UNIVERSITY OF SUSSEX

Health and Safety

Guidance on Completing DSEAR Assessments

DOCUMENT HISTORY

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Contents

1 PURPOSE 4
2 INTRODUCTION 4
3 RESPONSIBILITIES 4
3.1 Vice Chancellor 4
3.2 Heads of Schools / Directors of Professional Services Divisions 5
3.3 Principal Investigators, Line Managers and Technical Services Managers 5
3.4 All staff and Postgraduate Researchers 5
3.5 Estates Division 5
3.6 University Health & Safety Team 5
3.7 DSEAR Support Assessors 6
4 PROCEDURE 6
4.1 Identifying dangerous substances. 6
4.2 DSEAR Standard for laboratories 6
4.3 DSEAR Risk Assessment 7
4.4 Pre DSEAR Risk Assessment Questionnaire 7
4.4 Description of the project/activity and the type of ventilation (Risk Assessment Section 1.1) 8
4.5 Potential ignition sources present or possible (Risk Assessment Section 1.2) 8
4.6 Chemical Analysis (Risk Assessment Section 2) 9
4.6.1 Details of dangerous substances being handled, stored or produced (Risk Assessment Section 2.1) 9
4.6.2 Flammable gases, liquids and solids (Risk Assessment Sections 2.2, 2.3 and 2.4) 9
4.6.3 Frequency of use and who may be at risk? (Risk Assessment Sections 2.5 and 2.6) 10
4.7 Current control measures and mitigations (Risk Assessment Section 3) 11
4.8 Further control measures (Risk Assessment Section 4) 12
4.9 Hazardous Area Classification (Risk Assessment Section 5) 12
4.10 Hazardous Area Classification in laboratories 13
4.11 Labelling of pipes and containers 14
4.12 Assessing the risk using the risk matrix (Risk Assessment Section 6) 14
4.13 Sign off process (Risk Assessment Sections 7, 8 and 9) 15
4.13.1 Approval (Risk Assessment Section 7) 15
4.13.2 Verification (Risk Assessment Section 8) 15
4.13.3 Review (Risk Assessment Section 9) 17
4.13.4 Assessment Acknowledgement (Risk Assessment Section 10) 17
4.14 Third Parties 17
4.15 Emergency planning 17
4.16 Accidents, incidents and near misses 18
4.17 Monitoring and review 18
5 Contacts 19
6 REFERENCES 19

7 QUICK REFERENCE GUIDE 20

8 Appendix 1 – Determining whether a flammable liquid is capable of releasing sufficient vapour to produce an explosive atmosphere. 21

9 Appendix 2 – Flammability Classes for liquids, gases and solids 23

10 Appendix 3 – Guidance for completing section 3 of the 'Large Inventory' DSEAR Assessment 24

11 Appendix 4 – Chemical Compatibility Chart and Key 27

12 Appendix 5 – Estimating the extent of an EX Zone. 29

13 Appendix 6 – DSEAR Standard for laboratory work where flammable substances (Cat 1, 2, 3 and 4) are stored and handled. 30

14 Appendix 7 – Dangerous Substances Identification Sheet 32

14 Appendix 8 – List of Equipment for Area Classification 33

1 PURPOSE

This document provides guidance to Schools and Professional Service Divisions to support them in keeping staff, students and others safe, by eliminating or reducing the risk of a fire or explosion. This is managed by fulfilling duties under the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR). This guidance should be read in conjunction with the Dangerous Substances and Explosive Atmospheres Policy and the DSEAR risk assessment templates available from the Health and Safety Team's A-Z webpage.

2 INTRODUCTION

This section provides an overview of when and why you should follow this guidance.

DSEAR addresses the hazards and risks associated with dangerous substances (those displaying the pictograms shown in Figure 1).

Figure 1: Dangerous substance pictograms (Flammable, Compressed gas, Oxidiser, Explosive, Corrosive to metal)

The DSEAR regulations, university policy and this supporting guidance will apply to you if:

- A dangerous substance is present (or liable to be present) at your work location and in connection with your work.
- The dangerous substance/s could be a risk to the safety of people as a result of fires, explosions or similar energetic events or through corrosion to metal.

Dangerous substances are found in nearly all workplaces and include such things as solvents, paints, varnishes, flammable gases, wood dusts and pressurised gases. You should apply this guidance in any area of the university where a dangerous substance is, or is liable to be, used or present in connection with work. It covers dangerous substances that are purchased and those that are produced as part of a work process, such as those produced during a chemical reaction in a laboratory.

Following this guidance will ensure a consistent approach to looking after everyone's health and safety, by ensuring that those who work with dangerous substances carry out a risk assessment, put measures in place to control and mitigate the risk from dangerous substances, and carry out hazardous area classification where required. The guidance explains how to share these arrangements with those involved in the work, or who may be affected by it, and that training in DSEAR is provided. It also supports you in ensuring there are emergency procedures in place for responding to a DSEAR related incident or accident.

3 RESPONSIBILITIES

The DSEAR policy details the specific responsibilities of different groups of people at the university. This guidance document therefore provides a brief synopsis of each.

3.1 Vice Chancellor

The Vice Chancellor has overall responsibility and accountability for DSEAR at the university. They have delegated the management responsibility of fulfilling these requirements through the university's management structure. However, they retain accountability.

3.2 Heads of Schools / Directors of Professional Services Divisions

Heads of Schools and Directors of Professional Services Divisions have overall responsibility for ensuring that responsibilities delegated to them by the Vice Chanceller are fulfilled. They may themselves delegate some of these tasks to competent colleagues within their School or Division.

They need to oversee DSEAR in their School or Division, ensuring that dangerous substances are identified and that activities involving these are risk assessed. They must make sure that relevant people are informed about the outcomes of these risk assessments and that staff involved in working with such substances are trained. They must be reassured that explosive atmospheres, such as in a chemical store, are identified where required and managed effectively.

3.3 Principal Investigators, Line Managers and Technical Services Managers

Principal Investigators, Line Managers and Technical Services Managers are responsible for ensuring that tasks delegated to them relating to DSEAR are carried out. This will involve ensuring that dangerous substances are identified in the areas they are responsible for and that a DSEAR risk assessment is undertaken where required. They are responsible for ensuring that those they manage and that will be working with such substances are informed about the control measures that are in place to protect them and to ensure they attend DSEAR training.

They must ensure that where an explosive atmosphere is, or is likely to be, present that this is managed effectively and that emergency procedures are documented and communicated to those that will need to follow them. They need to ensure that their teams know how to report DSEAR related incidents, accidents and near misses and that DSEAR remains a point of discussion. If they arrange contractors to attend campus, they must also make sure that they inform the contractor of any DSEAR arrangements that will affect them, and also require the contractor to share DSEAR arrangements with them too, for example, if hot works are to be carried out.

3.4 All staff and Postgraduate Researchers

All staff and Post Graduate Researchers at the university, no matter what their grade, have a responsibility to support their managers and others in fulfilling their responsibilities under the DSEAR policy. This will involve following DSEAR risk assessments and procedures as directed, attending DSEAR training as directed and to ensure that suitable training is provided to students under their supervision. Staff and Postgraduate Researchers also have a responsibility to report any DSEAR related incidents, accidents and near misses to their line manager and on Sussex Direct. They must let their manager know if any arrangements put in place to manage DSEAR are not working effectively so that they can be reviewed.

3.5 Estates Division

The Estates Division are responsible for managing the Facilities Management (FM) contract with the FM provider and for addressing concerns that arise through this contract. Where refurbishments and other projects are taking place, and DSEAR is a risk in those areas, they must consult the University Health and Safety Team. For example, to discuss requirements around the ATEX rating of electrical installations and their certification by a CompEx certified contractor. They must also consult the team if projects are going to impact existing, or introduce new, DSEAR arrangements. Finally, the Estates Division must ensure works arranged on campus are reviewed prior to them starting, to make sure contractors are not introducing additional DSEAR risks. This then gives the opportunity for risk assessment if new DSEAR risks are likely to be introduced.

3.6 University Health & Safety Team

The University Health & Safety Team is responsible for providing advice and support relating to DSEAR. This includes the implementation of a process for carrying out risk assessment such as the provision of templates. The team can support those with the responsibility for carrying out risk assessments to do so. This will include ensuring that risk assessments address all the requirements of DSEAR and that DSEAR control measures and mitigations have been considered. The University Health and Safety Team also deliver DSEAR training, carry out audits and inspections periodically, investigate DSEAR related incidents, accidents and near misses and support the verification of low to medium residual risk DSEAR assessments.

