

Local Rule: Dangerous Substances and Explosive Atmospheres (DSEAR)

1. Significant Hazards of Dangerous Substances and Explosive Atmospheres

The hazards presented by dangerous substances are those of fire and explosion, which put the safety of people at risk.

Examples of activities to which DSEAR applies (the list is not exhaustive, but offered as examples)

- use of flammable solvents in laboratories;
- storage of flammable goods, such as paints, solvents, reagents;
- storage, use and handling of flammable gases, including LPG;
- transport of flammable liquids in containers around the University/department;
- manufacture of chemical or gas resulting from research or teaching;
- 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; and
- work activities that could release naturally occurring methane.

The University aims to manage the risks from dangerous substances and explosive atmospheres by fulfilling the requirements of the current Dangerous Substances and Explosive Atmospheres Regulations.

2. Key Definitions

A Dangerous Substance is any natural or artificial substance which is explosive, extremely flammable, highly flammable or flammable, including liquids, vapours, gases, dust and equipment that might leak or generate a dangerous substance.

A **dangerous substance** means:

- a) a substance or preparation which is explosive, oxidising, extremely flammable, highly flammable or flammable;
- b) a substance or preparation which because of its physical or chemical properties and the way it is used or is present at the workplace creates a risk, not being a substance or preparation falling within (a) above; or
- c) any dust, whether in the form of solid particles or fibrous materials or otherwise, which can form an explosive mixture with air or an explosive atmosphere, not being a substance or preparation falling within (a) or (b) above.

An **explosive atmosphere** means 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;

Such substances that are bought in commercially will be recognised by the standard pictograms on the container, e.g.



Most common organic solvents

Varnishes

Benzoyl peroxide

LPG

Ammonia gas

Methyl ethyl ketone

Oxygen gas

Styrene monomer

Petrol

Acrylamide monomer

3. Departmental Roles

3.1. Nominated Coordinator

Nominated coordinators must be appointed to coordinate the DSEAR assessment process and in many cases will be the Departmental Safety Convenor. The role will be:

- to liaise with colleagues, such as PIs and Supervisors to ensure they are identifying and assessing the risks to staff and students from dangerous substances and explosive atmospheres; and
- coordinate and manage the DSEAR assessment process within the department by establishing a DSEAR assessment programme to ensure assessments are conducted and regularly reviewed;

3.2. Principle Investigator/Supervisor

The Principle Investigator or Supervisor must ensure the identification and assessment of the risks to staff and students from dangerous substances and explosive atmospheres. They will be required to assess and manage these risks in the areas under their control and implement any necessary risk control measures.

3.3. Staff, Students and Others

Staff and students have a responsibility to comply with the arrangements put in place to prevent or reduce the risk of fire or explosion from these dangerous substances or creation of an explosive atmosphere.

4. Requirements of DSEAR

The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) require risks from the indoor storage of Dangerous Substances to be controlled by elimination or by reducing the quantities of such substances in the workplace to a minimum and providing mitigation to protect against foreseeable incidents.

All departments must ensure that risks associated with dangerous substances are assessed and eliminated or reduced as far as is reasonably practicable. The key requirements of the Regulations require departments to:

- assess the risks from dangerous substances;
- provide measures to eliminate those risks, or reduce them in so far as is reasonably practicable;
- ensure places where hazardous explosive atmospheres may be present are classified into appropriate zones and marked where necessary;
- ensure any new electrical or mechanical equipment used in those zoned places comply with the requirements of the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996 (EPS);
- provide equipment and procedures to deal with accidents and emergencies; and
- provide information and training to employees.

5. Assessing Risks from Dangerous Substances and Explosive Atmospheres

5.1 Identifying the hazards

DSEAR makes no distinction as to the scale of the hazard, whether a sample of a few millilitres or a store containing hundreds of litres. In general terms, to determine if dangerous substances are present the assessor will need to carry out the following three steps:

- check whether the substance or preparation has been classified under the Chemicals (Hazard information and Packaging for Supply) Regulations (CHIP) as explosive, oxidising, extremely flammable, highly flammable or flammable;
- assess the physical and chemical properties of the substance or preparation and the work processes involved to see whether the work activity creates a potential for fire, explosion or similar energetic (energy releasing) event; and
- check to see if the work activity involves the creation or handling of potentially combustible or explosive dusts.

