The Dangerous Substances and Explosive Atmospheres Regulations 2002

Summary of requirements

The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) require employers to assess the risks from substances or preparations that may give rise to fire, explosion or other similar event. DSEAR applies if the following conditions are met –

- Work is being carried out by an employer in a workplace. 'Workplace' means any premise or part of a premise used for work, and includes industrial, commercial, educational and higher education premises, vehicles, vessels, roads, houses and other domestic dwellings and common parts of buildings, in every undertaking.
- A dangerous substance is present, or is liable to become present, for example, a chemical reaction generates an unstable product, diesel fuel becomes vaporised in an area where sparks might occur.
- The dangerous substance presents a hazard to the safety of persons who may be affected, as opposed to their health.

The following classes of dangerous substances are covered –

- Oxidising;
- Extremely flammable;
- Highly flammable;
- Flammable;

Examples of dangerous substances include –

- Most common organic solvents;
- Flammable gases; Acetylene; Oxygen; Helium etc;
- Petrol;
- Varnishes;
- LPG;
- Kerosene;
- Styrene monomer;
- Acryl amide monomer;
- Fine dusts that when spread in air to form a cloud and form an explosive atmosphere;
- Any other substances, or mixtures of substances, which because of their physical properties create a risk to safety from fires and explosions;

Examples of activities to which DSEAR may apply -

- Storage of petrol as a fuel for cars, boats or horticultural machinery;
- Use of flammable gases, such as acetylene, for welding;
- Handling and storage of waste dusts in a range of manufacturing industries;
- Handling and storage of flammable wastes such as fuel oils;
- Welding or other 'hot work' on tanks and drums that have contained flammable material;
- Work that could release naturally occurring flammable substances such as methane in coalmines or at landfill sites;
- Use of flammable solvents in laboratories;
- Storage and display of flammable goods, such as paints, in shops;
- Filling, storing and handling aerosols with flammable propellants such as LPG;
- Transporting flammable substances in containers around a workplace;
- Deliveries from road tankers, such as petrol and bulk powders;
- Chemical manufacturing, processing and warehousing;
- Experimental or research work with the potential for 'thermal runaway' chemical reactions.
- Chemical or gas manufacture resulting from research or teaching;

Roles and responsibilities

The assessment of risk and implementation of any control measures under DSEAR is the responsibility of the Head of the School or Department. While the responsibility associated with this duty cannot be passed to others, the task of implementation can be formally delegated to a nominated competent person.

Assessing risks

Before work is carried out, employers must assess the fire and explosion risks that may be caused by dangerous substances. The purpose of the assessment process is to help employers to decide what they need to do to eliminate or reduce the risks from dangerous substances and should take account of-

- Dangerous substances in the workplace;
- The work activities involving those substances;

- The ways in which those substances and work activities could harm people;

If there is no risk to safety from fires and explosions, or the risk is trivial, then no further action is needed. However, if there are risks then employers must consider what else needs to be done eliminate or control these risks in order to comply with the requirements of DSEAR.

Mitigating risks

The well known and accepted hierarchy of risk control is the foundation used by DSEAR, the application of all or some of the following can be shown to reduce the risk -

- Elimination/substitution – where a dangerous substance is considered for use, consider if safer materials might be used;
- Reduction in quantity to minimise consequence;
- Avoidance of release/containment – see whether any containment method can be used e.g. sealed systems, but beware that in attempting to contain the process, the containment, if it fails, does not contribute to the severity of the dangerous occurrence. e.g. a fume cupboard will contribute to avoidance of release, but will not, unless specially designed, contain a fire or explosion;
- Control the process at source – keep tight control over the process dynamics;
- Prevent explosive atmospheres from developing – use efficient ventilation;
- Avoid build up of potentially dangerous materials - by correct storage, collection and disposal;
- Remove potential for ignition – remove electrical equipment which is not safe, but also remember to consider auto-ignition, materials with very low ignition temperatures etc. Intrinsically safe / flameproof equipment may be required.
- Clothing that does not create the risk of an electrostatic discharge igniting an explosive atmosphere, e.g. anti-static footwear may also be required, the clothing provided depends on the level of risk identified in the risk;
- Segregate potentially reactive materials;
- Care in storage and weighing out of materials;
- Reduce the number of persons who might be affected by an uncontrolled event – either remove the people from the reaction or remove the reaction;
- Avoid the propagation of an uncontrolled reaction – by using more than one of the steps already outlined in combination;
- Provide explosion relief where practicable;
- Provide suppression – by working in, or cloaking the reaction with inert atmospheres;
- Provide intrinsically safe / flameproof / pressure resistant equipment;
- Permit–to–work systems and area access permits should also be used as part of any risk assessment and mitigation programme e.g. Hot work permits;