3.7 DSEAR Support Assessors

Upon request, DSEAR Support Assessors can provide support to those with responsibility for carrying out DSEAR risk assessments in areas where DSEAR applies. Responsibility for carrying out the risk assessment remains with the responsible person, but the DSEAR Support Assessor can advise on the DSEAR risk assessment process and the application of the DSEAR control and mitigation hierarchies (see section 4.7 of this guidance document). DSEAR Support Assessors may provide technical guidance if they are competent to do so, otherwise technical guidance should be sought from Technical Services. DSEAR Support Assessors must have attended 'Introduction to COSHH and DSEAR' and 'DSEAR Assessor' training.

4 PROCEDURE

4.1 Identifying dangerous substances.

The first stage of managing the risks posed by dangerous substances is to identify where they are in your School or Division and the maximum quantities you will use and store. DSEAR requires you to consider all dangerous substances that are used and/or produced in relation to work. This includes any that you purchase and also those that are produced as a result of a process, such as an experiment in a lab.

A dangerous substance can be identified by checking if the packaging, or its Safety Data Sheet (SDS), shows any of the pictograms in Figure 1. Alternatively, if it is a substance that has been produced by an in-house process, the person who has produced it should be able to confirm whether the substance would be classified as a dangerous substance based on the substances used to produce it, similar and/or related substances, or where necessary by seeking specialist advice. Finally, you should also ensure you identify any pipework that transports dangerous substances, such as acetylene, and that you identify any systems that operate at high pressure. These systems may not necessarily carry a dangerous substance, but may cause an energetic event should they fail.

The way in which you identify dangerous substances can be done in a number of ways, but it is up to the School or Division to decide the best way to do this, that fits in with your way of working. For example, you could carry out a workplace inspection, with the sole aim of identifying dangerous substances, or you could send out a School/Division communication to colleagues with responsibility for workareas to collate the information. A form to help you keep track of dangerous substances you have identified is available under DSEAR on the Health & Safety A-Z webpage or in Appendix 7 of this guidance document.

4.2 DSEAR Standard for laboratories

Specifcally for laboratories, where flammable substances are handled, you can use the information you have obtained during your review of dangerous substances to make a decision on whether a full DSEAR assessment is required. In line with the University of Nottingham, the University of Sussex has adopted a DSEAR Standard (Appendix 6) for laboratories where flammable substances are handled.

If your laboratory meets all the points within the standard you will not need to carry out a full DSEAR risk assessment. If you are not able to meet all the points in the standard, you should discuss this with thhe Science Schools Health and Safety Team or Univeristy Health and Safety Team.

Although meeting the DSEAR Standard will not require you to carry out an assessment for your general work area, if you carry out processes that introduce a DSEAR risk above what the DSEAR standard covers,

you will need to carry out a full DSEAR assessment for those specific processes, for example, wood and metal work that creates dust, manifold gas systems etc.

For activities covered by the DSEAR Standard, it is expected that the controls for these are likely to be covered by relevant COSHH risk assessments. However, these control measures must be clearly identified as DSEAR control and mitigation measures within the relevant COSHH risk assessment.

4.3 DSEAR Risk Assessment

If your work area is not a laboratory, or you do not meet the requirements of the DSEAR Standard, you can use the information from your review of dangerous sunstances to carry out your DSEAR risk assessment. The purpose of the risk assessment is to methodically consider the dangerous substances you have and their properties. This allows you to assess how effective existing control measures are and to consider what additional ones may be required to eliminate, or further reduce, the risk. To assist you in your risk assessment, and to ensure you cover all the points you need to, you should use the DSEAR risk assessment templates available from the Health and Safety Team's A-Z under 'Dangerous substances and explosive atmospheres regulations (DSEAR)'. If you are risk assessing work areas and processes that use a number of dangerous substances, you should use the 'Large Inventory' template, for anything else, such as risk assessing Uninterruptible Power Supplies, you should use the 'Single Substance' template.

4.4 Pre DSEAR Risk Assessment Questionnaire

This section of the DSEAR risk assessment form must be completed to determine whether a full in-depth risk assessment is required.

You should answer the questions in this section based on all the substances that are being used and/or produced during the process you are reviewing, or that are used/produced within the work area, such as a lab or workshop.

To support you in answering the questions, you should refer to the substance's safety data sheet. This will help you determine which substances you are using or producing are classified as explosive, oxidising, flammable, a compressed gas or corrosive to metal. At this initial questionnaire stage of the assessment, you do not need to go into detail around the flammability category of the substances being considered, this is addressed in the chemical analysis section.

Consideration should be given to the flashpoint of the substances you are going to use or produce. As a reference, you should determine whether the substances have a flashpoint lower than 32°C. This is considered to be a hot summers day in the UK and has been benchmarked against other universities. If a substance does have a flashpoint lower than 32°C, it is capable of producing flammable vapours at ambient temperatures.

Finally, you should consider whether the substances you will be using or producing will be able to release sufficient vapour, gas or dust to form an explosive atmosphere. To support you in making this decision you can use a calculation (Appendix 1) specifically for calculating how much of a flammable liquid could evaporate before reaching 25% of the substance's lower explosive limit (LEL). This is based on the specific substance and the dimensions of the room you will be using or producing that substance in. DSEAR requires that 25% of the LEL is not exceeded in well-ventilated areas and that 10% of the LEL cannot be exceeded in confined spaces.

If none of the substances you will be using or producing are classified as explosive, oxidising, flammable, a compressed gas, corrosive to metal or capable of forming an explosive dust cloud, and you have answered 'no' to the flashpoint and explosive atmosphere questions, you do not need to go any further with the risk assessment. You should keep a copy of the pre-questionnaire with the associated COSHH risk assessment. If any of the substances are classified as dangerous and you have answered 'yes to any of the other questions, you will need to carry out a full DSEAR risk assessment by following the rest of the template.

4.4 Description of the project/activity and the type of ventilation (Risk Assessment Section 1.1)

In this section you should describe the process or workspace you will be risk assessing. There should be enough detail in this section to allow the reader to understand what it is that is being risk assessed. For example, if you are risk assessing a process, describe what is being done, why it is being done, where it is being carried out, when it will be carried out, how it will be carried out and who will be involved. If there is a COSHH risk assessment that covers the process, this should be referenced in this section as well.

If you are risk assessing a workspace, describe what it is e.g. lab, workshop etc. its dimensions, the number of people that will be using the space and what type of work will be carried out that has prompted the DSEAR risk assessment.

You should also describe the type of ventilation that will be in use during the process or in the general area. For example, will the process be carried out in a fume cupboard and does the room have natural ventilation or mechanical ventilation. If mechanical ventilation is in use, you should enquire with Sussex Estates & Facilities (SEF) to find out what air changes are expected in the room via the Service Centre (servicecentre@sef.fm).

Once confirmed, this detail should be included in this section of the risk assessment. If this information cannot be confirmed, you should note this in this section and assume poor ventilation (less than 5-10 air changes per hour) when considering control measures and mitigation measures through the rest of the risk assessment. Whatever type of ventilation serves the workspace, there should be a minimum of 5 air changes per hour.

4.5 Potential ignition sources present or possible (Risk Assessment Section 1.2)

This section requires you to consider all the ignition sources that are, or may be present, in the workspace you are assessing or that are, or may be present, during the process. Consider each of the seven categories and use the drop-down lists to select whether they are applicable to this assessment or not. Where they are applicable, you should list the relevant equipment and add any additional comments (Figure 2).

Figure 2: Example ignition sources

Ignition Source	Examples
Hot surfaces	Heat mantles, radiators, hot plates.
Electrical	Lighting, switches, mobile phones.
Mechanical	Grinders, fans, other moving parts of machinery.
Hot works/maintenance arrangements	Welding, tools that generate a spark such as power drills.
Static	People, clothing, footwear, friction of substances over other materials.
Naked flames	Bunsen burners, candles, lighters, smoking.
Lightning	Confirm whether the area is earthed.
Other	Self-heating, self-igniting substances.

4.6 Chemical Analysis (Risk Assessment Section 2)

This is the foundation to the DSEAR risk assessment process and allows you to consider the risks associated with the dangerous substances you will use and/or produce by reviewing their properties. You should consider the chemical properties of all the dangerous substances you have identified as this will help you decide what control measures and mitigations to put in place. Suggested properties such as boiling point, flammability category, density relative to air, auto ignition temperature, flashpoint, explosive limits, minimum ignition energy, gas group and temperature class are included on the template, however, if there are others that you think need to be considered, you should include these too.

