

## **DANGEROUS SUBSTANCES AND EXPLOSIVE ATMOSPHERES (DSEAR) PROCEDURE**

### **INTRODUCTION**

The University uses dangerous substances and generates explosive atmospheres in some of its operations and accepts that it has a duty of care to reduce exposure to risk from these to as low as reasonable practicable

This Procedure is intended to ensure that all staff and students of the University who use dangerous substances or generate explosive atmospheres do this in a manner that assists the university to discharge its duty of care in this area and to comply with the Health and Safety at Work, etc. Act 1974 and the Dangerous Substances and Explosive Atmospheres Regulations 2002.

It should be noted that the requirements of this Procedure clarify what needs to be done in relation to the safe management of dangerous/hazardous substances in existing legislation e.g. the Management of Health and Safety at Work Regulations 1999, the Control of Substances Hazardous to Health Regulations 2002 and the Fire (Scotland) Act 2005 and therefore should not place any additional duties on those complying with existing legislation.

It is the express intention of the University of the West of Scotland to protect the health and safety of employees, students and all other persons through proper control of the risks from dangerous substances and explosive atmospheres to which people may be exposed as a result of University activities.

This procedure is intended to implement that policy and applies to all Schools and Departments of the University and applies on all campuses.

This Procedure covers dangerous substances and explosive atmospheres anywhere within the University. It applies to the control of dangerous substances and explosive atmospheres in areas outside of the University (e.g. as the result of visits to other workplaces with University Staff, field trips). The requirements of the Procedure may be met in respect of other workplaces by ensuring that the risk assessments and risk control measures produced by the controllers of those workplaces are suitable and sufficient prior to the commencement of the activities that may give rise to exposure.

There is a specific requirement, under DSEAR to carry out a risk assessment in respect of all dangerous substances and explosive atmospheres and to put in place appropriate risk control measures to remove or reduce the risk to staff, students and other persons who may be exposed to such dangerous substances and explosive atmospheres as a result of the University's operations. The responsibility to ensure compliance with the DSEAR Regulations and this Procedure rests with the University, the School / Support Department and all individuals involved.

**The requirement to carry out a suitable risk assessment under DSEAR is an absolute duty in order to properly manage the use, storage, handling and disposal of dangerous substances and explosive atmospheres.**

When carrying out a DSEAR risk assessment reference should be made to other University Policies, e.g. "Procedure for Disposal of Hazardous Wastes", "Carrying out of Risk Assessment: Procedure and Guidance", "Procedure for Control of Substances Hazardous to Health", etc.

Further information regarding dangerous substances and explosive atmospheres is available through the Resilience and Safety Team, and the Health and Safety Executive's Website and links from the University intranet or internet sites.

## **RESPONSIBILITIES**

### **Deans of Schools / Directors / Heads of Department**

Responsible for all health and safety within their School or Department and therefore must:

- Allocate sufficient staff training resources to manage DSEAR where applicable
- Ensure risk assessments are completed, including for DSEAR
- Allocate sufficient resources for all control measures required by the risk assessment
- Cooperate with the Estates department for any statutory examination and testing and ensure appropriate maintenance records are kept.

### **Supervisors, Line Managers**

Responsible for ensuring the day to day supervision of health and safety matters in their areas of responsibility and therefore must:

- Identify safer alternatives to working with dangerous and explosive atmospheres where reasonably practicable
- Carry out, or ensuring the carrying out, and monitor/review all applicable risk assessments, including for DSEAR
- Communicate the risk assessment to all affected parties
- Bring this procedure to the attention of direct reports undertaking the work
- Check that the relevant paperwork, such as Risk Assessment, statutory checks and maintenance is completed by those undertaking work

### **Health and Safety Champion**

Act as the focal point for health and safety within their school or department and as such must:

- Bring any concerns reported to them, and related to this procedure, to the attention of the school or department Health and Safety Committee as appropriate. Any urgent concerns should be raised with the Dean of School / Head of Department immediately.

