Guidance on the Procedure for Carrying Out an Assessment in order to Comply with the COSHH Regulations

1. Categorization of Substances Hazardous to Health

The procedures to be adopted when carrying out an assessment under the COSHH Regulations depend on the nature of the substance which may be categorized as follows:

1.1
Chemicals used in a laboratory or similar location
1.2
Proprietary materials such as cleaning fluids, adhesives, paints, etc. The precise constituents are unlikely to be known.
1.3
Biological agents.

Certain features of the assessment are common to all three procedures and these are described in sections 2 to 4 of this appendix.

2. Common Features of all Assessment Procedures

2.1
The object of an assessment is the elimination or adequate control of risks to health. RISK is a function of the potential of a substance to impair health (HAZARD) and the extent to which a substance enters, or comes in contact with, the body (EXPOSURE).
2.2
An assessment starts with the estimation of hazard and exposure separately and then the results are combined to compute the risk. The assessment is completed by specifying the control measures that are necessary in order to control the risk. In specifying the control measures account must be taken of the procedures to be adopted in the event of an emergency. Guidance on this aspect is given in section 4 of this appendix.
2.3
It is essential that the determination of the hazards and exposure, together with the general risk assessment, takes into account the actual work being undertaken. For example, the following must be considered:

- the effects of mixing substances together (i.e. the nature of the reaction products)
- the properties of substances and their reaction products at the physical conditions to be employed (e.g. temperature and pressure)

2.4
An outline of the work (protocol) must be included in the assessment. This must define the critical aspects of the procedure and include an estimate of quantities of materials to be used.
2.5
Substances can enter the body by inhalation, ingestion, absorption through the skin or by a combination of these routes. Exposure may also arise from injection into the body or contact with the eyes. However, inhalation is the main route of entry for most substances into the body.
2.6
All measures (e.g. containment, protective clothing, disposal, disinfection, spillage response, first aid) proposed as part of an assessment must be compatible with the equipment and materials actually available in your building. Do not simply copy out, word-for-word, measures contained in the recommended sources of information (e.g. Merck Data Sheets, Sax). You must know where items listed by you are kept and how they are used.

3. Control Measures common to all Assessment Procedures

Certain control measures should always be adopted whenever work with a hazardous substance is undertaken. These measures may be regarded as good practice.

3.1
Identification and Hazard Information

Containers of chemicals should be clearly and permanently identified. When substances are transferred to smaller containers, the hazard warning pictograms on the container from which they are transferred should be put on the new container.

3.2
Disposal

Ultimate disposal of waste should be part of the planning for any procedure. Waste must be disposed of when it is generated and not left in the laboratory.

Waste solvent should be disposed of into the containers provided for halogenated or non-halogenated waste. If it is contaminated with strong acid or alkali it should be neutralized before disposal into a separate container to prevent reactions with other chemicals and corrosion of, and subsequent leakage from the metal drums into which waste solvent is bulked.

Other waste chemicals should be clearly identified with hazard pictograms on the container as appropriate. Waste should be removed to the Waste Store after

making prior arrangements with the Safety Office. In some cases treatment of the waste to make it less hazardous will be required before the waste is accepted.

3.3
Ingestion
3.3.1
Eating, drinking, smoking and the application of cosmetics are not permitted in areas where substances hazardous to health are used.
3.3.2
At the end of each session of work with substances hazardous to health hands should be washed
3.3.3
Mouth pipetting is not permitted
3.4
Personal Protective Equipment

Personal Protective Equipment must only be used when it is not reasonably practicable to institute engineering controls.

3.4.1
Respiratory Protection

If the assessment identifies that respiratory protection is required it must be of a suitable type and comply with the relevant British Standard.

3.4.2
Protection of Eyes

Eye protection complying with BS.2092 should be worn when working with substances which could harm the eyes if splashed into them.

3.4.3
Skin

For corrosive substances where there is any possibility of splashing onto the face a full face visor should be worn. For all substances which are corrosive, toxic or harmful and which may come into contact with the skin, gloves should be worn. The gloves chosen must be suitable for use with the substance being handled. For other substances accidental contact with the skin will be less harmful and may be dealt with by washing. However, immersion or deliberate contact should be avoided.

4 Emergencies and Incidents

Users of substances hazardous to health should know what they would do in the event of a foreseeable contingency and suitable facilities must be available.

4.1

Spillages

In the event of spillage outside a fume cupboard or local exhaust enclosure:

- If the substance is flammable, eliminate sources of ignition
- Instruct others to keep at a safe distance
- Open windows where appropriate
- For spillage of volatile materials, evacuate the room and shut the door unless the substance has been determined as safe to use on the open bench with no physical barrier
- Unless the spillage is one which may be left to clear by evaporation and ventilation, it should be cleared up by at least two people wearing appropriate respiratory protection, absorbing it onto sand or proprietary absorbent which is transferred into a container which is put into a well ventilated space for ultimate disposal.