4.6.1 Details of dangerous substances being handled, stored or produced (Risk Assessment Section 2.1)

In this section you should list all of the substances that will be used or produced. You should list the name of the substance, the quantity that will be present and select whether it is a solid, liquid or gas from the drop-down list. You must also use the substance's safety data sheet to identify the type of dangerous substance it has been classified as (explosive, oxidising, flammable, flammable compressed gas, oxidising compressed gas, corrosive to metal).

Finally you need to decide what severity rating to assign to the dangerous substance. This should be considered based on the flammability category of the substance, the amount that will be used or stored and by considering the consequences if it were to be involved in a fire or explosion, such as the types of injuries sustained and the number of people who may be affected. To help you make your decision, you can use the university's risk rating matrix in Appendix 1 of the risk assessment template. Use the drop-down list next to each substance to select the level of severity. You may have a range of severity levels selected once complete, you should keep the highest severity level in mind when considering control and mitigation measures.

4.6.2 Flammable gases, liquids and solids (Risk Assessment Sections 2.2, 2.3 and 2.4)

In sections 2.2, 2.3 and 2.4 you need to consider each substance and their chemical properties depending on whether they are a solid, liquid or gas. Properties to consider include boiling point, flammability class, density relative to air, auto ignition temperature, flashpoint, explosive limits, minimum ignition energy, gas group and temperature class (Figure 3). If any of these properties are not applicable to a particular substance, mark them as 'N/A'. If there are any properties that will impact the DSEAR assessment that are not included on the template, you should make note of these too.

These sections also require you to consider the hazard statements associated with the dangerous substances you use and/or produce. For the DSEAR risk assessment you only need to note the hazard statements specifically related to fire, explosion or corrosion to metal. This is because hazard statements related to health are considered through your COSHH risk assessment/s. Select the relevant H-statements from the dropdown lists by consulting the substance's safety data sheet.

Figure 3: Chemical property definitions	
Property	**Definition**
Boiling point	The temperature at which a liquid is turned to vapour. This may need to be considered if the substances you are working with have a boiling point at or below ambient temperature or the temperature control you have put in place for the work activity.
Flashpoint	The lowest temperature at which a substance gives off vapours in such quantities, that when mixed with air, combine to form a flammable mixture.
Flammability class	This replaces the previous classifications of extremely flammable, highly flammable and flammable. Flammability classes include Flammable Gases, Flammable Liquids and Flammable Solids. Please see Appendix 2 for a more detailed breakdown.
Vapour density relative to air	This helps you identify how heavy a gas, vapour or mist is. Air is given a vapour density of one. Therefore if the vapour density of a substance is less than one, this means it is lighter than air. If the vapour density is greater than one, this indicates the substance is heavier than air. This will allow you identify where an explosive atmosphere may be present and to consider whether high or low level ventilation is required.
Auto ignition temperature	The temperature at which the surface of a flammable substance reaches a point whereby the vapour pressure of the substance is so high that the arising gas-air mixture self-ignites without external assistance.
Explosive limits	Made up of the lower explosive limit (LEL) and upper explosive limit (UEL). This is the range in which a mixture of flammable vapour and air is actually flammable. Legally, you must remain no higher than 25% of the LEL of a substance.
Gas group	Flammable gases, vapours and mists are assigned a gas group based on the explosive pressure they generate and their minimum ignition energy (MIE). The groups are classified as IIA, IIB and IIC and identify the volatility of the substance, whereby IIA substances are the least volatile and IIC substances are the most.
Minimum ignition energy	A measure of how sensitive a flammable/explosive vapour or dust is to electrical spark ignition. Where a hazardous area has been classified, typically, if a substance has a gas group of IIB or IIC, and a MIE of less than 0.2mj, earth dissipating clothing and footwear should be worn. If the substances have a gas group of IIA and a MIE greater than 0.2mj, antistatic footwear should be worn (DSC Limited).
Temperature class	This is applied to electrical equipment and identifies the temperature at which the equipment will shut down to prevent a hot surface on the equipment from igniting a flammable atmosphere. The class is shown as a 'T' value i.e. T1-T6, where the temperature reached before shutdown decreases as the 'T' value increases. This helps you identify suitable equipment in flammable atmospheres when considering a substance's auto ignition temperature.

4.6.3 Frequency of use and who may be at risk? (Risk Assessment Sections 2.5 and 2.6)

In sections 2.5 and 2.6 of the DSEAR risk assessment template you need to state the frequency at which you will be using/producing the substances. For example, if a process is to be carried out once a week, you should select 'weekly'. If your assessment is covering a whole work area, you should select 'daily'.

You should also identify who may be at risk by selecting from the categories of people, for example, students, visitors etc. You should include how many people from each category could be at risk. In this section you should consider whether you can reduce the number of people who could be at risk. To aid

mitigation if there were to be a fire or explosion, you should be aiming for as few people as possible being in the work area or being part of the process.

4.7 Current control measures and mitigations (Risk Assessment Section 3)

The next step is to consider the control measures and mitigations that are already in place. This gives you an opportunity to assess whether these are suitable and sufficient, or if you will require additional ones to make sure the risk is reduced to as low as reasonably practicable.

Under DSEAR, a control measure is something that either eliminates, or reduces the chance, of a fire or explosion taking place. A mitigation is put in place to reduce the consequences of a fire or explosion that has occurred, despite control measures being in place.

The DSEAR risk assessment 'Inventory' template takes you through a question set to help you consider what is already in place and what additional measures may be needed. For each question you have the option to say if the question has been met, unmet or if it is not applicable to the work area or process you are assessing.

Where you identify that a question has been met, you should enter on to the template what is in place to meet the question. Where a question is unmet, you should state why on the template and add an action to meet the question in the action plan at the end of each section.

Where you identify further actions are required, it is important to assign each action to an individual, giving them a timeframe in which to complete it. For more detailed guidance on filling in this section of the DSEAR risk assessment, please see Appendix 3.

When considering control measures you must consider the DSEAR hierarchy of control measures. You must consider control measures in the order detailed below:

1) Reduce the quantity of dangerous substances to a minimum – Consider the substances you plan to use and decide if these can be eliminated or substituted for substances which are not dangerous, or are less dangerous. Consider how much you need for your activity and reduce this as far as practical, for example, by only keeping enough of a dangerous substance in your work area to support you for a day's work.
2) Avoid or minimise releases of dangerous substances – look at the entire work process and where possible, design the process so that issues that may result in the release of dangerous substances are removed or reduced. For example, you can reduce the amount of dangerous substance used or ensure the process is carried out in a fume hood or in a work area that has at least 5 air changes per hour.
3) Control releases of dangerous substances at source – For example, by ensuring lids are always put back on bottles of dangerous substances after each use. During heating processes, that don't require vapour to release, you could cover the vessel the substance is held in, to reduce the release of vapour at source.
4) Prevent the formation of a dangerous atmosphere – here you need to consider ventilation. If in a science lab, you should use suitable ventilation methods such as a fume hood or extract canopy. In other work areas it may be sufficient to ensure good natural ventilation by opening windows. There should be good general ventilation in the work area, wherever you will be working, this should be at least 5-10 air changes per hour.
5) Collect, contain and remove any releases to a safe place (for example, through ventilation) – similarly to point 4 above, good local exhaust ventilation in a lab will ensure that any releases are removed from the fume hood and released from stacks on the roof of the building.
6) Avoid ignition sources – where dangerous substances will be used you will need to consider ignition sources. Wherever possible these should be removed, or reduced by adapting them e.g. ATEX rated electrical equipment. The latter would only be required within an established EX Zone (see section 4.9).
7) Avoid adverse conditions (for example, exceeding the limits of temperature or control settings)

that could lead to danger – if a dangerous substance has a flashpoint of 26°C, consider how the temperature of the work area can be maintained below this to prevent flammable vapours being released from the substance.

8) Keep incompatible substances apart – consider storage arrangements and making sure that incompatible substances, such as acids and bases, are kept apart. You can use the chart and key in Appendix 4 to support you with this, or you can contact the DSEAR Technical Team (jp743@sussex.ac.uk) based in JMS Building.