As a preliminary step, if the assessor quickly comes to the conclusion that hazards from dangerous substances are not present or unlikely to occur, this should be recorded in the General Risk Assessment Form (S20) and no further action is necessary. However, where dangerous substances exist and there is the potential for fire or explosion, then a more detailed DSEAR risk assessment must be carried out for each substance using S30 as an aide memoire and to record the significant findings.

5.2 Evaluating Risks

The more detailed risk assessment will involve listing all the substances that are (or could be) present or produced, along with the associated work activities and then analysing what could go wrong to lead to a fire or explosion. The assessor, i.e. PI's, supervisors and managers within departments, should include where appropriate:

- the hazardous properties of the substance;
- information on safety provided by the supplier, including information contained in any relevant safety data sheet;
- the work processes and substances used and their possible interactions;
- the amount of the substance involved;
- where applicable the risk presented by substances in combination;
- arrangements for the safe handling, storage and transport of dangerous substances and waste containing dangerous substances;
- activities such as maintenance, where there is potential for a high level of risk;
- the effects of control measures which have been or will be taken;
- 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 an explosion;
- any places which are or can be connected via openings to places where explosive atmospheres may occur;
- individuals or groups who could be harmed and how;
- such additional safety information that the department may need to complete the risk assessment; and
- fire safety issues (means of escape, fire fighting measures, detection, fire fighting training etc.).

5.3 Deciding on and Implementing Risk Control and Mitigation Measures

Departments must implement actions to reduce the risks from dangerous substances, eliminating the substance or replacing it with a substance or process which is less dangerous.

Where it is not reasonably practicable to eliminate the risk from a dangerous substance, the department must put in place measures to control the risks and to mitigate the detrimental effects of a fire or explosion or other harmful physical effects arising from dangerous substances. It may be necessary to liaise with Estates Services Engineering section to develop appropriate safe designs/installations for their space.

5.3.1 Measures to Control Risks

Such control measures should be considered in the following priority, to determine if each is reasonably practicable to implement:

- reduction of the quantity of dangerous substances to a minimum;
- avoidance or minimising the release of a dangerous substance;
- control of the release of a dangerous substance at source;
- prevention of the formation of an explosive atmosphere, including the application of appropriate ventilation;
- ensuring that any release of a dangerous substance which may give rise to risk is suitably collected, safely contained, removed to a safe place, or otherwise rendered safe, as appropriate;
- avoidance of ignition sources, including electrostatic discharges;
- avoidance of adverse conditions which could cause dangerous substances to give rise to harmful physical effects; and
- segregation of incompatible dangerous substances.

In so far as is reasonably practicable and subject to them being consistent with the DSEAR assessment and appropriate to the nature of the activity or operation, the department shall ensure the following are included within their control arrangements:

- ensure that the workplace is designed, constructed and maintained to reduce risk. Departments will liaise with Estates Services to develop appropriate safe designs/installations for their space;
- designing, constructing, assembling, installing, providing and using suitable work processes so as to reduce risk;
- maintaining work processes in an efficient state, in efficient working order and in good repair; and
- the application of appropriate safe systems of work including the issuing of written instructions for carrying out the work.

5.3.2 Measures to Mitigate Effects

So far as is reasonably practicable, departments must introduce mitigation measures in the following priority:

- reduction to a minimum of the number of employees exposed;
- avoidance of the propagation of fires or explosions;
- provision of explosion pressure relief arrangements;
- provision of explosion suppression equipment;
- provision of plant which is constructed so as to withstand the pressure likely to be produced by an explosion; and
- provision of suitable personal protective equipment.