4.2

Toxic Gas Leaks

If a compressed gas is leaking and cannot be shut off, feed the gas if possible into a fume cupboard or other ventilation discharging directly to the outside. Where practicable transport a leaking gas cylinder to the open air and clear the surrounding area. If this is not practicable, evacuate the room, if possible opening windows before leaving. Subsequent removal of the cylinder to a better ventilated place should only be carried out by at least two persons wearing appropriate respiratory protection.

4.3

First Aid

Persons should know what help should be given before qualified help arrives on the scene. Except where special procedures apply (notably for hydrofluoric acid and cyanides/nitriles) the standard procedures are as follows:

4.3.1
Eyes

Flood thoroughly with water for at least 10 minutes. Use tap water from a clean container or run gently from a hose or sterile eyewash. Gently, but if necessary firmly, prise eyelids open. SEEK IMMEDIATE MEDICAL ATTENTION.

4.3.2
Skin

Drench with plenty of water. Remove contaminated clothing. Removal of agents insoluble in water will be facilitated by using soap as well as water. Continue with running water for 10 minutes. Unless contact has been slight SEEK IMMEDIATE MEDICAL ATTENTION.

4.3.3
Lungs

Remove from area of exposure, without putting yourself in danger (e.g. do not enter a room where the general atmosphere appears to be dangerous unless wearing correct respiratory protection). Rest and keep warm. Unless exposure has been slight and the patient feels quite well SEEK IMMEDIATE MEDICAL ATTENTION.

4.3.4
Mouth

If the substance has been confined to the mouth give large amounts of water as mouth wash - ensure mouth wash is not swallowed. If the substance has been swallowed and the patient is conscious give about a pint of water to drink immediately. SEEK IMMEDIATE MEDICAL ATTENTION. DO NOT INDUCE VOMITING.

4.4
Reporting

Report accidents and incidents on a Company Accident/Incident Report Form which is available from the Area Safety Officer. Wherever there is reason to believe that a person has had a higher than acceptable level of exposure to a substance it should be reported to the Area Safety Officer. Anyone who thinks his/her health might have been affected by exposure to substances at work (including eg. dermatitis or asthma) should contact the Company Medical Officer

5 Assessment of Chemicals used in a Laboratory or Similar Location

5.1
Hazard Evaluation

Some degree of hazard can be ascribed to virtually any substance, although for some the toxicity or other harmful effect is not fully known. For the purposes of an assessment all substances (including those of unknown toxicity) should be assigned one of the hazard categories listed in Table 1. Substances of unknown toxicity should normally be categorized as of high or extreme hazard.

5.2

Exposure Estimation

The exposure potential should be estimated by reference to Table 2 and then multiplying the individual scores A x B x C

5.3

Risk Assessment

The assessment of risk combines the estimates of hazard and exposure leading to an overall classification of the activity as high, medium or low risk. Table 3 can be used to classify the risk and hence the level of containment required.

5.4

EXAMPLE OF AN ASSESSMENT OF A SUBSTANCE THAT PRESENTS AN EXTREME HAZARD BUT USE OF THE PROCEDURE IN PARAGRAPHS 5.1, 5.2 AND 5.3 RESULTS IN AN OVERCAUTIOUS ASSESSMENT.

The work to be undertaken is to determine whether a substance is soluble in diethyl ether by attempting to dissolve it in 1.5cm^3 of diethyl ether in a test tube at room temperature. The substance to be dissolved has been assessed as a low risk. However, when the diethyl ether is assessed the following result occurs:

5.4.1
Hazard estimation using table 5.1

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Saturated Vapor Pressure (SVP)          =    400 mm Hg at 18oC
Occupational Exposure Standard (OES)     =    400 ppm

Saturated Vapor Pressure in ppm   =   400 x 106  =  526,315
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                                          760

SVP   =   1316
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OES
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Therefore diethyl ether is categorized as an extreme hazard.

5.4.2
Exposure estimation using table 5.2.

The quantity of diethyl ether to be used is 1.5cm^3 giving a value for A of 10.

Diethyl ether is a highly volatile liquid giving a value for B of 100.

Use of the test tube can be described as a partially open system with a low chance of mishap giving a value for C of 10.

The total score of A x B x C is 10^4, which gives a medium exposure potential.

5.4.3
Risk assessment using table 5.3.

The use of substances that are categorized as being extreme hazards always requires the use of a fume cupboard which appears overcautious for the use of only 1.5cm^3 of diethyl ether.

5.4.4
Alternative assessment.

The short term exposure limit (obtained from OES tables) for diethyl ether is 550 ppm. The amount of diethyl ether that would be required to be totally vaporized into a typical laboratory of 100m^3 and create a concentration of 500 ppm is 214cm^3.

In this case the use of only 1.5cm^3 would make it impossible even to approach the STEL and therefore, the work may be carried out on the laboratory bench.