Guidance for completion of a DSEAR risk assessment

The assessment tools provided within this guidance comprises a number of parts -

- **Appendix 1** - Template assessment to ascertain whether DSEAR applies to an area;
- **Appendix 2** - Detailed template assessment & zone classification where DSEAR applies;
- **Appendix 3** – Guidance for the assessment for laboratory work with flammable materials;

Classification of places (zones) where flammable atmospheres may occur

Zone 0 A place where an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas vapour or mist is present continuously or for long periods or frequently.	**Zone 20** A place where an explosive atmosphere consisting of a cloud of combustible dust in air is present continuously or for long periods or frequently.
Zone 1 A place where an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas vapour or mist is likely to occur in normal operation occasionally.	**Zone 21** A place where an explosive atmosphere consisting of a cloud of combustible dust in air is likely to occur in normal operation occasionally.
Zone 2 A place where an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas vapour or mist is not likely to occur in normal operation, but, if it does occur, will persist for a short period only.	**Zone 22** A place where an explosive atmosphere consisting of a cloud of combustible dust in air is not likely to occur in normal operation, but, if it does occur, will persist for a short period only.

Note

1. 'Normal operation' means a foreseeable situation arising when installations are used within their design parameters.
2. Layers, deposits and heaps of combustible dust must be considered as a potential fuel source which can form an explosive or secondary explosive atmosphere.

Interpretation of area classifications

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

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

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

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

Marking of the hazardous area

The extent of any hazardous zones identified must be clearly marked with the appropriate pictogram, and a clearly identified zone category.

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Selection of equipment for use in explosive atmospheres

It is important that any equipment is suitable for the zone in which it is to be used, electrical and mechanical equipment suitable for use in the zones identified above must be used as part of the equipment and protective systems employed.

As well as the standard 'CE' marking which ensures uniformity of compliance, a second mark is affixed to indicate that the equipment is suitable for use in explosive atmospheres.

Two equipment groups are specified, one for use in mines (designated group I, and prefixed with M), and one general group.

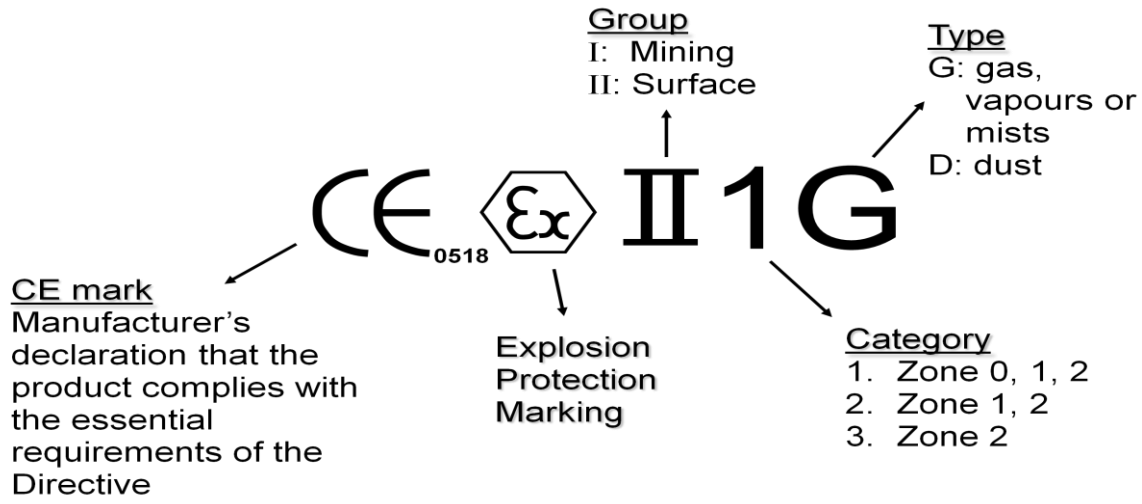
Within the general group (designated equipment group II), there are three categories -

- **Category 1** is suitable for use in all atmospheres including those where a permanently explosive atmosphere is present.
-
- **Category 2** is suitable for atmospheres where explosive atmospheres are likely to occur occasionally in normal operation.

