

Dangerous Substances & Explosive Atmospheres Policy

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1. Introduction

The aim of the procedure is to provide guidance on the use of Dangerous Substances to ensure a safe working environment and to comply with the statutory regulations. The Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) 2002 require employers to assess the risks to workers (and any others who may be affected by their work or business) which may arise because of the presence of dangerous substances in the workplace.

2. Scope

DSEAR aims to protect people from fires, explosions and other similar events that may occur as a result of the presence or use of dangerous substances in the workplace. DSEAR is principally concerned, therefore, with the safe use of substances that can create thermal radiation effects (burns) and over-pressure effects (blast injuries). In summary, a dangerous substance is any natural or artificial substance which is explosive, oxidising, extremely flammable, highly flammable, or flammable (see CLP pictograms below):



Examples of Dangerous Substance K

- Most common organic solvents
- Benzoyl Peroxide
- Ammonia Gas
- Oxygen Gas
- Petrol
- Varnishes
- LPG
- Methyl Ethyl Ketone
- Styrene Monomer
- Acrylamide Monomer

Examples of Activities to which DSEAR applies (note, this list is not comprehensive):

- Storage of petrol and LPG as a fuel for cars, machinery etc.
- Use of flammable gases, such as acetylene, for welding.
- Handling and storage of waste dusts in woodworking shops.

- Handling and storage of flammable wastes including fuel oils.
- Hot work on tanks or drums that have contained flammable material.
- Work activities that could release naturally occurring methane.
- Use of flammable solvents in laboratories.
- Storage of flammable goods such as paints, solvents, and reagents.
- Storage, use and handling of flammable gases, including LPF.
- Transport of flammable liquids in containers around the workplace.
- Chemical or gas manufacture resulting from research or teaching.

3. Roles and responsibilities

3.1 Heads of Departments

Heads of Departments are responsible for the implementation of the Institution's risk assessment procedure within their area of control. Heads of Departments must ensure:

- a) All significant hazards are captured on the School or area hazard register.
- b) All DSEAR risk assessments are completed.
- c) There are suitable and sufficient DSEAR risk assessments in place for all significant departmental risks, especially those recorded on the hazard register.
- d) There is effective risk control by conducting termly inspections.
- e) Ensure suitable and sufficient risk assessments are in place before introducing new pieces of equipment especially those which may be used in explosive atmospheres.

3.2 Academic Staff

The involvement of academic staff in the risk assessment process is vitally important as research and teaching are the most likely areas where people may be at risk.

Academic staff are well placed and possess the technical expertise and information to assess health and safety risks and identify control measures to protect students and colleagues. LMU therefore requires all academic staff to:

- a) Complete the mandatory in-house risk assessment training for academic staff.
- b) Ensure health and safety risks arising from their academic activities are identified, assessed and there are adequate controls in place before commencement of work. This must be captured on the DSEAR Risk Assessment form.
- c) Ensure that hazardous areas are identified (as part of the risk assessment above) and forward a copy of this information (along with the assessment) to the Safety Office.
- d) Inform students/researchers and others who may be affected by hazards of the risk control measures in place by agreed arrangements within the department.
- e) Provide adequate supervision to ensure risk controls are always in place and remain effective .

- f) Seek advice from the H&S Office and Estates during the conceptual stage of introducing new equipment which may require alteration to the building's infrastructure.
- g) Assess the introduction and suitability of new equipment.

3.3 Health & Safety Office

- a) The H&S Office will provide training, advice, and guidance on the provision of risk assessment.
- b) The H&S Office is responsible for the adequacy of the Institution's risk assessment arrangements including the provision of risk assessment forms and other pro forma.
- c) The H&S Office will provide specialist advice on the application of this procedure and on the control measures appropriate to control risk.
- d) The H&S Office will ensure that hazardous areas are identified in the Fire Risk Assessments and that this information is available to the emergency services.

3.4 Staff

Staff are required to:

- a) Follow information, instruction and training received.
- b) Follow safe systems of work or standard operating procedures.
- c) Inform their manager of unsafe conditions or equipment posing imminent danger.
- d) Report any shortcomings in risk control arrangements.
- e) Avoid putting themselves or others at risk by their acts or omissions.

Failure to comply with either the safety arrangements or control measures could result in disciplinary action.

3.5 Students

- a) Students will be informed of the hazards and the reason for following safe system of working. Equipment supplied as part of the assessment they will not interfere with intentionally or recklessly or misuse the PPE.
- b) Students and researcher are required to wear the Personal Protective Equipment (PPE) provided to them, store as instructed and report damage.

4. Risk Assessment and Control of Dangerous Substances

4.1 Risk Assessment

The DSEAR Risk Assessment form provides a template to considering each of the points below:

- Check whether the substance has been classified under CLP as explosive, oxidising, extremely flammable, highly flammable, or flammable.

- Assess the physical and chemical properties of the substances (or preparation) and the work processes involved to determine whether the work activity creates a potential for fire, explosion, or similar energetic event. If a Safety Data Sheet (SDS) is available it will list the applicable Physical Hazard (H) Statements, i.e. H200 Unstable Explosive or H221 Flammable Gas.

NOTE: For example, diesel oil is not classified as ‘flammable’ under CLP however its physical properties are such that when heated to high temperature it can present a fire and explosive risk.

Check whether the work activity involves the creation or handling of potentially combustible dusts.

NOTE: The presence of a dangerous substance can also lead to the development of an ‘Explosive Atmosphere’ – 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.

