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### **Executive Summary**

1. The Dangerous Substances and Explosive Atmospheres Regulations are concerned with protection against risks from fire and explosion.
2. The key requirements of the Regulations are that risks from dangerous substances are assessed and eliminated or reduced.
3. Principal Investigators are responsible for the implementation of effective risk assessment for work within their control
4. Heads of Department are responsible for the safe use of flammable liquid stores within their area of responsibility

### Introduction

#### What is DSEAR?

The Dangerous Substances and Explosive Atmospheres Regulations 2002<sup>1</sup>, known by the acronym DSEAR, aim to protect people from the risks 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). DSEAR has removed a large amount of old health and safety legislation on flammable substances, for example the Highly Flammable Liquids and Liquefied Petroleum Gases Regulations 1972.

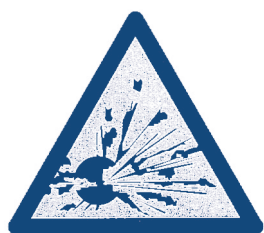
Examples of Dangerous substances include:

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 (the list is not exhaustive, but offered as examples)

- Storage of petrol and LPG as a fuel for cars, boats, horticultural 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, reagents;
- Storage, use and handling of flammable gases, including LPG;
- Transport of flammable liquids in containers around the workplace;
- Chemical or gas manufacture resulting from research or teaching

Some definitions from the Regulations are given in Appendix 1. In summary, 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. Such substances that are bought in commercially will be recognised by the standard pictograms on the container, e.g.



**Explosive**



**Oxidising**



**Flammable**

<sup>1</sup> SI 2002 No 2776 See the regulations at <http://194.128.65.3/si/si2002/20022776.htm>

### **Relationship with other health and safety legislation**

The duties in DSEAR apply alongside the Health and Safety at Work Act and other Regulations made under the Act, and especially legislation on fire precautions. The following paragraphs explain the interface between DSEAR and some key pieces of legislation.

**The Management of Health and Safety at Work Regulations 1999** ('the Management Regulations') support the general duties under the Act. The Management Regulations require employers, amongst other things, to: assess the general risks to health and safety arising from their work activity; identify the preventive and protective measures that need to be taken to control the identified risks; introduce procedures for serious and imminent danger; and to provide information and training for employees.

Where dangerous substances are present or used at the workplace the more specific provisions of DSEAR will apply to work with those substances. For example, an assessment of the risks from dangerous substances carried out under DSEAR will not need to be repeated for the Management Regulations, and in many cases will be incorporated into the more general risk assessment. Similarly, the provisions in DSEAR concerning arrangements for emergencies involving dangerous substances will generally be sufficient to fulfill the corresponding general requirements for such procedures in the Management Regulations.

### **The Control of Substances Hazardous to Health Regulations 2002**

Health risks from substances are controlled primarily by the Control of Substances Hazardous to Health Regulations (COSHH).

The definitions of "dangerous substance" and "substance hazardous to health" contained in DSEAR and COSHH respectively, cover a wide range of substances. As a result, some substances that may be dangerous to safety could also present a health risk.

For example, certain gases (e.g. hydrogen, methane, propane, etc) are extremely flammable and come within the scope of DSEAR. However, the gases themselves can also act as asphyxiants, reducing the quantity of oxygen present in a workplace to the extent that life can be put at risk. As a result, they will also satisfy the definition of a substance hazardous to health for the purposes of COSHH. Therefore, where substances that could result in a risk to both safety and health are present, employers have duties to control the risks from those substances under both sets of Regulations.

**DSEAR are a complex set of regulations. Not only is the text complex, but the regulations are supported by a set of five Approved Codes of Practice. This document is of necessity a summary of the major points that are perceived by SEPS are being common to science-based departments in the University. It is the responsibility of Principal Investigators and Heads of Department to ensure that all work within their area of responsibility to which DSEAR applies is compliant with the regulations.**

**Risk assessment is the key to compliance with DSEAR. A model assessment form is given at the end of this document. If compliance with DSEAR is the overriding consideration, i.e. flammability risks predominate, this form should be used. If toxic risks predominate, the assessment form from the University's guidance on the COSHH regulations should be used, with a note to the effect that flammability/explosive risks have been addressed too.**

### Risk Assessment and Control of Dangerous Substances

#### Introduction

The purpose of risk assessment is to enable the University to decide what 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 controls are implemented.