In addition the department's general arrangements must include:

- arrangements for the safe handling, storage and transport of dangerous substances;
- arrangements for appropriate handling, transport and disposal of flammable waste. Refer to University guidelines on hazardous waste disposal; and
- ensuring that any conditions necessary for ensuring the elimination or reduction of risk from dangerous substances are maintained.

5.4 Recording the Significant Findings

Departments must ensure the significant findings of the DSEAR assessment are recorded. Form S30 should be used for this purpose.

The DSEAR assessment should be reviewed if there is any reason to suspect that the original assessment is no longer valid or there has been a significant change in the work to which the assessment relates.

In any case the DSEAR assessment should be reviewed at least every 3 years.

6. DSEAR Assessments and COSHH Assessments

Many substances will be classified as both a dangerous substance and one harmful to health, so departments have duties to consider both types of risk assessment.

A **DSEAR** assessment will consider the particular **safety risks** from the presence or use of dangerous substances in a workplace and the actions needed to eliminate, reduce or control those risks.

A **COSHH** assessment required under the Control of Substances Hazardous to Health Regulations, will consider the particular **health risks** from exposure to substances hazardous to health and the actions needed to eliminate, reduce or control those risks.

It will often be the case that the toxic hazard or the flammability hazard predominates; this in many cases will be determined by the circumstances of use of the substance and the relevant COSHH assessment or DSEAR assessment completed. E.g. a laboratory manager with responsibility for the solvent store will need to consider the DSEAR assessment as a priority; a PI using 50ml of a toxic, flammable substance may need to consider a COSHH assessment in the first instance; a DSEAR assessment may not in fact be required due to the small quantity of flammable substance.

However it is for the PI or supervisor to assess the need for a COSHH and/or DSEAR assessment. Where only one assessment form is considered necessary, the relevant COSHH or DSEAR assessment should be completed, with notes made that other hazards have been considered.

If this does not present a true reflection of the situation then both forms ought to be completed; it is for the area supervisors, principal investigators and managers to decide which form(s) are appropriate in the circumstances of each case. (See also Section 5.1 "Identifying Hazards").

7. Explosive Atmospheres and Classified Zones

Where explosive atmospheres may occur, departments must ensure such areas are classified into zones, based on the likelihood and persistence of any such atmosphere. Zoned work places should be classified as follows:

Zone 0

A place in which an explosive atmosphere consisting of a mixture of air with dangerous substances in the form of gas, vapour or mist is present continuously or for long periods of time or frequently.

Zone 1

A place in which an explosive atmosphere consisting of a mixture of air with dangerous substances in the form of gas, vapour or mist is likely to occur in normal operation, occasionally.

Zone 2

A place in which an explosive atmosphere consisting of a mixture of air with 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.

Zone 20

A place in which an explosive atmosphere in the form of a combustible dust in air is present continuously or for long periods of time or frequently.

Zone 21

A place in which an explosive atmosphere in the form of a combustible dust in air is likely to occur in normal operation occasionally.

Zone 22

A place in which an explosive atmosphere in the form of a combustible dust in air is not likely to occur in normal operation but, if it does occur, will persist for a short period only.

Once classified, departments must ensure the area is protected from sources of ignition. Departments must ensure the points of entry to zoned areas are marked with a specified "EX" sign (Triangular shaped, block capital lettering, black text on yellow background). Staff working in zoned areas must be provided with appropriate anti-static clothing.



Before a zoned hazardous workplace is brought into use for the first time, departments must ensure that overall explosion safety is verified by a person who is competent in the field of explosion protection. Further advice on competent organisations can be sought from Safety Services.