5.5
Control Measures
5.5.1
The standard control measures described in sections 3 and 4 of this Appendix should be adopted
5.5.2
Where the route of entry of the substance to the body is by inhalation the appropriate level of containment must be adopted. The level of containment is determined by the result of the above risk assessment and reference to Table 4.

It should be noted that, in addition to providing protection against inhalation, containment such as a fume cupboard may provide some protection against contact with the skin or eyes.

Table 1

Hazard Category	Examples of criteria that may be used for assigning hazard category (in descending order of importance)
Extreme Hazard	Substances of known or suspected exceptional toxicity including i. human carcinogens ii. respiratory sensitizers iii. volatile substances where the saturated vapor pressure (in ppm) divided by the MEL or OES (in ppm) is greater than 1000 iv. endocrinologically or pharmacologically active substances effective at <1mg/day in humans

	v. plant or bacterial toxins of known or exceptional toxicity vi. substances with MEL or OES <0.1 ppm vii. unknowns of very high toxicity
High Hazard	All substances whose toxicity exceeds that of the medium hazard category, except for those known or believed to be so highly toxic as to merit special precautions (i.e. those in the extreme category) This category includes i. other carcinogens ii. volatile substances where the saturated vapor pressure (in ppm) divided by its MEL or OES (in ppm) is greater than 100 but less than 1000 iii. endocrinologically or pharmacologically active substances effective at <50mg/day in humans iv. substances with MEL or OES 0.1 - 10 ppm v. skin sensitizers vi. substances classified under CHIP regulations Approved Supply List as Very Toxic/Toxic/Corrosive vii. substances with a hazard rating of 3 in SAX and where the rating is mainly based on toxicity viii. unclassified substances known not to be in the extreme hazard category
Medium Hazard	i. Volatile substances where the saturated vapor pressure (in ppm) divided by its MEL or OES (in ppm) is 100 or less ii. substances with MEL or OES 10 - 500 ppm iii. Substances with a hazard rating of 1 or 2 in SAX and where the rating is based mainly on toxicity iv. Substances classified under CHIP regulations Approved Supply List as harmful or irritant
Low Hazard	i. Substances with OES > 500 ppm ii. Substances not matching CHIP regulations Approved Supply List criteria for classification as dangerous

Notes

1. MEL - **M**aximum **E**xposure **L**imit
2. OES - **O**ccupational **E**xposure **S**tandard (8hr Time Weighted Average[TWA])
3. SAX - Dangerous Properties of Industrial Materials by N. Irving **Sax** - copy available in the University Library and some departments
4. CHIP - Chemicals (Hazard Information and Packaging for Supply)

Care should be taken when using Table 1 that:

a. the toxicity considered should be that of the substance or mixture handled, including any impurities. The products of any reaction must also be considered
b. substances may have other properties (eg. flammability) which may call for other precautions.

Table 2

The exposure potential should be estimated by reference to Table 2 and then multiplying the individual scores A x B x C

Score -->	1	10	100
A - quantity of substance	less than 1g	1-100 g	More than 100 g
B- physical characteristics of the substance	dense solids, non-volatile liquids, no skin absorption	dusty solids, freeze dried solids, volatile liquids, low skin absorption	gases, highly volatile liquids, aerosols, substances that are easily absorbed through the skin
C - characteristics of operation (including primary containment - see notes below)	predominantly enclosed system, low chance of mishap	partially open system, low chance of mishap	No physical barrier, any operation where chance of mishap is medium or high (includes the dispensing of chemicals)
AxBxC = 10^2 or less = low exposure potential AxBxC = 10^3 or 10^4 = medium exposure potential AxBxC = 10^5 or 10^6 = high exposure potential			

Notes

1. Time factors, such as frequency and duration of the activity, should also be considered. Continuous operations on a daily basis should raise the exposure estimate to the next higher category.
2. It is important that the evaluation is based only on estimates of potential exposure arising from the activity itself without additional control measures. The effect of secondary containment, such as fume cupboards, should not be included as this would pre-judge decisions on the level of containment required.
3. In deciding on the volatility of a liquid the volatility at the temperature of use must be taken into account.
4. Primary containment is that containment provided by the apparatus or equipment in which the substance is handled. Secondary containment is the additional containment needed to ensure appropriate control of exposure.

Table 3

Extreme Hazard	**This procedure may be used for substances categorised as extreme hazards. However, using this procedure will always require that the work is carried out in a fume cupboard or facility offering even greater protection. If it is considered that this is an overcautious approach a written risk assessment,**

	that clearly shows that adequate precautions are being taken, may be prepared. An example of such an approach is given in paragraph 5.4.		
High Hazard	Medium Risk	Medium/High Risk	Medium/HighRisk
Medium Hazard	Low Risk	Medium Risk	Medium Risk
Low Hazard	Low Risk	Low Risk	Low Risk
	Low Exposure	Medium Exposure	High Exposure

Table 4

Low risk	open bench work is acceptable
Medium risk	work must be carried out in a fume cupboard
High risk	a special facility eg. a glove box should be considered