The term 'dangerous substance' covers any substance or preparation that could cause harm to people from fire or explosion as a result of its properties or the way it is used. This includes, for example, petrol, LPG, paints, varnishes, solvents, and dusts that could cause an explosive atmosphere with air.

The key requirements of the Regulations are to:

- Assess the risks from dangerous substances;
- Provide measures to eliminate those risks, or reduce them so far as is reasonably practicable;
- Provide equipment and procedures to deal with accidents and emergencies; and
- Provide information and training to employees.

In addition, if there are places where hazardous explosive atmospheres may be present then those places must be classified into zones and marked where necessary. Any new electrical or mechanical equipment used in those zoned places must comply with the requirements of the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996 (EPS).

#### Risk Assessment under DSEAR

The risk assessment under DSEAR is intended to build upon that already required by the Management of Health and Safety at Work Regulations 1999. It should be an identification and examination of the dangerous substances that are (or could be) present, the associated work activities and an analysis of what could go wrong, leading to a fire or explosion. Please refer to Appendix 5.

Responsibility for ensuring risk assessments are completed lies with the Principal Investigator of the work in question. For activities based on departmental work, such as the ownership of a flammable liquid store, responsibility lies with the Head of Department.

As preliminary step, if the assessor quickly comes to the conclusion that hazards from dangerous substance are not present or unlikely to occur no further action is necessary. However, typically in a scientific department, the following steps will be required.

**STEP 1** - Check whether the substance has been classified under the Chemicals (Hazard Information and Packaging for Supply) Regulations<sup>2</sup> (CHIP) as: explosive, oxidising, extremely flammable, highly flammable or flammable. The CHIP Regulations require dangerous substances to be classified by suppliers using criteria set out in the *"Approved Guide to the Classification and Labelling of Substances and Preparations Dangerous for Supply"*<sup>3</sup> into certain categories of danger. **If a substance or preparation is classified as explosive, oxidising, extremely flammable, highly flammable or flammable then it is a "dangerous substance"**

When dangerous substances are used at work, suppliers must provide safety data sheets (an MSDS) that indicate whether the chemical has been so classified.

<sup>2</sup> SI 2002 No 1689

<sup>3</sup> The Approved Supply List (6th Edition) ISBN 0 7176 1832 3

**STEP 2** - Assess the physical and chemical properties of the substance or preparation **and the work processes involved** to see whether that creates a potential for fire, explosion or similar energetic (energy releasing) event<sup>4</sup>. See Appendix 4 for the full definition as given in the Regulations, and Appendix 5 for the risk assessment *pro forma*.

Remember, the Regulations apply because of the way a substance is *used or present*. For example, diesel oil is not classified as “flammable” under CHIP. Nevertheless its physical properties are such that when heated to a high temperature it can present a fire and explosive risk. The key point is that it is not only the substance’s fundamental physical or chemical properties, but also the way the substance is used/ processed or present that determines whether DSEAR applies. Another example would be substances which on their own or when mixed with others decompose or react to release energy such that there could be a fire or explosion. Examples include certain chemical reactions with the potential for thermal runaway and the handling and storage of unstable substances such as certain types of peroxides. A risk assessment uses information about the physical and chemical properties of the substance and the characteristics of the work processes to determine whether there is a hazard and risk. **If the assessment of the work activity involving the substance or preparation shows that there is a risk of a fire, explosion or similar energetic (energy-releasing) event then the substance or preparation is “dangerous”.**

**STEP 3** - Check to see if the work activity involves the creation or handling of potentially combustible or explosive dusts

### Control and Mitigation

The most effective control to avoid the risk from dangerous substances is to remove them from the workplace, and DSEAR requires that efforts are made to avoid using dangerous substances where this is possible. 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. The nature of the work may mean that this is simply not possible - often the properties that make a substance useful or needed in a work activity or process also make it dangerous.