8. Selection of Equipment for use in Zoned Areas

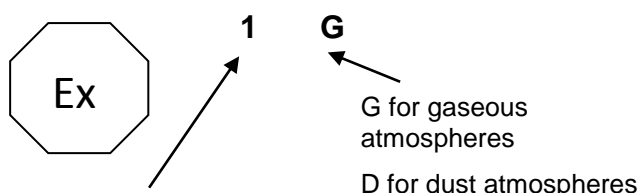
Departments must ensure new electrical and mechanical equipment and protective systems used in a zoned area comply with the Equipment and Protective Systems for use in Potentially Explosive Atmospheres Regulations 1996 (EPS), although equipment already in use prior to July 2003 can continue to be used so long as it is safe to do so, i.e. explosion protected. (See Schedule 3 DSEAR ACoP, L138)

In addition a temperature rating expressed as a 'T' marking and sometimes a gas group will be included.

The following categories of equipment must be used in the zones indicated, provided they are suitable for gases, vapours, mists, dusts as appropriate:

Zone	Equipment category
0 or 20	1
1 or 21	1 or 2
2 or 22	1 or 2 or 3

A standardised marking scheme is used to identify equipment suitable for a specific zoned location. Equipment built to the requirements of EPS will carry the following style of marking:



Equipment Category 1, 2 or 3

9. Storage of Flammable Liquids

It is recognised that for practical purposes where flammable liquids are used, there is likely to be a need for a limited quantity to be stored in the workroom/working area. It is the responsibility of the department when carrying out a DSEAR assessment to justify the need to store any particular quantity of flammable liquid within a workroom/working area. However, the guiding principle is that only the **minimum** quantity needed for frequently occurring activities, or that required for use during ½ day or one shift, should be present in the workroom/working area (DSEAR ACoP L135, para.39 refers).

For flammable liquids that have a flashpoint below 32°C a small quantity is considered to be up to 50L; for flashpoints above 32°C, 250L. (DSEAR ACoP L135 para. 40 refers) Clearly, actual quantities will depend on the work activity and also the organisational arrangements for controlling the fire risks in the workroom /working area. ([Storage of Flammable Liquids in workroom/working areas](#))

10. Emergency Procedures

DSEAR requires departments to put procedures in place to protect people from explosive incidents that may occur, building on requirements established in the Management of Health and Safety at Work Regulations 1999. The nature and extent of these procedures should be based on the findings of the DSEAR assessment and where necessary, should include:

- warning and communication systems;
- escape facilities;
- written procedures for people to follow in the event of an incident; and
- type of appropriate protective equipment and;
- frequency of practice drills.

11. Information, Instruction and Training

Where a dangerous substance is present at a workplace, the DSEAR assessment carried out by the department will identify those employees, and others in and around the workplace who will be required to receive information on the significant findings of the assessment and may include:

- suitable and sufficient information, instruction and training on appropriate precautions and actions to be taken in order to safeguard them at the work places;
- the details of any such substance including its name, material safety data sheet and where it is used;
- the type and extent of the risks including factors that may increase the risk e.g. smoking or other ignition sources;
- the legal requirements which concern the hazardous properties of the substance;
- the significant findings of the DSEAR assessment;
- details of control and mitigation measures adopted, including methods of work, the reasons for these, and how to use them properly;
- procedures for dealing with accidents, incidents and emergencies; and
- any further information resulting from a review of the assessment; for example why a review was necessary and how any changes will affect the way employees do the work in the future.

Information, instruction and training may need to be provided to non-employees where it is required to ensure their safety.

Gas safety awareness training and practical training on the safe use of compressed gas cylinders can be arranged through Safety Services.

12. Identification of Hazardous Contents of Containers and Pipes

Where pipes or containers are identified as part of the fabric or structure of the building, departments must liaise with Estates Services to arrange for their identification, especially those that are visible, so that staff and others are alerted to the presence of a dangerous substance and can take the necessary precautions. Similarly for containers or pipes or containers relating to experimental design, these are the responsibility of the department. Identification can also help to avoid confusion over contents and incorrect mixing.

'Containers' include any fixed or portable, open or enclosed means to contain dangerous substances such as tanks, silos, reaction vessels and waste receptacles together with any associated pipe runs or piping system.

DSEAR does not specify the means of identification. Suitable methods include labelling, appropriate colour coding or providing instructions and training. The most appropriate means of identification will depend on the nature of the work activity. For example, in situations where contents may change regularly (e.g. test tubes in labs, chemical process vessels and pipes which are not dedicated to one substance) it may not be practical to use labelling.