When considering mitigation measures you should:

1) Reduce the number of people exposed to the risk – the fewer people involved in an activity or permitted in the area during the activity will mean less people affected should something go wrong.
2) Provide plant that is explosion resistant – If using equipment where there is a risk of explosion within it, it should be purchased from a reputable retailer and the specification checked to ensure it is suitable for what you intend to use it for.
3) Provide plant that is corrosion resistant – if you are using substances that are corrosive to metal, you should ensure that the materials of the equipment you use are suitable for those substances. For example, a metal cupboard used to store corrosive substances must be made of suitable materials to prevent it from degrading.
4) Provide explosion suppression or explosion relief equipment – If the risk assessment identifies that an explosion is a risk, there should be measures in place to suppress the explosion and explosion relief equipment fitted in the work area or on equipment to ensure the energy can be released safely.
5) Take measures to control or minimise the spread of fires or explosions – here you should consider the provision of fire fighting equipment, whether a fire risk assessment is in place for the work area and if any actions from this have been completed. You may need to consult the Fire Safety Team by contacting healthsafety@sussex.ac.uk to confirm these points for your assessment.
6) Provide suitable personal protective equipment – this may be required where there is a significant risk of fire, such as flame proof overalls, or antistatic footwear to reduce the chance of electrostatic ignition if a hazardous area has been established.

4.8 Further control measures (Risk Assessment Section 4)

This section prompts you to think about any further control measures that may be required to minimise risk when thinking about storage and disposal of dangerous substances. In section 4.1 you should detail the storage arrangements for your dangerous substances and in section 4.2 you should detail the waste disposal process for any dangerous substances. This may be transport of the dangerous substance to the designated waste store, or may mean contacting the DSEAR Technical Team at JMS Building.

The remaining parts of section 4 require you to think about emergency procedures that need to be in place to address any emergency situations involving your dangerous substances. You will need to find out who your emergency contacts are for your School or Division, for example, it may be a Principal Investigator (PI), someone in Technical Services or someone else. You should enquire with your line manager or Health & Safety Coordinator if you are unsure. You should also consider foreseeable emergency situations such as fire, and plan for a response to these. Where you have a planned response to a foreseeable emergency, this procedure needs to be communicated to all those who will be required to follow it and the procedure should be tested periodically to ensure everyone remains aware of what to do. For example, a quarterly test of the emergency procedures. For more guidance on foreseeable emergency procedures, please see section 4.15 of this guidance document. Lastly, you should detail on the assessment what training people will require who will be working with dangerous substances.

4.9 Hazardous Area Classification (Risk Assessment Section 5)

Where there is a possibility that an explosive atmosphere could be present in the work area or during a

process, this area must be EX zoned. This requires you to identify the type of zone that is present and its extent, allowing you to make decisions around the types of control measures required to eliminate, or reduce as far as reasonably practicable, the ignition sources within the zone. There is specific guidance around hazardous area classification in laboratories, which is detailed in Section 4.10.

Depending on the substances present, you should decide what type of release is possible i.e. continuous, primary or secondary and zone areas using the classifications in Figure 4.

Once you have classified a zone, you must also estimate the extent of it. This can be done by using data regarding the substances concerned and applying it in a formula available from British Standard BS EN 60079. To support you in making these estimations of the extent of a hazardous area, you can follow the guidance in Appendix 5.

Once you know the estimated extent of the zone, you can identify ignition sources that need to be controlled within it. For example, if a plug socket is positioned within your hazardous area, this would need to be upgraded to an ATEX rated plug socket and the installation of it certified by a CompEx certified contractor. Please see Appendix 5 for an example of how to apply hazardous area classification.

A schematic illustration of the zone must be created. To ensure this is done clearly, a plan of the zone should be created and a side and front elevation. The distances the zone extends must be clearly labelled on the schematics and the zone category must also be clearly identified. This information can then be shared with others who need to be made aware, for example, contractors that need to carry out work in or near the identified zone.

Figure 4: Hazardous area classification categories	
Gases, vapours and mists	
Zone 0	A place in which an explosive atmosphere consisting of a mixture of air and a dangerous substance in the form of a gas, vapour or mist is present continuously or for long periods or frequently e.g. bottle of solvent under passive storage or for more than 4hrs/day.
Zone 1	A place in which an explosive atmosphere consisting of a mixture of air and a dangerous substance in the form of a gas, vapour or mist is likely to form occasionally under normal operation e.g. bottle of solvent under active storage or 3mins-4hrs/day.
Zone 2	A place in which as explosive atmosphere consisting of a mixture of air and a dangerous substance in the form of a gas, vapour or mist is not likely to form in normal operation, but if it does occur, will persist for a short period only e.g. spilling a bottle of solvent or less than 3mins/day.
Dusts	
Zone 20	A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is present continuously or for long periods and infrequently e.g. over 4hrs/day.
Zone 21	A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur occasionally in normal operation e.g. 3mins-4hrs/day.
Zone 22	A place in which an explosive atmosphere in the form of a cloud of dust in air is not likely to occur in normal operation but if it does occur will persist for a short period only e.g. less than 3mins/day.

Finally, a List of Equipment for Hazardous Area Classification (LEAC) must be collated (Appendix 8). You can use the template available on the Health and Safety A-Z. This document must list what equipment has been adapted or upgraded in order for it to comply with the zone it can be found within.

Where a zone has been identified, 'EX' signage, like that on the front sheet of this guidance document, must be displayed at the entrance/s to the work area.

The university is exploring methods of storing information centrally regarding hazardous area classification. Until this is agreed, this information should be held by Schools and Divisions.

4.10 Hazardous Area Classification in laboratories

If you work in laboratories, the Health & Safety Executive (HSE) provides specific guidance around how to apply the process of hazardous area classification.

In short, many of the dangerous substances used in laboratories will also be classified as hazardous, and as such will have a workplace exposure limit (WEL) detailed in the HSE document, EH40, that must not be exceeded. Where this is the case, control measures you have implemented through the COSHH risk assessment process will by default control any explosive atmosphere that may be created. This is because the WEL will always be a lot lower than the legal requirement of 25% of the LEL of a dangerous substance. There are some exceptions to this, so it is important to check the detail of a substance's WEL in relation to 25% of its LEL.

HSE guidance splits laboratory activities into three categories of scale: very small scale operations, medium scale operations and larger/pilot scale operations. As a guide, small scale operations will include use of flammable substances in quantities up to 50ml, whilst medium scale operations would include volumes of up to 2.5 litres (a standard Winchester bottle). The majority of lab activities are expected to sit within these two categories at the University of Sussex. Therefore, hazardous area classification is unlikely to be required, but only if other control measures in place to manage the release of dangerous substances into the lab are in place and working. If this is not the case or cannot be confirmed, hazardous area classification should be implemented as detailed in section 4.9. If hazardous area classification is not required, your risk assessment must still consider how ignition sources will be removed or reduced as far as reasonably practicable. For more detail around the application of hazardous area classification in laboratories, check out the HSE guidance.

4.11 Labelling of pipes and containers

Through your exercise to identify dangerous substances that are present or likely to be present in your work area, you should also identify any pipework that contains or is likely to contain dangerous substances. For example, a gas manifold that transports acetylene into a lab. If there is pipework in your work area and it is not immediately obvious what this contains, a job should be raised with the SEF Service Centre to investigate and confirm the contents. If the pipe contains a dangerous substance, the pipe must be clearly labelled with its contents. For example, a label stating 'acetylene' can be affixed to the pipe at various points along it. Confirmation of what the pipe contains, or if it has been confirmed as decommissioned, should be kept as part of your DSEAR risk assessment.

4.12 Assessing the risk using the risk matrix (Risk Assessment Section 6)

Once you have completed the assessment and noted control and mitigation measures already in place, you need to assess the level of risk presented with those existing controls in place. To do this, use the risk matrix provided in Appendix 1 of the risk assessment template. To do this, consider the control measures that are in place already to manage the risk from the dangerous substances you will be using/producing. With this in mind decide what the severity of an incident would be, for example, if there were to be a fire or explosion. As part of this process you should also consider whether the release of the dangerous substance is intentional (part of the process) or unintentional (such as spill). You should assign a value of 1 to 5 as detailed in the risk matrix. Then, consider how likely it is that an incident such as a fire or explosion will occur, assuming the existing control measures are in place and working. Again, assign a value of 1 to 5, where 5 means a fire or explosion is expected to occur weekly. Multiply these two values together to calculate the risk rating for the work area or activity with only the existing controls in place.

Next, consider the additional control measures you have entered into the action lists in your risk assessment. Again, assuming that these additional control measures will be in place and working effectively once the work activity starts or the work area is in use, select a value of 1 to 5 for the level of severity and the likelihood and multiply them to get your overall risk rating, that takes into account all the additional control measures and mitigations. The risk rating should be lower with your additional controls and mitigations in place. If this is not the case, you should consider if further controls and mitigations are required to improve safety in the work area or of the activity.