**Individual Users** (Staff and Students) have a responsibility for their own health and safety and that of others, and therefore must:

- Take care of themselves and others who could be affected by their actions and omissions
- Adhere to the control measures identified in the DSEAR Risk Assessment
- Report any significant safety issues to their Line Manager or Personal Tutor promptly

## **PROCEDURE**

In order to ensure compliance, the following must be undertaken:

- Carry out a risk assessment of any work activities involving dangerous substances (as defined below);
- Provide technical and organisational measures to eliminate or reduce as far as is reasonably practicable the identified risks;
- Provide equipment and procedures to deal with accident and emergencies;
- Provide information and training to employees;
- Classify places where explosive atmospheres may occur into zones, and mark the zones where necessary.
- The arrangements should make explicit good practices for reducing the risk to persons from fires, explosions and similar energy releasing events that are caused by dangerous substances such as flammable solvents.
- For Schools/Departments who already comply with Health and Safety legislation, the impact of DSEAR should be small, as the risks to safety from fire and explosion will already be covered by other risk assessments and fire safety risk assessments of work activities.

## **DSEAR**

DSEAR applies whenever the following conditions are met:

- There is work being carried out;
- A dangerous substance is present, or is liable to be present;
- The dangerous substance presents a risk to any person's safety (as distinct from their health)

In the context of the University, these regulations apply on any premises, whether owned or managed by the University or not, used for work, research or recreation. This also includes fieldwork.

DSEAR is intended to protect not only employees at the workplace, but also any other person whether at work or not who may be put at risk by dangerous substances. This includes employees working for other employers, students, contractors, visitors to the premises, members of the public, etc.

## Activities/Substances to Which DSEAR Applies

The following activities and substances may be commonly found in the work situation within premises. The list is not exhaustive, but offers examples:

- Storage of petrol as a fuel for cars, motor boats, horticultural machinery, etc.
- Use of flammable gases, such as acetylene, for welding
- Handling and storage of waste dusts in woodwork 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 (e.g. composting)
- Distillation of flammable solvents
- 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 workplace
- Chemical/gas manufacture, resulting from processes or research experiments

DSEAR is concerned with the harmful physical effects from thermal radiation (burns), over-pressure-effects (blast injuries) and oxygen depletion effects (asphyxiation) arising from fire or explosion.

## Determining the Presence of Dangerous Substances

You should undertake the following:

- a) Check whether substances or preparations in use have been classified under the European Regulation on Classification, Labelling and Packaging of Substances and Mixtures, (CLP) as: **explosive, oxidising, extremely flammable, highly flammable or flammable**.
- b) When dangerous/hazardous substances are supplied for use at work, suppliers must provide safety data sheets and these should identify whether the chemical is classified under CLP under the above categories. Another source of information is the table in Appendix 1. This lists many commonly used substances and their classification. If a substance or preparation is classified as explosive, oxidising, extremely flammable, highly flammable or flammable then it is a dangerous substance.
- c) In the case of proprietary substances purchased from a supplier, and classified under CLP, then the packaging in whatever form (cylinder, drum, bottle, tin, or box) should contain warning pictograms denoting the safety hazard, this is often the most easily noted warning that a substance is dangerous. The packaging may also include a Signal word, hazard statements and/or precautionary statements – for example, “explosive when mixed with combustible material”. Examples of the pictograms are shown in Appendix 2 of this Procedure.
- d) Assess the physical and chemical properties of the substance or preparation and the circumstances of the work involving those substances to see if that

combination can create a safety risk to persons from an energetic event. This is particularly important in order to identify dangerous substances that may only arise as a result of a work process. These may be vapours or gases produced as common intermediates during a laboratory technique or a process. Alternatively there could be substances that decompose, or react exothermically, when mixed with other substances e.g. peroxides.

- e) Wood, metal, and many other dusts may be dangerous substances, depending on the circumstances of the work as, when the dust is mixed in a cloud with air it can, in certain circumstances, be ignited and explode. Work activities involving grinding or machining are particularly prone to this risk.
- f) The **key point** here is that it is the combination of the properties of the substance **and** the circumstances of the work process that needs to be assessed. If the assessment shows that there is a safety risk to persons arising from a fire, explosion or other energy-releasing event then the substance is a dangerous substance for DSEAR purposes.

## **Risk Assessment**

If dangerous substances are identified as being present in the workplace DSEAR requires employers (or the self-employed) to carry out a risk assessment **before** commencing any new work activity involving dangerous substances.

The purpose of the risk assessment is to enable employers to decide what they need to do in order to eliminate or reduce, so far as is reasonably practicable, the safety risks from dangerous substances and ensure that these safety control measures are implemented. Therefore DSEAR uses the well-understood hierarchy of safety used in other Regulations – avoid or eliminate and if this is not possible, control or mitigate the effect.

A DSEAR risk assessment should be reviewed on an annual basis or sooner if there is reason to suspect it is no longer valid, there has been a significant change, or there has been an incident.