- **Category 3** is suitable for use in atmospheres where the risk of explosion is low, or where explosive atmospheres are likely to be of very short duration.

As well as this categorisation, a letter D (dust) or G (gas) is appended.

The following data plate is typical of how the above categorisations would be notated on equipment. This particular mark indicates that the equipment is suitable for use in an explosive atmosphere, but not in a mine, where the atmosphere is constantly present and is caused by a gas.



The category group markings relate to particular zones as follows

Zone		Category
0		**II 1 G** only
1		**II 1 G** or **II 2 G**
2		**II 1 G**, **II 2 G** or **II 3 G**

Zone		Category
20		**II 1 D** only
21		**II 1 D** or **II 2 D**
22		**II 1 D**, **II 2 D** or **II 3 D**

The Dangerous Substances and Explosive Atmospheres Regulations also impose a duty to maintain any installed certified electrical / mechanical equipment and protective systems intended for use in explosive atmospheres. This will usually require specialist skills to complete.

Pressure Vessels and Pipe work

All pipe work conveying flammable gases must be marked appropriately so that the contents can be identified.

Gas cylinders stored within an area assessed as being a fire risk must be considered in the overall assessment for the area e.g. oxygen, acetylene, propane in welding areas with other flammables used during test rig operation or vehicle repair.

The contents of some pressure vessels and pipe work may fall within the remit of DSEAR under failure conditions and fire.

Control of an emergency

In addition to normal standards of fire safety, where explosions may be a possibility, there must be -

- Emergency procedures relevant to the process, which have been adequately tested and the results of these tests noted;

- Provision of information which is relevant to the risks for that process, any mitigation in place, and all emergency procedures in place;
- Suitable warning systems, and rescue and responses systems appropriate to the scale of any predicted adverse outcome;
- Initial pre-explosion condition warning where appropriate e.g. Lower Explosive Limit (LEL) monitoring;

These responses must be appropriate to the nature of risk, and in the case of very large, potentially devastating processes, Control of Major Accident Hazard legislation (COMAH) set's out in detail the requirements. In the more ambiguous situation of, say a research laboratory, the effects can be just as problematic, and satisfying these requirements might seem 'over the top'; however the prudent manager will have systems in place, or be confident that University systems are available in this eventuality.

In the event of any explosion, there must be in place -

- A plan to stabilise the situation and mitigate appropriately any other effects;
- A plan for restoration of the situation to normality;
- An information system for employees (and others) who might be affected by the explosion or fire;

