LPG store is a minimum of 3m away from occupied buildings, boundaries and sources of ignition or heat.
- Cylinders must be secured and kept upright.
- Full and empty cylinders must be kept separate.
- The build-up of combustible materials must be prevented around the store area.
- Keep the amounts of LPG stored to a minimum.
- Ensure suitable safety signs are displayed around the stores area to indicate that LPG is being stored and to prohibit smoking and the use of naked flames.
- Ensure that suitable fire-fighting equipment is provided.
- Regularly inspect the store and ensure its integrity.
- All valve caps should be covered when not in use.
- Where possible site the store on a suitable hard stand.

When using LPG tanks, it is crucial that they are sited in a safe place and that all the appropriate safety devices fitted. All appliances and pipe work fitted to the tank must be protected. Furthermore, the following precautions should be considered:

- Prevent rubbish and other combustibles from building up around tanks.
- Ensure fencing around the boundary of LPG tanks is in good condition and gates kept locked.
- Ensure tanks and associated equipment are inspected and maintained.
- Ensure that only trained and competent persons work on the installation.
- Prohibit smoking and other sources of ignition from around the LPG tank.
- Provide adequate separation between the installation and work activities.

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Use the Diagram below to Classify, Zone and Identify Hazardous Workplaces