4.13 Sign off process (Risk Assessment Sections 7, 8 and 9)

Once your risk assessment is complete, it is important to ensure this is signed off by different parties to ensure resource for controls and mitigation is available, that it is suitable and sufficient, that fire safety has been considered and that technical elements have been reviewed and confirmed. Some elements of the sign off process (verification) will depend on whether hazardous area classification has been required.

4.13.1 Approval (Risk Assessment Section 7)

In all cases, the DSEAR risk assessment must be signed off and dated by the person who has carried out the risk assessment. If more than one person has carried it out, the assessment must be signed by all parties, detailing their role.

4.13.2 Verification (Risk Assessment Section 8)

Verification is not routinely required for all DSEAR risk assessments carried out by university staff. It is needed where hazardous area classification is required (i.e. an EX-zone needs to be established). Verification must be carried out by competent individuals. At time of writing, a consultant called Sigma-HSE has confirmed that they can act as verifier for DSEAR risk assessments. As there is a cost for this service (quoted on a case-by-case basis), this should be reserved for DSEAR risk assessments where:

- The residual risk is 'high' or 'severe'.
- The assessment covers a large-scale process.
- The activity requires specialist knowledge and expertise that is not available within the university community.
- A second, external opinion, is deemed necessary.

The cost of verification via an external consultant would need to be covered by the School/Division to which the hazardous area relates. Therefore, research proposals and other projects will need to factor this cost into grant applications and other budgetary arrangements.

For DSEAR assessments carried out by university staff, where there is low or medium residual risk, an alternative process has been put in place, whereby verification is a shared role between the University Health & Safety Team, Fire Safety Team and Technical Services.

Once it becomes apparent that an EX-zone may/will need to be established in a work area, the assessor must engage the following people as early on as possible:

- Senior Technical Manager for the relevant school.
- Science Schools Health and Safety Team (safetyscienceschools@sussex.ac.uk).
- University Health and Safety Team (healthsafety@sussex.ac.uk).
- Fire Safety Team (healthsafety@sussex.ac.uk).

By engaging these people at an early opportunity, this ensures all parties are aware of the planned work and the reasoning behind the need for an EX-zone to be established. They will then be able to feed into the DSEAR risk assessment process to ensure you cover the key things required. This will subsequently speed up the verification process once the risk assessment has been drafted.

Once the risk assessment has been drafted, the risk assessment must be shared with the contacts above.

Depending on School and Division arrangements, this could also be raised with the Faculty Dean, Head of School or Director of Professional Services Division in order to keep them informed of EX zones that will be/have been established in their School/Division.

University Health and Safety Team

The role of the University Health & Safety Team is to check that the risk assessment has been fully completed, and that the control and mitigation hierarchies have been sufficiently considered. Where this is not the case, a discussion will be held with the assessor/s to agree amendments. The University Health and Safety Team will also confirm the results of any calculations carried out within the risk assessment if they are competent to do so. In the longer term, this would include running data through a pre-setup Excel spreadsheet to confirm workings (See Appendix 5). The Health and Safety Team may ask pertinent questions about the activity to ensure their understanding when undertaking their part of the verification process.

Fire Safety Team

The role of the Fire Safety Team is to check that fire safety has been considered adequately in the risk assessment. Where this is not the case, a discussion will be held with the assessor/s to agree amendments. The Fire Safety Team may ask pertinent questions about the work activity being assessed to ensure their understanding when undertaking their part of the verification process.

Senior Technical Manager

The role of the Senior Technical Manager (STM) is to confirm that the DSEAR risk assessment has taken into consideration any standard and emergency operating procedures that apply, such as those relating to substance segregation, compatibility and storage. They may act as a final check on any substance incompatibilities that may have been overlooked during the risk assessment process. Where they are competent to do so, the STM may also confirm the results of any calculations carried out within the risk assessment to support their justification for verifying the risk assessment. They may choose to work with the University Health and Safety Team to do this, or they may opt to look at this independently. In the longer term, this would include running data through a pre-setup Excel spreadsheet to confirm workings (See Appendix 5).

The STM is not expected to have an extensive knowledge of the work being undertaken, however, as the STM for their school, they are required to sign the verification to ensure oversight of the EX-zones in the school and to reassure themselves that these zones will be effectively managed.

To support STMs in fulfilling this role they may delegate areas of these checks to other competent individuals within Technical Services, for example, to technical colleagues who have knowledge in the area of the work being assessed. They can also contact the Science Schools Health and Safety Team for advice and guidance. Outside of Technical Services, the STM may also discuss the work with the Principal Investigator or other responsible person to obtain reassurance that the work is being undertaken in a planned and controlled way.

Once all three parties have agreed on their area of the verification process, they must sign and date this section of the risk assessment. Any amendments made through the verification process should be documented, for example, in an email and attached to the finalised risk assessment. Verification will not be confirmed until agreed amendments are made.

Verification is a process of double-checking arrangements that are in place to ensure that potentially explosive atmospheres (i.e. established EX zones) are suitably controlled and managed. By acting as verifiers, the University Health and Safety Team, Fire Safety Team and Technical Services Managers:

- Are not signing off the risk assessment as the assessor, this remains the role of the person who is carrying out the risk assessment.
- Are not acting as the responsible person signing off the whole risk assessment and taking on the risks of the work activity. This remains the role of the responsible person, Principal

Investigator, Head of School/Division etc.

- Are not carrying out a formal review as would be carried out by those responsible for the work activity at regular intervals (e.g. annually).

If the work activity requires the establishment of an EX-zone, the activity is not permitted to begin until all three parties have verified the assessment from their perspective, the risk assessment has been signed off following the school/division's usual sign off process and all detailed actions, controls and mitigations have been put in place.

4.13.3 Review (Risk Assessment Section 9)

The DSEAR risk assessment must be reviewed at regular intervals. It is recommended a review takes place at least annually, but outside of this, following an incident, following a change in the dangerous substances being used/produced, changes in the work area, changes to those involved in the process and any changes in law, guidance or industry best practice.

Once reviewed, the person/s reviewing the assessment must sign and date Section 9. If a hazardous area classification is included, the verification process detailed in 4.13.2 must be followed as part of the review.

4.13.4 Assessment Acknowledgement (Risk Assessment Section 10)

Anybody involved in the work activity, or who works in the area the DSEAR risk assessment covers, must sign and date the completed assessment to confirm that they have read, understood and agree to follow the risk assessment.

4.14 Third Parties

Third parties are those that may be invited onto campus to provide a service, carry out building works or they may be based on campus as part of a letting arrangement. It is important that information regarding DSEAR is shared with these third parties in the same way you would share other health and safety information that is relevant to them.

The sharing of hazardous area classification is of particular importance. For example, if you have arranged for a contractor to carry out work next to an uninterrupted power supply (UPS), where a hazardous area has been established around the UPS. The information needs to be shared with the contractor so that suitable measures can be put in place to either eliminate or reduce as far as reasonably practicable the number of ignition sources within that zone. For example, it may be agreed with users that the UPS is turned off as this would then mean the hazardous area could be temporarily suspended, or it may be that the contractor needs to use equipment that will not create a spark and wear antistatic footwear.

Third party organisations that hire space from the university, must manage their own DSEAR risks, but they should ensure they meet the requirements of the DSEAR policy, they may follow this guidance to do so. It is the responsibility of the team who agrees the hire to ensure the third party organisation is not introducing DSEAR risks to the campus. If it is, these need to be assessed and agreed before the hire goes ahead.

4.15 Emergency planning

As part of the DSEAR risk assessment process, you must consider foreseeable emergencies such as spillages (both large and small), fires, events as a result of mixing incompatible substances etc. These foreseeable events must be documented in your risk assessment. However, if your school or division has an emergency operating procedure or standard operating procedure covering these foreseeable events, you can refer to these documents in the risk assessment, for example by noting the procedure title and document control number.

The response to these foreseeable events must be documented. How this is done is up to the school or

division to determine. The key things that must be completed to ensure foreseeable emergencies are properly planned for are:

- Identify the foreseeable event.
- Document the response procedure e.g. who will lead the response from the school or division, building closure arrangements, how this process links in with the univeristy's incident reponse process etc.
- Communicate the procedure to those who need to be aware.
- Provide any equipment required to respond to the event.
- Test the procedure periodically e.g. quarterly.
- Address any issues that are identified through these tests such as reviewing the procedure or providing additional training.