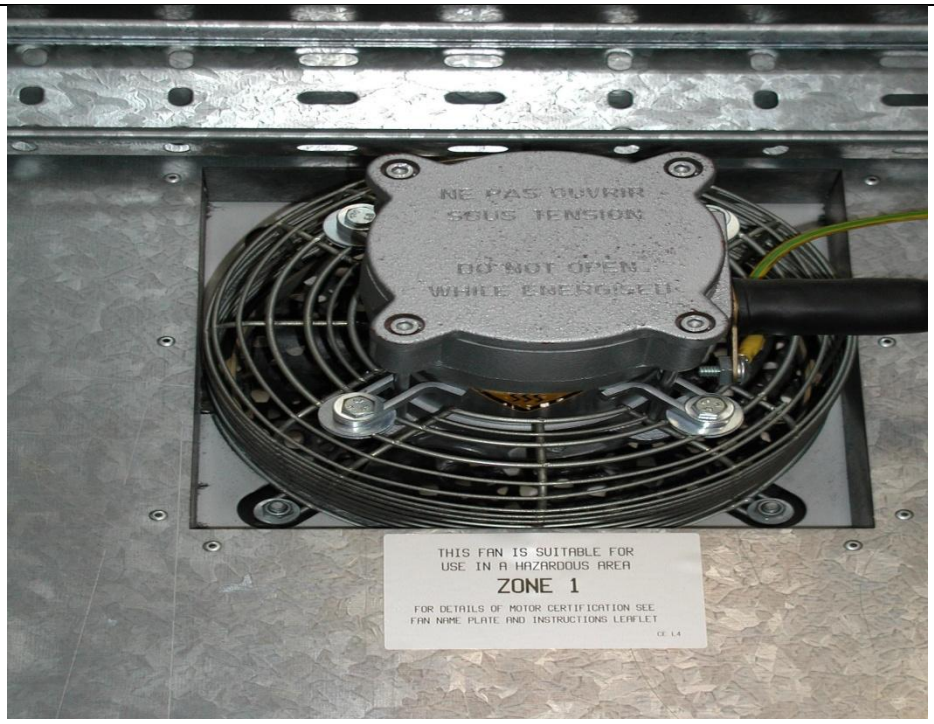
Building design considerations

The construction of any storage areas for dangerous substances should be satisfactory for the substances intended to be stored -

- Incompatible materials should be well segregated;
- Flammable solvents not be stored in close proximity to materials which could react to start a fire, or initiate an explosion in the area;
- Adequately bunded where required;
- Weatherproof, as appropriate (some gas storage is designed to be open at the sides, but has a lightweight roof);
- Adequately ventilated, either by an approved method of cross-ventilation or by suitable mechanical ventilation;
- It is recommended that for natural ventilation a minimum of five air changes per hour be achieved - the total area of air admittance apertures should be between 1 and 3% of the total wall and roof area (HSG51 - ISBN 0717614719);
- Accessible satisfactorily for normal access and egress, and for appropriate manual handling during acceptance and issue of material stored there;
- Pressure relief built into the structure - this may be by incorporating louvres into doors or walls, fitting a low resistance roof or pressure relieving panels into walls or roof;
- Intrinsically safe / flameproof equipment and fittings installed as required;
- Suitable earth bonding points for racking and storage drums, and where appropriate, personnel *via* a personal earth strap;

The following photographs illustrate some of these features.

	This photograph illustrates partial ventilation and potential pressure relief by the fitting of secure Louvre doors to the storage area. The two stores are used to segregate incompatible materials
	Side view of the store above showing adequate unobstructed cross-ventilation grilles.
	This store has a roof which is designed to relieve a build-up of pressure in an explosion. Also visible in the side wall are air vents at high and low level to aid ventilation and the elevated threshold to the entrance forming part of the

	containing bund.
	This shows the storage area for flammable materials in containers ready for issue - the floor is bunded, and the unit is well lit. Note the flame proof heater fitted to the wall. This area has a high level fan fitted to clear any vapour should the need arise.
	The high level fan fitted in the storage area - it is marked with a label on the wall of the store as being suitable for zone 1 use. The store is adequately cross-ventilated, and this fan would assist the natural ventilation in the event of a spillage - the controls are mounted externally

	Decant and dispense area of the bulk storage area - built to the same standard as that shown above, but used primarily for accumulation and bulking of waste solvents, including flammables - the hood is exhausted via an externally mounted fan stack, controlled from outside the unit.
	Gas storage at the side of a busy road - this storage facility has a lightweight roof, louvered doors and open grilled steel door to either end. Note the barriers to protect both the storage facility and the cylinder handling area from traffic.

	Another gas facility in a less used area - this is more open to the weather, but has a solid lightweight roof. This gas facility has cylinders which are permanently piped into laboratory supplies - cylinders are delivered to this point and used from there - less manual handling is required.

Management considerations

In normal operation, access to any storage area should be strictly controlled, staff with access should be fully aware of any health and safety issues which have arisen from any relevant risk assessment (including that arising out of DSEAR), and understand what emergency actions are required should the need arise.