## **Elimination**

Elimination is the best solution and **must** be considered first. This involves replacing a dangerous substance with a substance or process that totally eliminates the risk by avoiding exposure to the hazard. In practice this may be somewhat difficult to achieve and it is more likely that it will be possible to replace the dangerous substance with one that is less hazardous (e.g. by replacing a low flashpoint solvent with a high flashpoint one) or to design the process so that it is less dangerous – for example, by reducing quantities of substances in the process. However, care must be taken whilst carrying out these steps so as to ensure that no other new safety or health risks are created or increased (e.g. replacing a low flashpoint solvent with a high flashpoint one that also has carcinogenic properties).

## **Control Measures**

If elimination is not possible then DSEAR requires that control measures be applied in the following order of priority consistent with the risk assessment and appropriate to the nature of the activity or operation:

- Reduce the quantity of dangerous substances to a minimum
- Avoid or minimise releases
- Control releases at source
- Prevent the formation of an explosive atmosphere
- Collect, contain and remove any releases to a safe place (e.g. by ventilation)
- Avoid ignition sources
- Avoid adverse conditions (e.g. exceeding the limits of temperature or control settings) that could lead to danger
- Keep incompatible substances apart.
- Measures that mitigate the risk must be applied and these should likewise be consistent with the risk assessment and appropriate to the nature of the activity or operation, these should include:
  - Reducing the numbers of employees exposed
  - Providing plant which is explosion resistant
  - Providing explosion suppression or explosion relief equipment
  - Taking measures to control or minimise the spread of fires or explosions
  - Providing suitable Personal Protective Equipment (PPE)

DSEAR also specifies that the measures taken to achieve the elimination or the reduction of risk should include:

- Design, construction and maintenance of the workplace (e.g. 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
- The application of appropriate systems of work including: written instructions, permits to work and other procedural systems of organising work.
- DSEAR also requires the identification of hazardous contents of containers and pipes.

## **Additional Requirements for Explosive Atmospheres**

In places where your risk assessment indicates that explosive atmospheres may occur you should ensure that:

- areas where hazardous explosive atmospheres may occur are classified into zones based on their likelihood and persistence, and in accordance with Schedule 2 to the Regulations;
- areas classified into zones are protected from sources of ignition by selecting equipment and protective systems meeting the requirements of the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996. Equipment already in use before 1 July 2003 can continue to be used indefinitely provided the risk assessment shows it is safe to do so;

- where necessary, areas classified into zones are marked with a specified **"EX"** sign at their points of entry;
- where employees work in zoned areas they are provided with appropriate clothing that does not create a risk of an electrostatic discharge igniting the explosive atmosphere;
- before coming into operation for the first time, areas where explosive atmospheres may be present are confirmed as being safe by a person competent in the field of explosion protection. The person carrying out the verification must be competent to consider the particular risks at the workplace and the adequacy of control and other measures put in place.

### **Arrangements to Deal with Accidents, Incidents and Emergencies**

DSEAR requires that employers make arrangements to protect employees (and others who are at the workplace) in the event of accidents etc. including:

- Suitable warning (including visual and audible alarms) and communication systems
- Escape facilities – if required by the risk assessment
- Emergency procedures to be followed in the event of an emergency
- Equipment and clothing for essential personnel dealing with the incident
- Practice drills
- Making information on the emergency procedures available to employees
- Contacting the emergency services to advise them that information on emergency procedures is available (and providing them with any information they consider necessary)

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

### **Information Instruction and Training**

Staff, students and other persons who might 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:

- Names of the substances in use and risks they present
- Access to any relevant safety data sheets
- Copies of this Procedure
- The significant findings of the risk assessment

Information, instruction and training need only be provided to non-employees where it is required to ensure their safety. Where it is provided, it should be in proportion to the level and type of risk. Again, much of this is already required by existing health and safety legislation and should not place any additional burden upon Schools or other management units.

## Recording the Significant Findings of the Risk Assessment

As with other health and safety legislation, DSEAR requires the recording of the significant findings of the risk assessment. The details should include:

- The measures (technical and organisational) taken to eliminate and/or reduce risk,
- Sufficient information to show that the workplace and work equipment will be safe during operation and maintenance including:
- Details of any hazardous zones
- Any special measures taken to ensure co-ordination of safety measures and procedures, when employers share a workplace, e.g arrangements for contractors such as service engineers, alarm activation out of normal hours etc.
- Measures taken to inform, instruct and train employees.