4.16 Accidents, incidents and near misses

All accidents, incidents and near misses related to DSEAR need to be reported using Sussex Direct. For example, if a fire starts, there is a build up of dust on surfaces in a workshop, or a Winchester bottle of solvent is left open overnight, allowing flammable vapour to be released and potentially build up in a work area. Once reported, and depending on the nature of the report, it may be assigned to a local Health and Safety Manager from the School or Division, or to a Health and Safety Coordinator for follow-up. The University Health and Safety Team may investigate further in order to identify opportunities to further build on control and mitigation measures to make them more robust. The aim of an incident follow-up is to identify areas of learning, not to place blame on individuals or teams.

4.17 Monitoring and review

Monitoring and review should be carried out by schools and divisions on a regular basis. For example, control and mitigation measures in place for DSEAR could be reviewed through school and division workplace inspections.

The University Health and Safety Team will also carry out periodic review of DSEAR arrangements. For example, DSEAR themed audits may be carried out where the team review school and division DSEAR arrangements against the university's policy.

Whether carried out locally by schools and divisions, or carried out by the University Health and Safety Team, the findings and actions from monitoring and review activities should be documented and tracked so that actions can be completed.

5 Contacts

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Sigma-HSE
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6 REFERENCES

- Dangerous Substances and Explosive Atmospheres Approved Code of Practice (L138)

7 QUICK REFERENCE GUIDE

8 Appendix 1 – Determining whether a flammable liquid is capable of releasing sufficient vapour to produce an explosive atmosphere.

First you need to convert the lower explosive limit of the substance to grams per cubic metre (g/m³). This can be done by multiplying the LEL% by the substance's molecular weight, then dividing this by the constant, 2.4.

$$g/m^3 = \frac{\text{LEL\% x Mol weight}}{2.4}$$

Worked example – Acetone

$$g/m^3 = \frac{2.5 \times 58.08}{2.4}$$

$$g/m^3 = \frac{145.2}{2.4}$$

$$g/m^3 = 60.5 g/m^3$$

Next you should work out how much of the substance could be spilt, and fully evaporate, before the LEL% is reached. This can be done by multiplying the LEL% grams per cubic metre conversion by the volume of the room you will be working in, then dividing this by density of that substance at 20°C (ambient temperature). This will provide a value in grams, which can then be converted to litres by dividing by 1000.

$$\frac{g/m^3 \text{ x room volume}}{\text{specific density @ 20°C}} \quad /1000$$

Worked example – Acetone in a room 5 x 7 x 3 metres in size (105m³ volume)

$$\frac{60.5 \times 105}{0.79} \quad /1000$$

$$\frac{6352.5}{0.79} \quad /1000$$

8041.14 /1000

= 8.04 litres

In this worked example, 8.04 litres of acetone would need to evaporate in the room for the LEL% to be reached. However, DSEAR requires that 25% of the LEL% is not exceeded. Therefore the number of litres should be further divided by 4 in order to find out the number of litres that would need to evaporate before 25% of the LEL% is reached.

$$\frac{8.04 \text{ litres}}{4}$$

= 2.01 litres

Therefore, in this worked example for Acetone, in a room of 105m³ volume, 2.01 litres of acetone would need to evaporate before 25% of the LEL% is reached (the legal limit), and 8.04 litres would need to evaporate before an explosive atmosphere could be produced in the room. Therefore the maximum size of a container of acetone in this room should not exceed that of a standard Winchester bottle i.e. 2.5 litres.

This calculation provides you with an indication of the limits of this space, however bear in mind it does not

take into account other substances that may also be producing vapour in the same room and therefore contributing to production of an explosive atmosphere. It is also unlikely that full evaporation will be able to take place, therefore localized zoning may be required above the open container or spillage depending on the location your calculations are covering. The calculations also do not take into account ventilation in the area, which would support keeping the LEL% as low as possible.

Data used in this worked example was taken from the GESTIS data base.

9 Appendix 2 – Flammability Classes for liquids, gases and solids

Flammable Liquids			
Flammability Category	**Previously known as**	**Flashpoint (FP) & Initial Boiling Point (IBP)**	**Examples**
1	Extremely flammable liquid and vapour.	<23°C FP ≤ 35°C IBP	Diethyl Ether
2	Highly flammable liquid and vapour.	<23°C FP >35°C IBP	Isopropanol, Methanol, Ethanol
3	Flammable liquid and vapour.	≥ 23°C and ≤ 60°C FP	Acetic Acid
4	Other combusitble liquids.	> 60°C and ≤ 93°C FP	Diesel fuel

Flammable Gases		
Flammability Category	**Definition**	**Examples**
1	Gases, which at 20°C and a standard pressure of 101.3kPa: a) Are ignitable when in a mixture of 13% or less by volume in air; or b) Have a flammable range with air of at least 12 percentage points regardless of the lower flammable limit.	Hydrogen Acetylene
2	Gases, other than those of Category 1, which at 20°C and a standard pressure of 101.3kPa, have a flammable range while mixed with air.	Ammonia

Flammable Solids		
Flammability Category	**Definition**	**Examples**
1	Burning rate test: Substances or mixtures other than metal powders: a) Wetted zone does not stop fire; and b) Burning time < 45s or burning rate > 2.2mm/s Metal powders: burning time ≤ 5mins.	Sodium
2	Burning rate test: Substances or mixtures other than metal powders: a) Wetted zone stops the fire for at least 4mins; and b) Burning time < 45s or burning rate > 2.2mm/s Metal powders: burning time > 5mins and ≤ 10mins.	Barium