### Substitution and Risk Reduction

In practice 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. Care must be taken, however, whilst carrying out these steps so as to ensure that no other new safety or health risks are created or increased.

DSEAR also requires mitigation measures to be in place in case an incident occurs. These measures include:

- Preventing fires and explosion from spreading;
- Reducing the number of people exposed to a potential incident; and
- Providing equipment that can safely contain or suppress an explosion or vent it to a safe place.

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<sup>4</sup> It may be, however, that the properties of the substance or preparation are such that it meets the technical criteria for classification, but is exempt from CHIP. For example, a flammable solvent produced in a chemical process and then used again in another process on the same premises is exempt from CHIP. No labeling or provision of safety data sheets needs to be carried out. However, if that substance meets the technical criteria for “flammability” in the Approved Guide, DSEAR applies even though CHIP does not. **If a substance or preparation meets the criteria for classification as set out in the Approved Guide, it is a “dangerous substance” even if it is exempt from CHIP.**

**By: -**

- Reducing the quantity of dangerous substances to a minimum
- Avoiding or minimising releases
- Controlling releases at source
- Preventing the formation of an explosive atmosphere
- Collecting, containing and removing any releases to a safe place (e.g. by ventilation)
- Avoiding ignition sources
- Avoiding adverse conditions (e.g. exceeding the limits of temperature or control settings) that could lead to danger
- Keeping 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)

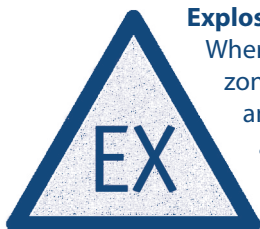
DSEAR also specifies that the measures taken to achieve the elimination or the reduction of risk should include:

- 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

### **Emergency Procedures**

DSEAR requires employers 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 risk assessment and where necessary, should include:

- Warning and communication systems;
- Escape facilities;
- Procedures for people to follow in the event of an incident;
- Appropriate protective equipment; and
- Practice drills.



### **Explosive Atmospheres and Classified Zones**

Where an explosive atmosphere may occur then such areas must be classified into zones, based on the likelihood and persistence of any such atmosphere. Once zoned, an area must be protected from sources of ignition. The points of entry to zoned areas should be marked with a specified "EX" sign where necessary for safety and employees working in zoned areas must be provided with appropriate anti-static clothing.

New electrical and mechanical equipment and protective systems used in a zoned area must comply with the EPS Regulations (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).

Before areas zoned under DSEAR are brought into operation the effectiveness of the overall explosion protection measures to each area must be formally verified.

### Appendix 1

#### Safe handling of flammable gases

Gases contained in cylinders are used for many different purposes such as in research work, for soldering, welding and flame cutting, and for extinguishing fires. They are safe when adequate risk control is in place but users and others sometimes suffer accidents if careful risk assessment has not been carried out. The main causes of accidents with gas cylinders are:

- Inadequate training and supervision of users;
- Poor installation;
- Poor examination and maintenance;
- Faulty equipment and/or design (e.g. badly fitted valves and regulators);
- Poor handling;
- Poor storage;
- Inadequately ventilated working conditions.

#### Users must ensure: -

- Staff who handle cylinders are properly trained
- Minimum numbers of cylinders are used and held in laboratories
- Cylinders are secured to walls or benches with chains or proprietary clamps
- Valves are not opened fully. Half a turn is sufficient to ensure optimum gas flow. (If fully open it becomes difficult to close in an emergency.)
- Risk assessments are carried out to determine the potential for an explosive atmosphere when using flammable gases.
- Adequate ventilation where flammable gases are used
- All obvious ignition sources are removed from handling areas
- Electrical items not in use are switched off and unplugged
- Storage areas for flammable gases are well ventilated.
- Cylinder valves are closed immediately when no longer needed
- Cylinders are transported in suitable cylinder trolleys by staff trained in manual handling techniques
- Acetylene cylinders are moved with the valve upright, or allowed to stand for at least 1 hour after moving and before use
- Acetylene equipment never contains copper. Acetylene reacts with silver, mercury and copper to form explosive acetylides
- Acetylene cylinders subject to excess pressure, impact or heat must be checked for temperature rise using the back of the bare hand as acetylene becomes unstable and potentially explosive. Never move or approach a cylinder subjected to excess heat.
- Staff are trained to fit regulators correctly
- Flashback arrestors are fitted to fuel regulators to give flashback protection
- Dry powder fire extinguishers are present in the workplace
- Skin is protected from liquid propane, which freezes skin on contact.
- Propane gas is only used with special resistant hoses (orange colour)
- Propane is never stored underground. Ensure good ventilation at low levels
- Propane cylinders are not exposed to excess heat
- Propane cylinders are always transported and used upright.
- Staff are aware hydrogen is highly flammable and ignites more easily than any other common gas. At high pressure it can self-ignite. It burns with an almost invisible flame.
- Everyone knows the emergency procedure in the event of a significant leak of flammable gas. Extinguish all flames and heat sources, do not switch electrical appliances on or off, get out and stay out. Alert Central Services on 4444.