## Classification into Zones

There are three zone categories for explosive atmospheres consisting of a mixture of air with a flammable substance in the form of a mist, vapour or gas and a further three for explosive atmospheres consisting of a cloud of combustible dust mixed with air.

It is possible to have all three zones in the one workplace with a Zone 1 immediately next to the source of the material giving rise to an explosive atmosphere – for example inside a reaction vessel; a Zone 2 in the area immediately outside that vessel – where there is likely to be an explosive atmosphere in the event of an overpressure in the vessel; and a Zone 3 in the remainder of the room – where an air current may allow an explosive atmosphere to exist for a short period.

These limits will be found in the Safety Data Sheet for each individual substance (although, for materials such as organic dust and wood dust where there is no SDS it will be necessary to research this a bit more deeply).

These zone categories are Zone 0, Zone 1 and Zone 2 for a mixture of air with gases, fumes or vapours and Zone 20, Zone 21 and Zone 22 for mixtures of flammable dust and air.

**Policy Statement Author** – Health and Safety Team

**Procedure Owner** – Head of Estates and Environment

**Parent Policy Statement** – Health and Safety Policy Statement

**Public Access or Staff Only Access** – Public

**Version** – Version 2 – June 2022

**Changes and Reason for Changes** – Protocol Review



## Appendix 1- DSEAR 2002 Risk Assessment Form (preliminary assessment)

This form should always be attached to a COSHH risk assessment form

School/Department:

\_\_\_\_\_

Date: \_\_\_\_\_

**If the substance is a proprietary product, does the Safety Data Sheet or labelling on the product packaging indicate that it is (tick appropriate box):**

Extremely Flammable	<input type="checkbox"/>	Highly Flammable	<input type="checkbox"/>	Flammable	<input type="checkbox"/>
Explosive	<input type="checkbox"/>	Oxidising	<input type="checkbox"/>		<input type="checkbox"/>
Or has it a flash point lower than 32°C.					<input type="checkbox"/>
Or, could a release of vapour or gas produce an explosive atmosphere					<input type="checkbox"/>

**If the substance is produced as a result of an *in house* process or as a by-product of, or common intermediate in, such a process, is that substance (tick box):**

Extremely Flammable	<input type="checkbox"/>	Highly Flammable	<input type="checkbox"/>	Flammable	<input type="checkbox"/>
Explosive	<input type="checkbox"/>	Oxidising	<input type="checkbox"/>		<input type="checkbox"/>
Or, has it a flash point lower than 32°C.					<input type="checkbox"/>
Or, could it release a vapour or gas producing an explosive atmosphere					<input type="checkbox"/>

If the answer to all the questions above is “no”, you may finish at this point. However you will still have to carry out a COSHH Risk Assessment prior to use of the substance.

If the answer to any of the questions above is “yes” you must continue and carry out an extension DSEAR Risk Assessment in addition to the COSHH Risk Assessment.

**DSEAR 2002 Risk Assessment Form (assessment extension)**

**What is the location of the Activity or process .....**

**What are the names of the products being handled, stored or produced and what is the activity or process (use one form per process or storage unit).**


**How could a system of work, or activity fail and give rise to fire or explosion. Also note any sources of ignition. (Continue on a separate sheet of paper if necessary.)**

**What measures have been put in place to control the risk (tick as appropriate?)**

	Yes	No	N/A
Has the quantity of the dangerous substance held or used been reduced to a minimum?			
Have steps been taken to avoid, or minimise releases (intentional or unintentional)?			
Have steps been taken to control releases at source?			
Have steps been taken to prevent the formation of an explosive atmosphere?			
Have steps been taken to collect, contain, and remove any releases to a safe place (e.g. ventilation)?			
Have steps been taken to avoid adverse conditions (e.g. exceeding temperature limits or other control settings)?			
Are incompatible substances kept apart in storage, and so far as practicable, in use (e.g. oxidisers and combustibles)?			
Has the number of people exposed to the dangerous substances or the explosive atmosphere been reduced to a minimum?			
Is plant in use that is explosion resistant?			

Is explosion suppression or relief provided on equipment?			
Have adequate measures been taken to control or minimise the spread of fire or explosion?			
Has suitable personal protective equipment been provided and have staff been trained how to wear it properly?			