10 Appendix 3 – Guidance for completing section 3 of the 'Large Inventory' DSEAR Assessment

Section 3: Current control measures

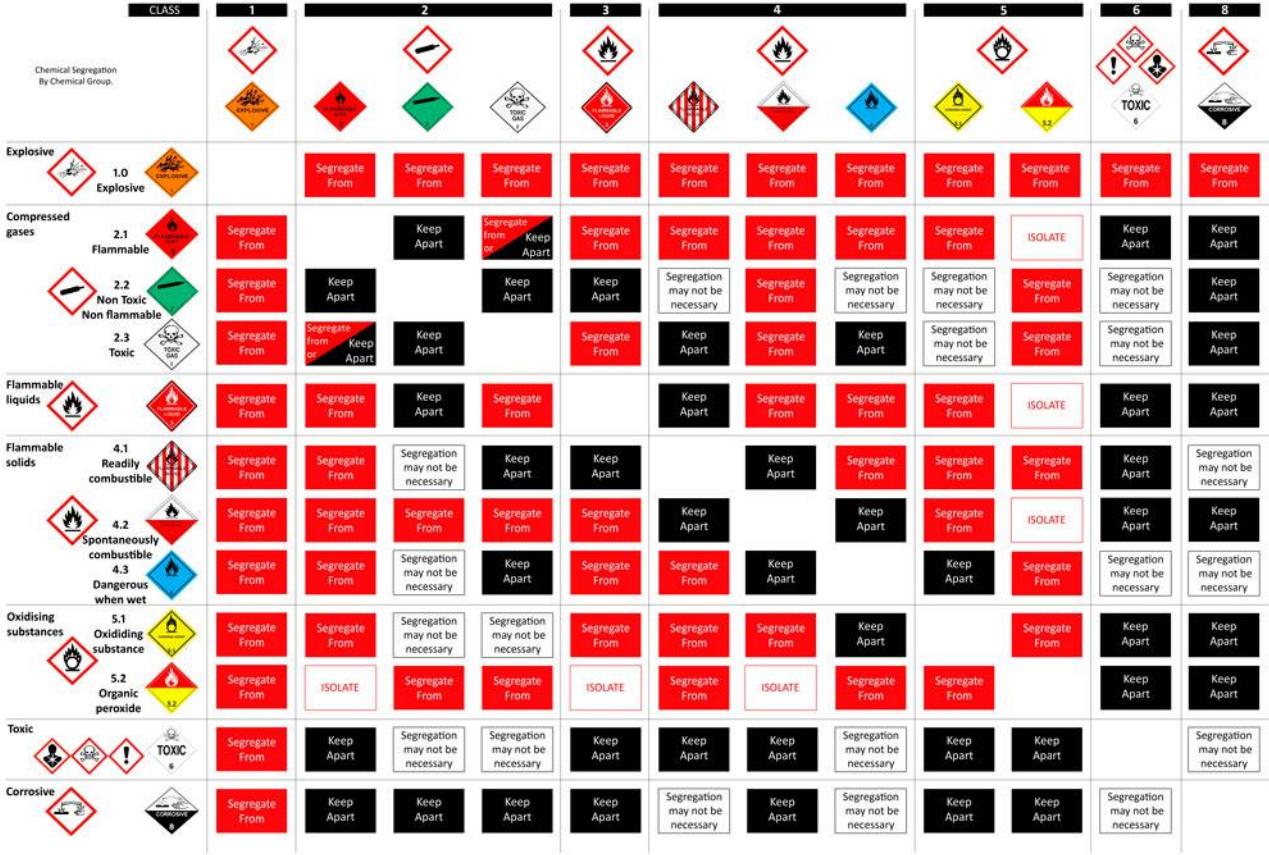
3.1 Process/Activity Where appropriate to the nature of the process or activity:	Yes	No	N/A
Has the quantity of the dangerous substance held/used been reduced to a minimum?			
State what has been done to reduce the quantity of the dangerous substance to the minimum required and provide justification for this quantity. As a guide, you should only have enough of a dangerous substance present to allow you to work for a day.			
Have steps been taken to avoid or minimise releases (whether the release is intentional or unintentional?			
This may be things such as securing bottles of dangerous substances with their cap when you finish using them, containing processes within fume hoods or covering processes to reduce any vapour that may be created.			
Have steps been taken to control release at source?			
For example, has a container holding a dangerous substance been covered during a process. In terms of storage, are Winchester bottles capped in passive storage to prevent releases.			
Have steps been taken to prevent the formation of an explosive atmosphere?			
Is your process or activity being carried out within a fume cupboard. Are measures in place to minimise the risk of spills, such as the use of Winchester carry baskets			
Have steps been taken to collect, contain and remove any releases to a safe place (e.g. by ventilation)			
Where will the process or activity be carried out. For example, will it take place in a fume cupboard. Has general ventilation in the work area been confirmed as providing at least 5 air changes per hour.			
Have steps been taken to avoid adverse conditions (e.g. the limits of temperature or other control settings)?			
If you have measures in place to manage the risk from dangerous substances, for example, operating a work area at a certain temperature to prevent flammable substances being used from reaching their flashpoint, what other measures are in place to ensure these controls are maintained.			
Are incompatible substances kept apart in storage and so far as is practicable, in use (e.g. oxidisers and combustibles)?			
Explain here what is done to ensure this is the case. For example, do you have separate chemical cupboards for keeping incompatible substances apart and are those involved in the process aware of what substances should be kept apart.			
Have the number of employees exposed to the dangerous substances or explosive atmosphere been reduced to the minimum?			
Give consideration here to how many people will be exposed during the process. You should consider everyone who may be exposed, not just those directly involved. For example, if you are carrying out the process in a shared lab, have those sharing the lab been considered. You should aim to have the least number of people at risk and provide justification for this.			
Has plant been supplied that is explosion resistant?			
Where there is a risk of explosion within equipment that you plan to use, this must be supplied by a reputable retailer (as with all equipment) and able to contain the pressure from an explosion. For example, a temporary flammable store with vented panels that seal in a fire and are able to contain low pressure changes as a result of ignition of substances held within the unit.			
Is explosion suppression or relief provided on equipment?			
Where there is a risk of explosion consider whether suppression is required or pressure relief panels. For example, if you are working with a pressure system, does it have pressure relief valves fitted and if so, are these kept free from obstruction.			
Have adequate measures been taken to control or minimise the spread of fire, or explosion?			
State what measures are in place such as a fire risk assessment that covers the area the activity or process is to take place in. If you are unsure, you should contact healthsafety@sussex.ac.uk to confirm.			
Has suitable Personal Protective Equipment (PPE) been provided and have			

operatives been trained how to wear it correctly? E.g. Antistatic boots.			
Is personal protective equipment required to protect operatives, for example, heat resistant gloves, or antistatic footwear if an EX zone needs to be established as a result of your risk assessment.			
3.2 Workplace/process and management systems Where appropriate to the nature of the process or activity:	**Yes**	**No**	**N/A**
Is the workplace designed, constructed and maintained so as to provide adequate fire resistance and/or explosion relief?			
Detail what is in your workplace to achieve this. You may need to consult a fire risk assessment covering your building or work area. You may also need to consult the fire safety team.			
Is any assembly, construction, installation, rig, plant, equipment, protection system etc. designed in such a manner as to minimise risk of fire and/or explosion?			
If any of the equipment you will be using is designed to minimise the risk of fire or explosion, detail that here. Any specifications you may have can also be attached to the risk assessment as an appendix.			
Have appropriate safe systems of work, or other required procedural systems of organising work, been developed and communicated to the workforce, either by way of this form or another document?			
Detail here what has been communicated to those involved in the activity or those who may be affected and need to be aware. If this is yet to be done, you can state that here and include an action in the plan below.			
Is a permit to work scheme required for working with the substance(s), or in the work area, and are these strictly enforced?			
Detail here if a permit is required for accessing the work area or for using the substance. For example, any hot works such as welding will require a permit before the activity is undertaken. At time of writing Estates are reviewing the possibility of a cloud based system for organising permits across campus in relation to all areas, including DSEAR.			
Have all such areas been classified into zones in accordance with Schedule 2 to the Regulations?			
If there is likely to be an explosive atmosphere present, then you need to state that here and explain what zone is to be established i.e. 0, 1 or 2 for flammable gases, mists and vapours or 20, 21 or 22 for dusts. There is no need to go into the extent of the zone at this point as this can be detailed in the calculation section later in the assessment. If you work in a laboratory, you may not need to classify hazardous areas if you have robust control measures in place for preventing the formation of an explosive atmosphere or you are carrying out small or medium scale research. You should refer to HSE guidance on this for support.			
Where necessary have such classified zones been marked at their entry points with the specified 'EX' hazard warning sign?			
Detail here if the work area where an EX zone has been established already has EX signage on its entry points. If it doesn't, this can be included as an action.			
3.3 Storage	**Yes**	**No**	**N/A**
Are all flammable substances kept in suitable fire-resistant storage and are all quantities in excess of 50ltrs kept in an appropriately protected external flammable store?			
Where dangerous substances cannot be kept in external stores, the preferred method of internal storage is use of double skinned 90 minute flammable cabinets. Wherever possible, storage should be limited, for example, having a shared supply of the dangerous substance rather than individuals and teams having their own supply.			
Are all petroleum spirits, or derivatives thereof, in excess of 50ltrs kept in dedicated and appropriately protected petroleum spirit stores?			
Consideration needs to be given to volume of petroleum spirits and derivatives stored. This is because large supplies may be covered by separate regulations.			
Are incompatible substances stored apart (e.g., flammables, oxidisers, combustibles, flammable gases, LPG)?			
Some substances cannot be stored together as they may violently react with one another, or promote a fire. You can use the storage chart in appendix 4 to support you with this, or you can contact the DSEAR Technical Team.			
Where appropriate have storage areas been designed to provide explosion relief/resistance?			

This should be considered with any storage. For example, if external storage is used, are there openings in the roof to allow explosion pressure to be released and not across a footpath. If indoor storage is unavoidable, Asecos double skinned cabinets will withstand an internal explosion containing it within the cupboard.			
3.4 Emergency Procedures	**Yes**	**No**	**N/A**
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)?			
Consider all scenarios where something could go wrong, such as a temperature controlled process going out of control. For each, there should be a clear procedure in place that everyone who may be affected is aware of and can follow. This procedure should be tested periodically, such as quarterly, to ensure those involved remain aware of action to take and that any safety equipment required is stocked and working effectively. If there is the liklihood of an incident affecting the wider univeristy community, it should like to the univeristy's incident management process.			
Have suitable emergency procedures been developed and communicated to the workforce to deal with fire and evacuation?			
Similarly to above, consider what emergency procedures are in place to deal with a fire or evacuation. The university's standard fire evacuation process may not be suitable for the activity you are assessing, and there may be other steps you need to include.			
Have suitable emergency procedures been developed and communicated to the workforce to deal with the spillage of dangerous substances?			
Again, consider the procedures and equipment that are needed in place to ensure spillages, both large and small, can be dealt with effectively. Those involved should be aware of what they need to do and equipment should be readily available. The procedures should be tested periodically to ensure they remain effective.			
3.5 Waste Disposal	**Yes**	**No**	**N/A**
Have suitable procedures been developed, communicated to the workforce and implemented to deal with the safe transport and disposal of dangerous substances?			
Consider waste arrangements. In most cases you will be able to follow the university's waste process for dangerous substances. Get in contact with the DSEAR Technical Team to discuss this further and detail the outcome in this section.			
3.6 Information, Instruction & Training	**Yes**	**No**	**N/A**
Has appropriate information, instruction and training, commensurate with the hazard potential of the dangerous substances, or process, been provided to the workforce as regards; product detail, hazard, risk reduction methods to be employed, management systems to be followed, emergency systems, etc.?			
Consider what information needs to be shared and training provided for those involved in the activity, wider work area or others who need to be aware that could be affected. Describe here what will need to be provided and to whom.			
Are only trained and competent persons involved in work with dangerous substances?			
Consider who will be involved in the process or in the work area. Are they competent to work with the substances or in the area. Any gaps in competence should be addressed and you can summarise these here. For example, all staff will need to attend 'Introduction to COSHH and DSEAR' training.			