### Golden rules of gas cylinder safety

<ul style="list-style-type: none"><li>• Never tamper with, attempt to repair, or disguise damage to, a cylinder or cylinder valve - report it</li></ul>
<ul style="list-style-type: none"><li>• Never transfer or “decant” gas from one cylinder to another</li></ul>
<ul style="list-style-type: none"><li>• Never subject cylinders to abnormally high or low temperatures, or mechanical shocks that could damage the valve or safety device.</li></ul>
<ul style="list-style-type: none"><li>• Never use cylinders as rollers or supports,</li></ul>
<ul style="list-style-type: none"><li>• Never rely on the colour of the cylinder to identify the contents - the label (below valve assembly) is the only sure means of identifying the gas inside the cylinder.</li></ul>
<ul style="list-style-type: none"><li>• Never apply PTFE tape, jointing compounds, lubrication or other sealing materials to valves to try to achieve a gas tight seal - if gas tight seal cannot be achieved, replace regulator or change cylinder.</li></ul>
<ul style="list-style-type: none"><li>• Oils or grease should never be allowed to contaminate oxygen regulators, cylinders, pipelines, valves or associated fittings, nor should they be handled by oily or greasy hands, gloves or rags</li></ul>
<ul style="list-style-type: none"><li>• Check “O” ring seals are in good condition; if not replace with approved part.</li></ul>
<ul style="list-style-type: none"><li>• An “empty” cylinder is never empty - it contains gas at atmospheric pressure!</li></ul>
<ul style="list-style-type: none"><li>• Before fitting regulator to cylinder - check valve for particles of dirt or water - use a clean dry cloth to remove any large deposits.</li></ul>
<ul style="list-style-type: none"><li>• Fuel gases are given a smell to aid leak detection. They also need oxygen and an ignition source for combustion to occur, but once started, are self-propagating. Explosive mixtures vary according to the gas, e.g. Acetylene = 2% - 82% and Propane = 2% - 10%.</li></ul>
<ul style="list-style-type: none"><li>• Handle regulators with care. Rough treatment can damage springs, diaphragms, valve seats and valves</li></ul>
<ul style="list-style-type: none"><li>• Regulators should only be used with the gas for which they were designed and labelled.</li></ul>
<ul style="list-style-type: none"><li>• Using incorrect or damaged regulators on high-pressure gases is potentially hazardous.</li></ul>
<ul style="list-style-type: none"><li>• Leave the pressure adjustment knob/screw fully out when the regulator is not in use</li></ul>
<ul style="list-style-type: none"><li>• Regulators must be serviced or replaced every 5 years, and inspected annually by a competent person and the inspection recorded.</li></ul>
<ul style="list-style-type: none"><li>• Air or nitrogen regulators must not be used with oxygen. Serious accidents have occurred when contaminated equipment has been used on oxygen systems.</li></ul>