**What workplace or process and management systems have been put in place, where appropriate to the nature of the activity or operation?**

	Yes	No
Is the workplace designed, constructed and maintained so as to provide adequate fire-resistance and/or explosion relief?		
Is any assembly, construction, installation, rig, plant, equipment, protection system etc., designed in such a manner as to minimise the risk of fire and/or explosion?		
Is any assembly, construction, installation, rig, plant, equipment, protection system etc., used in such a way as to minimise the risk of fire and/or explosion?		
Have appropriate safe systems of work, or other required procedural systems of organising work, been developed and communicated to all persons who might need to know, either by way of this form or another document?		
Is a permit to work scheme required for working with the substance(s) or in the work area, and is it in place and strictly enforced?		

**Zoning and control of explosive atmospheres (if not applicable, tick here and proceed to next section)**

	Yes	No	N/A
Have all such areas been classified into zones in accordance with Schedule 2 of the Regulations?			
Where necessary, have such classified zones been marked at their entry points with the specified 'EX' hazard warning sign and the supplementary zone classification signs?			
Are all classified zones appropriately protected from sources of ignition, through the selection of equipment and protective systems compliant with the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996?			
Are people working in zoned areas provided with clothing that does not create a risk of electrostatic discharge?			
Before their first operation, have areas where explosive areas may be present been verified as being safe, by a competent person?			

## Storage

	Yes	No	N/A
Are all flammable substances kept in suitable fire resistant storage?			
Are all quantities of flammable substances in excess of 50L kept in dedicated and appropriately protected flammable stores?			
Are incompatible substances stored apart (e.g. flammables, oxidisers, combustibles, flammable gases, LPG)?			
Where appropriate, have storage areas been designed to provide explosion relief or resistance?			

## Emergency Procedures

	Yes	No	N/A
Have suitable emergency procedures been developed and communicated to personnel to deal with adverse process conditions (e.g. exceeding limits of temperature, or other control settings)?			
Have suitable emergency procedures been developed and communicated to personnel to deal with fire and evacuation?			
Have suitable emergency procedures been developed and communicated to personnel to deal with a spillage of dangerous substances?			

## Waste disposal

	Yes	No
Has the University Hazardous Waste Officer been consulted on measures that can be taken to minimise the waste generation and safely dispose of any waste		
Have suitable procedures been developed communicated to personnel and implemented to deal with the safe transport and disposal of dangerous substances?		

## Information, instruction and training

	Yes	No
Has appropriate information instruction and training, commensurate with the hazard potential of the dangerous substances, or process been provided to personnel as regards; product detail, hazard, risk reduction methods to be employed, management systems to be followed, emergency systems, etc.?		

**Where any questions relevant to a dangerous substance being used produced handled or stored has returned a “no” response, the subject area should be revisited to ensure that all required and reasonably practicable risk reducing methods have been implemented.**

## Conclusion

The risk(s) from the hazard potential of the dangerous substances and/or explosive atmospheres identified in this risk assessment have been reduced to the lowest possible level reasonably practicable. Is this the case?

Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
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If the answer is “no” then a reassessment must be carried out to determine what steps can be taken to reduce the risk further.

**Name of assessor**

\_\_\_\_\_











**Signature** \_\_\_\_\_

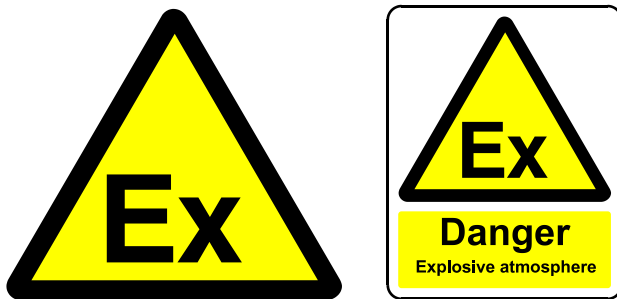
**Date** \_\_\_\_\_

**Date review/reassessment required** \_\_\_\_\_

**The assessor must sign above and then proceed to the next page to prepare or attach a Safe System of Work. This Safe System of Work must be signed by all staff or students who are using the substance(s) or process assessed above.**

**Appendix 2- Warning pictograms on dangerous substance containers**

Physical Hazards				
				
Explosive	Flammable	Oxidising	Compressed Gas	Corrosive to metals
Health Hazards				Env. Hazards
				
Acutely Toxic	Corrosive	Less Serious Hazard	Long Term Health Effects	Damaging to the Aquatic Environment



"EX" sign



Gas, mist, fume, vapour



Combustible Dust

**Examples of supplementary zone classification signs**