In operation, there should be strict procedures should be in place for -

- Receipt and issue of bulk materials;
- Decanting or dispensing into smaller containers;
- Dealing with minor spills (including use and disposal of absorbent granules, absorbent 'pigs' etc.);
- Ensuring that where minor spills occur during decanting or dispensing, these are soaked up with absorbent materials which are disposed of safely in a well ventilated area;
  Venting of emptied bulk containers and drums;
  Defined procedures in the event of fire;
- Defined procedures in the event that a person is overcome by gas, vapour or dust;
- Discouraging the practice of decanting from 25 litre drums into smaller containers, but it is recognised that potentially there are large cost implications in doing so;
- Ensuring that where decanting is unavoidable, the generation of vapours should be reflected in the final DSEAR area assessment, depending on how long the vapour will persist in the surrounding atmosphere before dispersal. It may be possible to use dispensing equipment, such as siphon pumps to transfer material to smaller containers, though this process may be more time consuming than decanting;
- Ensuring that materials with very low flash or auto-ignition points e.g. diethyl ether, very low boiling point hydrocarbons etc. should, as a rule, be procured in containers of no more that 2.5 litres, and these should be issued unopened from this store;

- Where prolonged storage of certain materials is envisaged, remember that some compounds can deteriorate on standing to form potentially explosive by-products e.g. peroxides. Storage of such materials should be closely controlled to ensure even turnover in use, and appropriate disposal before peroxides can form;
- Bulk solvents such as acetone and industrial alcohol can be dispensed readily from larger containers, but the containers should be earthed before opening to avoid ignition by static discharge. Bear in mind that the act of dispensing the liquid can, in certain cases, lead to static build-up and discharge. It may be necessary for the operative to wear a static discharge lead while carrying out this task;
- Efficiency that the efficiency of the ventilation process will affect the assessment; where natural cross-venting is the only means, the rate of air changes may be relatively slow. However, if efficient mechanical ventilation is present, the rate of air change is likely to be much faster;
- Recognition that in hot weather, the rate of evaporation of the solvent during decanting or from a spillage will be much higher than in cold weather, and therefore the formation of a potentially explosive atmosphere is likely to occur more rapidly;

Information instruction and training

The School or Department must provide information, instruction and training on the use, storage and disposal of materials in use.

Material Safety Data Sheets (MSDS) must be suitably interpreted for inclusion into the risk assessment, taking into account quantity, likelihood and extent of adverse reaction and appropriate deactivation and disposal of any waste material.

Any routinely used standard operating procedures must be checked to ensure that DSEAR is taken into account.

ALL other relevant legislative requirements must be taken into account at the time of risk assessment.

Any significant findings of risk assessment must be made available to anyone who may be affected by the process, all communications must be effective, and people must understand what they need to do in respect of any emergency response e.g. response to the alarm of fire.

Supporting legislation and guidance

- **L138** Dangerous Substances and Explosive Atmospheres Regulations 2002 - Approved Code of Practice - ISBN 0 7176 2203 7

Approved Codes of Practice (ACoPs) have been published to offer specific guidance in four high hazard situations, but these are not exhaustive.

The four supporting ACoP's cover -

- **L133** Unloading petrol from tankers - Approved Code of Practice - 0 7176 2197 9
- **L134** Design of plant, equipment and workplaces - Approved Code of Practice - 0 7176 2199 5
- **L135** Storage of dangerous substances - Approved Code of Practice - ISBN 0 7176 2200 2
- **L136** Control and mitigation - Approved Code of Practice - ISBN 0 7176 2201 0
- **L137** Safe maintenance, repair and cleaning procedures - Approved Code of Practice - ISBN 0 7176 2202 9

Other relevant guidance covering storage and use of flammable materials -

- **HSG 140** safe handling and use of flammable liquids
- **HSG 51** storage in containers – limit of 1/2 day's supply or 50 litres in metal cabinet in any workplace.

In some areas of research, specific guidance on a given situation may not be available; in such cases increased rigor within the risk assessment process would be required supported by relevant expert guidance.