### Appendix 2

#### Safe handling of flammable liquids

##### Users must ensure: -

- Minimum quantities only to be used, handled and stored
- Risk assessments are carried out to identify and minimise the potential for an explosive atmosphere when handling and using flammable liquids (required by DSEAR) as well as their health effects (required by COSHH)
- Adequate ventilation is provided where flammables are dispensed, used or stored
- All obvious ignition sources are removed from storage and handling areas
- Electrical items must be safe for use in the zone indicated, or they must be intrinsically safe for use in such areas.
- Nylon lab coats are not used due to potential static problems
- All flammable liquids are in suitable lidded containers and stored in clearly marked bins or cupboards away from other processes and storage areas
- Storage areas with significant solvent vapour present are marked "EX" and all electrical equipment within the storage area is "EX" rated
- Containers are closed, or lid put back on, immediately when not needed and returned to the proper storage bin or cupboard
- Glass containers of flammables are carried so that they cannot be dropped or broken by striking against each other or other items on trolleys - use a suitable carrier and/or plastic sleeves around individual bottles
- Dispensing from large drums to small containers is done by trained staff
- In laboratories, that liquids are dispensed in a fume cupboard over spillage trays and that you have a stock of inert absorbent material to mop up spills. Dispense larger quantities in a dispensary or outside
- Solvent contaminated clothing is removed and placed in fume cupboard immediately
- Rags and cloths used for mopping up spills are disposed of in metal containers with well fitting lids, or placed in fume cupboard, and removed from the workplace at the end of the day
- Dry powder fire extinguishers are present in the lab
- Everyone knows the emergency procedure in the event of a significant spillage of flammable liquid - extinguish all flames and heat sources, do not switch electrical appliances on or off, get out and stay out and alert Central Services on 4444

#### Operation of a Flammable Solvent Store

Most University flammable solvent stores are solely used to store unopened bottles of solvent as a buffer stock. These are issued as units when required. However, in a few solvent stores, dispensing is carried out. Although solvent stores may have mechanical ventilation, they are not provided with local extract ventilation to control emissions from processes such as dispensing. Mechanical ventilation, if installed, is there to prevent a build up of flammable vapour over a period from minor leaks from containers. In order to comply with the DSEAR Approved Code of Practice, alternative areas must be found for dispensing solvents safely, away from stored stocks.

*"Areas in and around storage facilities where explosive atmospheres could be formed should be designated as hazardous zones according to the principles of Hazardous Area Classification. The employer should implement measures to prevent the ignition of hazardous substances and the flammable atmospheres in the hazardous zones arising from their storage."*

The Hazardous Area Classification is based on how often an explosive atmosphere is likely to occur and how long it would be likely to persist. The safety standard necessary for any electrical equipment used in the area will be determined from this Classification. Guidance on storage of flammable liquids in containers is given in the HSE publication HS(G)51<sup>5</sup>. This indicates that the interior of flammable stores, flammable storage cupboards or bins must normally be regarded as a Zone 2 area. Only electrical equipment suitable for use in such a zone may be used. Other areas that may need to be zoned in this way may include oil tank housings, LPG storage facilities, and areas used for the storage of other flammable gases. If you are responsible for such areas, please consult SEPS for advice.

<sup>5</sup> The storage of flammable liquids in containers. ISBN 0 11 885533 6

Flammable solvent stores can only be used to store flammable solvents. No other materials can be allowed within the store. Means should be available to deal with any spillage occurring in the store. Adequate fire fighting equipment must be provided.

### **DO**

- Restrict access to authorised staff
- Keep stock to a minimum
- Rotate stock (first in, first out)
- Dispose of stock which has been stored for too long
- Check condition of labels and bottles on a regular basis
- Use carriers or trolleys when issuing stock
- Have the electrical fittings checked for safety annually
- Keep the floor clear of solvent bottles and empty boxes
- Keep the area outside clear of any flammable materials
- Keep supplies of absorbent materials, such as dry sand, to control spills in the store
- Keep suitable fire-fighting equipment in the store
- Prohibit smoking

### **DO NOT**

- Dispense solvents in the store
- Put bottles of solvent on shelves above shoulder level
- Allow any hot work to be done
- Allow any power tools to be used
- Allow any smoking next to the store
- Allow vehicles with running motors next to the store

The store must be kept maintained. Faulty lighting or mechanical ventilation should be reported and repaired. Water ingress or structural damage to the store should also be reported and made good. Some solvents, when exposed to the air and then left in stock, will form peroxides that can later explode in use. Common solvents that are prone to do this are ethers, tetrahydrofuran and methyl ethyl ketone. Thus bottles that have been opened and left for any length of time should be handled with caution and disposed of or treated to make them safe.