4.2 Elimination

The most effective control to avoid the risk from dangerous substances is to remove them from the workplace and DSEAR requires that efforts be made to avoid using dangerous substances where this is possible. Elimination is the best solution and must be considered.

4.3 Substitution

In practice it is more likely that it will be possible to replace the dangerous substance with one that is less hazardous (i.e. using a solvent with a higher flashpoint) or to design the process so that it is less dangerous (i.e. by reducing the amount of substance in the process).

4.4 Mitigation and Emergency Procedures

DSEAR also requires measures to be put in place in case of an incident. These include

- Prevent fires and explosion from spreading
- Reducing the number of people exposed to a potential incident
- Providing safety equipment that can safely contain or suppress an explosion or vent it to a safe place.
- Warning and Communication Systems
- Escape Facilities
- Procedures for people to following in the event of an incident
- Appropriate Protective Equipment
- Practice Drills

This information must be readily available to the emergency services.

4.5 Control

The intention of DSEAR is that we:

- Reduce the quantity of dangerous substances to a minimum
- Avoid/ Minimise releases and control these at source
- Preventing the formation of an explosion atmosphere
- Collect, contain, and remove any releases to a safe place (i.e. by ventilation)
- Avoid ignition sources
- Avoid adverse conditions that could lead to danger (i.e. exceeding limits of temperature on equipment)
- Keeping incompatible substances apart

There are several physical/ engineering measures that should be considered to control the risk:

- Design, construction, and maintenance of the workplace (i.e. fire resistance, explosion relief)
- Design, assembly, construction, installation, provision, use and maintenance of suitable work processes, including all relevant plant, equipment, control, and protection systems.
- Providing plant which is explosion resistant
- Providing explosion suppression or explosion relief equipment
- Taking measures to control or minimise the spread of fires and explosions.
- All pipe work conveying flammable gas must be marked.
- Appropriate bunding in place to prevent leaks and spills.
- Intrinsically safe equipment and fittings installed.

Additionally, several human/ administrative measures exist that should be considered:

- The application of appropriate systems of work including, written instructions, permits to work and other procedural systems or organising work.
- Reducing the number of people exposed
- Ensuring that materials with very low flash or auto-ignition points are procured in as small containers as reasonably practicable.
- Where long term storage is foreseeable, control to ensure turnover in use and disposal to prevent compounds from deteriorating on standing (i.e. peroxides).
- Providing suitable Personal Protective Equipment (PPE)

4.6 Zoning

Where an Explosive Atmosphere may occur, the DSEAR regulations require classification of 'hazardous' and 'non-hazardous' places. Hazardous places must be classified in to 'Zones' unless the exceptions in the HSE guidance are considered¹.

¹ <http://www.hse.gov.uk/electricity/atex/classification.htm>

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|---|---|
| <p>Zone 0 A place where an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapour or mist is present continuously, long periods or frequently.</p> | <p>Zone 20 A place where an explosive atmosphere consisting of a cloud of combustible dust in air is present continuously, long periods or frequently.</p> |
| <p>Zone 1 A place where 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.</p> | <p>Zone 21 A place where an explosive atmosphere consisting of a cloud of combustible dust in air is likely to occur in normal operation.</p> |
| <p>Zone 2 A place where 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.</p> | <p>Zone 22 A place where an explosive atmosphere consisting 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.</p> |

An area can be 'non-hazardous' by virtue of the fact that either there is no material categorised as dangerous, or that it is present in very small quantities, and that where it is present in small quantities, there is no property of the material, or operation using that material being carried out, such that ignition or detonation will occur. No further action needs to be taken other than to check the validity of the assessment from time to time, or if a significant change of use of the area takes place.

An area will be categorised as zone 2 or 22 if, in normal use, there is material categorised as dangerous present but that risks are well managed, and equipment is suitable for use in the area. Any hazards present are likely to persist for a relatively short time (up to 15 minutes).

An area will be categorised as zone 1 or 21 if, in normal use, there is material categorised as dangerous present but that risks are well managed, and equipment is suitable for use in the area. Any hazards present are likely to persist for a relatively short time (up to 1 hour).

An area will be categorised as zone 0 or 20 if, in normal use, there is material categorised as dangerous present but that risks are well managed, and equipment is suitable for use in the area. Any hazards present are likely to persist for a significant time or are present continuously (over 1 hour).

4.7 Marking of hazardous areas

Any area identified above must be clearly marked with the appropriate signage with clearly identified zone category (see below):



4.8 Selection of equipment for use in Explosive Atmospheres

It is important that any equipment is suitable for use in the zone in which it is to be used. As well as the standard 'CE' mark, which ensures uniformity of compliance, a second 'Ex' Mark is affixed to indicate that the equipment is suitable for use in explosive atmosphere:



There are further sub-categories which are relevant to the duration of the time for which the explosive atmosphere is likely to occur and whether it will be for dust or gas. For further advice on the selection of such equipment please consult with your SLO and/or the Health and Safety Office.

5. References and further reading

- Dangerous Substances and Explosive Atmospheres Regulations 2002. Approved Code of Practice and guidance
<http://www.hse.gov.uk/pubns/books/l138.htm>
- (HSE) Hazardous area classification and Laboratory operations
<http://www.hse.gov.uk/electricity/atex/classification.htm>
- (HSE) Safe Use and Handling of Flammable liquids
<http://www.hse.gov.uk/pubns/books/hsg140.htm>
- (HSE) Storage of Flammable liquids in containers:
<http://www.hse.gov.uk/pubns/priced/hsg51.pdf>
- British Compressed Gases Association Codes of Practice
http://www.bcga.co.uk/pages/index.cfm?page_id=72