Appendix 1 - Template assessment to ascertain whether DSEAR applies to an area

Area /Process / Equipment under Assessment

Room number	School/Department

Area /Process / Equipment	Campus

	Y	N	N/A
1. For any proprietary product (substance) used in the area, does the hazard information contained within the Material Safety Data Sheet, or on the labelling on the product packaging denote that it is, (or has)			
explosive			
oxidising			
extremely flammable			
highly flammable			
flammable			
a flash point lower than 32°C			
capable of release of sufficient vapour/gas which may produce an explosive atmosphere			

2. For any substance generated as a result of an in-house process, or as a by-product of such a process, is that substance (so far as may be deduced)

explosive			
oxidising			
extremely flammable			
highly flammable			
flammable			
a flash point lower than 32°C			
capable of release of sufficient vapour/gas which may produce an explosive atmosphere			

3. Does any substance held or used decompose or react exothermically with any other material present in the area?			

4. Has any work activity in this area given rise to a fire, explosion or release of a dangerous substance within the past five years. If yes, please give brief details and date below			

If the answer to all these questions is NO, then the risk assessment may be terminated here as DSEAR will not apply to this area unless use of materials changes significantly.

Otherwise please continue to Appendix 2 – detailed assessment

Signed as an accurate record by responsible person for the area under assessment	**Date**

Signed by competent assessor	**Date**

Appendix 2 – Detailed assessment & zone classification where DSEAR applies to an area

Area /Process / Equipment under Assessment

Room number	School/Department

Area /Process / Equipment	Campus

5. Storage and use of dangerous materials	Y	N	N/A	Comments / action required
1. Has the quantity of the dangerous substance held/used been reduced to a minimum?				
2. Have steps been taken to avoid, or minimise any releases (intentional or unintentional)?				
3. Have steps been taken to control releases at source?				
4. Have steps been taken to prevent the formation of an explosive atmosphere?				

5. Have steps been taken to collect, contain and remove any releases to a safe place (e.g. by ventilation)?				

6. Have steps been taken to avoid adverse operating conditions (e.g. exceeding the limits of temperature or other control settings)?				

7. Are incompatible substances kept apart in storage and, so far as is practicable, in use (e.g. oxidisers and combustibles)?				

8. Where dangerous materials are stored and used, have the number of employees exposed to the dangerous substances or explosive atmosphere been reduced to the minimum?				

9. Has plant been supplied that is explosion resistant?				

10. Is explosion suppression or relief provided on equipment?				

11. Have adequate measures been taken to control or minimise the spread of fire, or explosion?				

12. Has suitable personal Protective Equipment (PPE) been provided, and have operatives been trained how to wear it correctly?				

6. Workplace	**Y**	**N**	**N/A**	**Comments / action required**

1. Is the workplace designed, constructed and maintained so as to provide adequate fire-resistance and/or explosion relief?				

2. Is any assembly, construction, installation, rig, plant, equipment, protection system, etc., <u>designed</u> in such a manner as to minimise risk of fire and/or explosion?				

3. Is any such assembly, construction, installation, rig, plant, equipment, protection systems, etc., used in such a manner as to minimise risk of fire and/or explosion?				

4. Have appropriate safe systems of work, or other required procedural systems of organising work, been developed and communicated to the workforce?				

5. Is a permit to work scheme required for working with the substance(s), or in the work area, and are these strictly enforced?				

6. Are permit to work schemes strictly enforced in these areas?				

. Storage	**Y**	**N**	**N/A**	**Comments / action required**

1. Are all flammable substances kept in suitable fire resistant storage				
2. Are quantities of flammable materials in excess of 50ltrs total volume kept in this work area?				
3. Are quantities of flammable materials in excess of 50ltrs total volume kept in dedicated and appropriately protected flammable stores away from the workroom?				
4. Are incompatible substances stored apart from one another(e.g. flammables, oxidisers, combustibles, flammable gases, LPG)?				
5. Where appropriate have storage areas been designed to provide explosion				

relief/resistance?				

8. Emergency procedures	**Y**	**N**	**N/A**	**Comments / action required**
1. Have suitable emergency procedures been developed and communicated to the workforce to deal with adverse process conditions (e.g. exceeding limits of temperature, or other control settings)?				
2. Have suitable emergency procedures been developed and communicated to the workforce to deal with fire and evacuation?				
3. Have suitable emergency procedures been developed and communicated to the workforce to deal with the spillage of dangerous substances?				

9. Transport and waste disposal	**Y**	**N**	**N/A**	**Comments / action required**

1. Have suitable procedures been developed and communicated to the workforce and implemented to deal with the safe transport of dangerous substances?				