### Generic Risk Assessment - Operation of Solvent Store

**Department:**

**Location:**  
Solvent store

**Description of activity:**  
Storage of flammable solvents

**Persons at Risk**  
Stores personnel

**Operator training/supervision required:**

Manual handling, written procedure for dealing with spills, use of fire extinguisher

Hazards/ Risks	Current controls	Action Required
Flammability	Closed full containers  Only flammable solvents Ventilation  Spill control kit Fire extinguishers Flammables next to store Good housekeeping Trolley or carrier Rotation of stock	No dispensing or returns of part-used solvent No incompatibles allowed Check functional Check supply is present Check present and unused Check none present weekly Regular inspections No issue without these
Spill through breakage Leak from rusting drum		
Leak from seal deterioration Ignition sources	Regular inspection Regular inspection Rotation of stock	Dating of new stock, records Designated inspector, records Designated inspector, records
Formation of unstable peroxides Toxic solvents	Safe electrical system No Smoking No hot-work or tools	Dating of new stock Checked annually Signs
Generation of unknowns by label deterioration	Closed full containers Rotation of stock Closed full containers Ventilation Regular inspection Rotating stock	No unauthorised entry No returns of part-used solvent Dating of new stock, records No dispensing or returns of part-used solvent Check functional Designated inspector, records Dating of new stock, records

Assessment ref. number:

Assessed by:  (Give job title) Date:

Approved by:  (Give job title) Date:

## Self-Inspection Checklist for Flammable Solvent Store

Department

Location/name of store

Checklist	Yes	No	Comment
Is the store clear of clutter on the floor?			
Are all containers on shelves below shoulder height?			
Are the containers arranged neatly on shelves and all standing upright?			
Are all containers full and unopened?			
Are all containers in good condition, and clearly labelled?			
Are all containers less than 6 months old?			
Is the store free from the smell of solvents? If not check (a) ventilation (b) activities taking place in store (c) integrity of containers and seals.			
Is there any substance other than flammable solvents present in the store?			
Is there ample absorbent (sand etc.) available for tackling a spill?			
Are the fire extinguishers present and unused?			
Is the area outside, next to the store free from flammable materials?			
Is the area outside the store free from any activities taking place that could generate an ignition source (running motors, drilling, smoking etc)?			
Is the area outside the store free from anything that would be affected by a fire in the store?			
Fabric			
Is the store wind and watertight?			
Is the bund intact and watertight?			
Do all the lights work?			
If there is mechanical ventilation, does it work?			
Has the electrical equipment (light and extraction) been checked for safety in the last 12 months?			
Is the natural ventilation (by air bricks at high and low level) clear of obstruction?			
Are the warning safety signs still in place outside the store?			

Signature

Print Name

Date

### Appendix 3 - Definitions from the DSEAR Regulations, Reg. 2 - Interpretation

**“Dangerous substance”** means -

- (a) a substance or preparation which meets the criteria in the approved classification and labelling guide for classification as a substance or preparation which is explosive, oxidising, extremely flammable, highly flammable or flammable, whether or not that substance or preparation is classified under the CHIP<sup>6</sup> Regulations;
- (b) a substance or preparation which because of its physico-chemical 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 subparagraph (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 subparagraphs (a) or (b) above.

**“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;

**“Hazard”** means the physico-chemical or chemical property of a dangerous substance which has the potential to give rise to fire, explosion, or other events which can result in harmful physical effects of a kind similar to those which can be caused by fire or explosion, affecting the safety of a person.

**“Risk”** means the likelihood of a person's safety being affected by harmful physical effects being caused to him from fire, explosion or other events arising from the hazardous properties of a dangerous substance in connection with work and also the extent of that harm.

### Appendix 4 Risk Assessment under DSEAR

Risk assessment under DSEAR has to take a specific form: this is specified in the Regulations themselves. The requirements are repeated here for reference.