In these cases other arrangements will be needed to ensure that staff and others are aware of the hazards associated with the substances involved e.g. providing suitable process instruction sheets, record sheets and training.

Identification is not required where the substance is a bulk solid product e.g. flour, which is not in itself a dangerous substance and is only hazardous if released and dispersed in air.

13. Further Information and Guidance

Publications free to download on the Health and Safety Executive website <http://www.hse.gov.uk/>

- [Dangerous Substances and Explosive Atmospheres. DSEAR 2002 ACoP L138](#)
- [Design of Plant, Equipment and Workplaces DSEAR 2002 ACoP L134](#)
- [Storage of Dangerous Substances DSEAR 2002 ACoP L135](#)
- [Control of Mitigation Measures DSEAR 2002 ACoP L136](#)
- [Safe Maintenance, Repair & Cleaning Procedures DSEAR 2002 ACoP L137](#)

The following guidance provides useful information on a variety of dangerous substances and considerations for the development of safe systems of work.

- [Take care with Acetylene](#)
- [The Storage of Flammable Liquids in Containers](#)
- [The Safe Use and Handling of Flammable Liquids](#)
- [Health & Safety in Motor Vehicle Repair](#)
- [Spraying Highly Flammable Liquids](#)
- [The Cleaning and Gas Freeing of Tanks Containing Flammable Residues](#)
- [The Storage of Flammable Liquids in Process Areas, Workrooms, Laboratories and similar working areas](#)
- [The Storage and Handling of Organic Peroxides](#)

The following summarises how departments can effectively implement this Local Rule and integrate into their management systems. These processes will be monitored as part of Safety Services' Audit Programme, and where departments are able to demonstrate fulfilment of key actions, this is likely to provide strong evidence of good practice.

		Key Management Actions
1.	Departmental Role	<ul style="list-style-type: none"> • Appoint a responsible person to coordinate the risk assessment process • Appoint a laboratory manager/supervisor to oversee the safety requirements for the use of flammable liquid and stores • Ensure that appropriate management, administrative and technical arrangements are in place to effectively control risks and these are regularly reviewed
2.	Identifying Hazards	<ul style="list-style-type: none"> • Ensure work activities involving dangerous substances and explosive atmospheres which may present a risk are identified.
3.	Evaluating Risks	<ul style="list-style-type: none"> • Ensure a DSEAR assessment is in place for all substances that are (or could be) present or produced, along with the associated work activities and then analyse what could go wrong to lead to a fire or explosion.
4.	Implementing Control Measures	<ul style="list-style-type: none"> • Ensure the range of risk control measures available is considered and those measures that will reduce exposure to dangerous substances or explosive atmospheres are implemented. • Ensure recommendations and action points are implemented and monitored.
5.	Involvement of Estates Services	<ul style="list-style-type: none"> • Ensure consultation with Estates and other competent persons to deal with matters such as: • Development of safe designs and installations for the workspace • Selection of equipment for use in zoned areas • Identification of hazardous contents of containers and pipes. • Ensure that timeous consultation & liaison with Estates Services on all matters concerning the regular servicing and maintenance of all equipment in use within the area which is subject to a programme of planned maintenance assessment.

		Key Management Actions
6.	Storage Arrangements	<ul style="list-style-type: none"> • Ensure that the minimum quantities of flammable liquids are stored in the work area or laboratory.
7.	Emergency Procedures	<ul style="list-style-type: none"> • Ensure procedures are in place to protect people from explosive incidents that may occur. The nature and extent of these procedures should be based on the findings of the risk assessment.
8.	Information, Instruction and Training	<ul style="list-style-type: none"> • Ensure suitable and sufficient information, instruction and training on appropriate precautions and actions to be taken regarding the risk. • Ensure a record of all training provided, and any information issued and given is recorded and kept on the premises for reference and inspection by an enforcing authority.