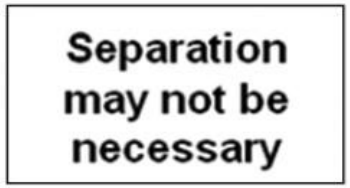
11 Appendix 4 – Chemical Compatibility Chart and Key

This chemical compatibility chart is used in industry and should be used as a guide. In a number of locations on campus, such as laboratories, storage risk is mitigated through the provision and use of 90-minute fire rated cabinets. Contact safetyscienceschools@sussex.ac.uk or healthsafety@sussex.ac.uk for further support (Reference DSC Limited).



Chemicals stored according to this table must comply with the following instructions:

These combinations should not be kept in the same building compartment or outdoor storage compound. Compartment walls should be imperforate, of at least 30 minute fire resistance and sufficiently durable to withstand normal wear and tear. Brick or concrete construction is recommended. An alternative is to provide separate outdoor storage compounds with an adequate space between them.



Separation may not be necessary, but consult suppliers about requirements for individual substances. In particular, note that some types of chemicals within the same class, particularly Class 8 corrosives, may react violently, generate a lot of heat if mixed, or evolve toxic fumes.

his is used for organic peroxides, for which dedicated buildings are recommended. Alternatively, some peroxides may be stored outside in fire resisting secure cabinets. In either case, adequate separation from other buildings and boundaries is required.

Separate packages by at least 3 metres in the storeroom or storage area outdoors. Materials in non combustible packaging that are not dangerous substances and present a low fire hazard may be stored in the separation area. This standard of separation should be regarded as a minimum between substances known to react together readily, if that reaction would increase the danger of an escalating incident.

The lower standard refers to the outside storage of gas cylinders. Where non-liquefied flammable gases are concerned, the 3 metre segregation distance may be reduced to 1 metre.

12 Appendix 5 – Estimating the extent of an EX Zone.

At time of writing, Excel calculations are being put together to support this process. In the meantime, for support in estimating the extent of an EX Zone, please contact healthsafety@sussex.ac.uk .

13 Appendix 6 – DSEAR Standard for laboratory work where flammable substances (Cat 1, 2, 3 and 4) are stored and handled.

DSEAR requires an assessment of risk, as outlined in published guidance. The minimum standard laid out below is provided for laboratories where flammable substances in Categories 1, 2, 3 and 4 are stored and handled.

The aim of the standard is to ensure a consistent approach and level of safety when handling flammable substances, whilst trying to reduce the amount of additional paperwork that lower risk labs need to complete.

If for any reason the minimum criteria cannot be met by a laboratory group, then a full DSEAR risk assessment must be carried out.

The laboratory, process or equipment can be deemed to present a low risk in relation to DSEAR, including the formation of explosive atmospheres, under normal operational conditions if:

Storage

- The least flammable material has been chosen for use, consistent with stated experimental aims.
- The total quantity of Categories 1 and 2 flammable substances, and those flammable substances with a flashpoint lower than the ambient temperature of room, held for routine use in the laboratory, does not exceed 25 litres.
- The total quantity of other flammable substances held for routine use in the laboratory, with a higher flashpoint of up to 60°C, does not exceed 125 litres.
- Waste flammable substances in temporary storage within a lab are included within the 25 litre and 125 litre limits set out above, and must be sealed and stored within a 90 minute fire rated cabinet when not actively in use.
- Waste flammable substances are sent to the waste stores at a frequency that ensures the limits set out above are not exceeded.
- Flammable substances and other substances are segregated and stored following SSHS SOP004 Guidance for Storage of Chemicals.
- Flammable substances are stored in 90 minute fire rated cabinets with suitable bunding.
- Flammable substances are clearly labelled and are returned to fire rated storage when not in active use.
- Any electrically cooled or heated storage areas (used for flammable materials) have intrinsically safe thermostats and/or thermal cut-outs.

Circumstances of the work/task

- A suitable and sufficient COSHH risk assessment is in place where the properties of the substances have been clearly identified and evaluated.
- A COSHH risk assessment establishes the quatitites to be used, and these do not exceed 50ml for small scale work.
- The work/task does not involve the intentional creation of an explosive atmosphere of Category 1 and 2 flammable substances, for example, spraying or drying in ovens.

- The work/task does not involve the unintentional release of more than 2.5 litres (Winchester bottle) of Categories 1, 2 or 3 flammable substances with a flashpoint below the maximum ambient temperature, for example, heating, dispensing or decanting, evaporation, grinding and fettling.

- A procedure is in place for addressing forseeable unintentional releases, such as leaks and spillages.

- Ignition sources have been removed where possible from areas where flammable substances are used.

- Flammable substances are used within a fume cupboard unless a COSHH risk assessment justifies otherwise.

- Only electrical equipment suitable for the work is used and is tested for electircal safety. For example, use of a mantle with efficient temperature control rather than a hotplate, for heating flasks.

- Suitable waste de-activation and disposal procedures are in place.

- Staff have been trained, instructed and informed about the DSEAR arrangements affecting them, including what to do in an emergency and how to summon emergency support.

- Emergency procedures have been put in place.

- A fire risk assessment is in place covering the work area and actions have been addressed or are due to be addressed imminently.

- Use of satisfactory experimental containment, for example, protective screens and glassware.

This DSEAR standard does not apply:

- To novel processes.

- Where there are multiple flammable storage areas within the same laboratory.

- Where quantities of flammable substances exceed the limits set out above.

In these instances you must seek advice from the Science School Health & Safety Team or Univeristy Health and Safety Team before carrying out any work.

14 Appendix 7 – Dangerous Substances Identification Sheet

School/Division			Human Resources				
Building	**Room**	**Substance**	**Dangerous properties**	**Type**	**Max. Quantity**	**Use**	**Held in pipework?**
Sussex House	340	Hard wood	Flammable	Solid Dust	10x planks	Repairing door frames	No
	340	Acetylene	Compressed extremely flammable gas	Gas	80kg cylinder	Welding	Yes - manifold
	340	Acetone	Highly flammable	Liquid	10 Litres	Cleaning	No

You can use this template to support you in carrying out your initial identification of dangeorus substances present, or liable to be present, at your school or division.

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14 Appendix 8 – List of Equipment for Area Classification

Hazardous Area Classification Datasheet							List of Equipment for Area Classification (LEAC)						
Location	Arundel Temporary Flammable Store	**Description**	Metal container unit containing fresh, sealed solvents.							**Page**	1 of 1		
Study team	Wilma Heath									**Issue No**	1		
										Date	23/07/2024		
Site	UoS Falmer Campus	**Plant**	N/A			**Unit**	Temporary Store			**Name**			
Drawing Ref	123456	**Drawing Title**	See schematic plans of store.										
Read this form in conjunction with hazardous area classification plans.													
Source of release		**Grade of release**	**Flammable material**				**Ventilation**			**Hazardous Area**			**Remarks**
Description	**Location**	**Continuous, Primary, Secondary**	**Flash Point range**	**Operating conditions Temp/ °C**	**Operating conditions Pressure/ bar**	**State Gas, vapour, mist, liquid, solid**	**Type Artificial, Natural**	**Degree High, Medium, Low**	**Availability Good, Fair, Poor**	**Zone Type 0/1/2 20/21/22**	**Zone extent Vert. (m)**	**Zone extent Horiz. (m)**	**Notes**
Arundel Temporary Flammable store	Rear of Arundel Building	S	-48°C to 38.5°C	Amb	N/A	V	Natural	Med	Fair	2	Entire internal space.	Entire internal space.	N/A

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