2. Have suitable procedures for waste disposal been developed and communicated to the workforce?				

10. Information, Instruction and Training	**Y**	**N**	**N/A**	**Comments / action required**
1. Has appropriate information, instruction and training, commensurate with the hazard potential of the dangerous substances, or process, been provided to the workers in the area. Eg. hazards, risk reduction methods to be employed, management systems to be followed, emergency systems, etc.?				
2. Are only trained and competent persons involved in work with dangerous substances?				
3. Is appropriate explanatory signage and guidance displayed in the area under assessment?				

Using information from above, you should now estimate whether or explosive atmosphere will or will not exist, and if it does, for how long. This information will be required to determine the zoning of the area.

Zone classification

(To be used only in conjunction with published guidance)

		Duration	Zone	Comments
Chemical / vapour	**Y / N**	**<1 min**	**No hazard**	
		Up to 15 min	**2**	

	Up to 1 hour	**1**	
	Over 1 hour	**0**	

Dust	**Y / N**	**<1 min**	**No hazard**	
		Up to 15 min	**22**	
		Up to 1 hour	**21**	
		Over 1 hour	**20**	

11. In the case of areas where a zone has been identified and classified…..	Y	N	N/A	Comments / action required
1. Where necessary have such classified zones and the extent of those zones been marked at their entry points with the specified 'EX' hazard warning sign?				
2. Are all areas classified into such 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?				
3. Are employees working in zoned areas provided with clothing that does not create a risk of electrostatic discharge?				

4. Have areas where explosive atmospheres may be present, before their first operation, been verified as being safe by a person, or organisation competent in the field of explosion protection?				

Record of assessment for compliance with the Dangerous Substances and Explosive Atmospheres Regulations 2002

Signed as an accurate record by responsible person for the area under assessment	**Date**

Appendix 3 – Guidance for the assessment for laboratory work where extremely or highly flammable materials are handled.

DSEAR requires an assessment of risk, as outlined in published guidance; the following model assessment is provided for undergraduate and postgraduate laboratories where **extremely or highly flammable materials** (ie. flammable materials) are handled.

If, for any reason, these criteria cannot be met, then a full risk assessment for DSEAR must be made.

The area / process or equipment can be deemed **non-hazardous** in 'normal' use, for the purposes of DSEAR, if -

- The least flammable material has been chosen for use, consistent with stated experimental aims.
- The total quantity of flammable materials held for routine use is below 50 litres or half a day's supply for normal use, whichever is the smaller.

When the area is in normal operation -

- All not in current use flammable materials are stored safely in purpose designed ventilated or flammable cabinets.
- Flammable materials in use and in storage are kept segregated from other incompatible and potentially dangerous substances.
- The minimum amounts of flammable materials are removed from safe storage, and are returned to safe storage as soon as necessary handling has taken place.
- The flammable materials are handled in a functioning fume cupboard wherever possible.
- Any electrically cooled or heated storage areas (used with flammable materials) have intrinsically safe thermostats and/or thermal cut-outs.

In addition a suitable general risk assessment of the procedure to be followed has been carried out, taking into account -

- Any relevant information provided in the material safety data sheets (msds).
- Use of the minimum quantity of any flammable material, consistent with the stated and authorised experimental aims.
- Use of satisfactory experimental containment e.g. Good quality, sound glassware or equipment for carrying out the experiment.
- Work carried out in a functioning fume cupboard to ensure that an explosive atmosphere is not allowed to build up around the equipment.
- Use of electrical equipment suitable for the purpose, and tested for electrical safety e.g. Use of a mantle with efficient temperature control rather than a hotplate for heating flasks.
- Minimal use of naked flames in the area.
- Suitable spillage control measures.
- Suitable waste de-activation and disposal procedures.
- Activities undertaken by competent staff.
- Local emergency arrangements are in place e.g.
    - Satisfactory fire risk assessment.
    - Means of summoning emergency aid.

In most cases, local safety guidance (or manual) and standard operational procedures will assist in meeting these requirements. Where any issue requires further investigation, contact your Departmental/School Safety Officer for further assistance.