#### Regulations 5 -

- (1) Where a dangerous substance is or is liable to be present at the workplace, the employer shall make a suitable and sufficient assessment of the risks to his employees that arise from that substance.
- (2) The risk assessment shall include consideration of -
  - (a) The hazardous properties of the substance;
  - (b) Information on safety provided by the supplier, including information contained in any relevant safety data sheet;
  - (c) The circumstances of the work including -
    - (i) The work processes and substances used and their possible interactions;
    - (ii) The amount of the substance involved;
    - (iii) Where the work will involve more than one dangerous substance, the risk presented by such substances in combination; and
    - (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 measures which have been or will be taken pursuant to these Regulations;
  - (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 and effective;
  - (h) The scale of the anticipated effects of a fire or an explosion;
  - (i) Any places which are or can be connected via openings to places in which explosive atmospheres may occur; and
  - (j) Such additional safety information as the employer may need in order to complete the risk assessment.

<sup>6</sup> The Chemicals (Hazard Information and Packaging for Supply) Regulations 2002 (SI 2002 No 1689). See them at <http://194.128.65.3/si/si2002/20021689.htm>

### **Risk Assessments Under DSEAR**

The purpose of risk assessment is essentially to take cognizance of the hazards inherent in a work process, not the precautions already in place, and guide the decision-making process as to whether more needs to be done to assure continued safety. DSEAR makes no distinction as to the scale of the hazard, but in the University, many users of flammable liquids may use quite small quantities - a few millilitres in a sample, say. Equally a large flammable liquid store may contain hundreds of litres.

The formal risk assessment process is complicated by the fact that most users will already be familiar with the risk assessment requirements of the COSHH Regulations. As will have been noted, DSEAR expands on the scope of the risk assessment requirements with chemicals.

It is not intended that users of chemicals necessarily complete both a COSHH and a DSEAR risk assessment form. It will often be the case that the toxic hazard or the flammability predominates. That being so, the relevant risk assessment form, COSHH or DSEAR, should be completed, and a note made that other hazards have been considered. If this is not a true reflection of the situation then both forms ought to be completed; it is for the Principal Investigator to decide which form(s) are appropriate in the circumstances of each case.





**Appendix 5**  
**Dangerous Substances and Explosive Atmospheres Regulations 2002 - Risk Assessment**

Department

Date

*This form may be considered an addendum to the University COSHH risk assessment form, or a stand-alone risk assessment under DSEAR and the Management of Health and Safety at Work Regulations 1999.*

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

- Explosive
- Oxidising
- Extremely Flammable  
(Or has a flash point lower than 32°C. Or, that release of vapour or gas may produce an explosive atmosphere)
- Highly Flammable
- Flammable

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

- Explosive
- Oxidising
- Extremely Flammable  
(Or has a flash point lower than 32°C. Or, that release of vapour or gas may produce an explosive atmosphere)
- Highly Flammable
- Flammable

If **No** has been answered to all the questions above, you may finish at this point. Otherwise continue

Note here the names of the products being handled, stored or produced.

Note here how a system of work, or activity could fail and give rise to fire or explosion. Also note any sources of ignition.

**Control Measures** (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?			

Workplace or process and management systems, 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 are these 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?			
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
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

This risk(s) from the hazard potential of the dangerous substances and/or explosive atmospheres identified in this risk assessment must be reduced to the lowest possible level reasonably practicable.

Is this the case?

Yes

No

Name of assessor

Signature

Date

Date review required

### Safe System of Work (DSEAR)

As a result of the risk assessment under the Dangerous Substances and Explosive Atmospheres Regulations of the work process involving the following dangerous substance(s)

This includes their handling storage and ability, in the form they present in the work situation, to result in an explosive atmosphere, the following safe system of work (rules of work) **must** be observed and adhered to at all times.

--

*(Continue on another sheet if required)*

In the event of an emergency, actions laid out in the safe system of work that are designed to minimise damage to equipment or property should be undertaken **only** if this does not put yourself or others at risk: personal safety and that of others must take priority.

**I have read and understood the above safe system of work.**

Signature

Date

