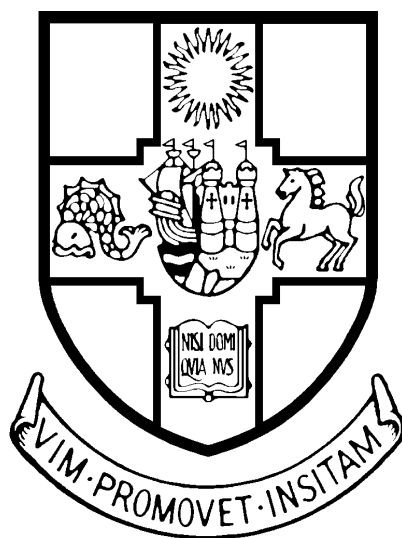


**University of Bristol**



# **Control of (chemically) Hazardous Substances**

## **Code of Practice**

**SAFETY OFFICE**

**ISSUE DATE: Jan 2002**

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# COSHH

## 1. INTRODUCTION:

1.1 **The Health and Safety at Work Act (1974)**, imposes duties on the University as an employer to provide as safe an environment for the staff and students as is reasonably practicable. Under the Act, the Control of Substances Hazardous to Health (**COSHH**) Regulations (1988) were given the force of law. These are regularly reviewed; the latest version, dated **2002**, has few changes from the original that have any additional significance to University departments. They require employers to take any necessary steps to protect their employees from the harmful effects of hazardous substances. These may be in any form (solid, liquid, gas, fume, vapour), any type (including micro-organisms and allergens), and can present a hazard to health by a variety of routes of exposure. Substances can be absorbed through the skin, injected, inhaled or ingested: they may be irritant or corrosive to skin or eyes. Substances that need consideration are those used in, **or generated as a result of**, any work activity under the employer's control (eg research, student studies, general laboratory work, cleaning, maintenance etc). The extent or degree of the risk posed by these substances is dependent on the **severity of the hazard** (inherent in the substance), and the **potential amount of exposure** (weights or volumes used, dustiness or volatility, frequency or duration of tasks).

1.2 This Code of Practice addresses the prevention of harm being caused by the substances covered by the COSHH Regulations, except for micro-organisms and allergens, which are dealt with in a separate University Safety Code of Practice "Biological Safety and Genetic Modification". In essence, therefore, this Code of Practice is concerned with the hazards posed by chemical substances, **and applies to all Departments**. There are specific regulations, not considered herein, applying to Asbestos, Lead, and substances that are being administered medicinally (except by the effect they may have on the person dispensing them). Such regulations are similar in nature to COSHH, but in general require more stringent controls. Please see other Codes of Practice or contact the Safety Office for advice. Further Codes of Practice have to be referred to if the substances have other hazardous properties eg. Pressurised, cryogenic, flammable, explosive, or radioactive. The primary concern of the University is to **protect persons from harm**, and not just to comply with regulations, imposed by legislation, to avoid prosecution. The aim is always to minimise risk, and not merely attain acceptable standards. Departments should follow this example.

1.3 In the University, the majority of hazardous substances are used in laboratories, and consequently this document makes many references assuming a laboratory context. **Nevertheless, in the many other places in the University where such substances are employed, the same safety principles should be applied.** Practicable methods of exposure control may, of course, need to be different in a non-laboratory environment.

Each department must decide how it wishes to manage COSHH to ensure that all statutory requirements are met, and general University policies are followed. This is scrutinised at the departmental safety audits, and so should be subject to regular internal inspection.

## 2. REQUIREMENTS

The COSHH Regulations state that the employer shall not allow work to commence or proceed that is likely to expose employees to hazardous substances unless they have made "a suitable and sufficient assessment of risks created by that work to the health of those employees". In this context, risk is a function of the hazard (eg toxicity or corrosivity) of the substance they are handling, **and** their potential level of exposure to it, for a specific purpose or task. **This means that no task should be started without an assessment having been completed.** If it is a simple task of little perceived risk then the assessment should not need to be recorded, even though it has been considered. Legally there is no designated format for the recording of assessments providing all aspects are adequately considered and the thought process leading to decisions is suitably described.

Following on from the findings of the assessment, adequate controls should be identified and employed to reduce exposure to **at least** an acceptable level. The practical application of assessments then needs to be locally managed to ensure this is not a theoretical exercise. The first

step in this process should be to inform the relevant persons of the findings, and to make the results readily accessible where the work is to be carried out.

**Hazard:** A material safety data sheet (**MSDS**), and the labelling as supplied when purchasing the hazardous material, may only describe the **hazard** that is inherent in the substance. The supplier or manufacturer can only suggest to you, the user, how the product could or even should be used. They cannot dictate from their discrete distance how it is actually to be used for your specific purpose, the place of use, or how much would be used, or how often and by whom. These are all elements that have to be considered to estimate the risks involved. It is therefore apparent that holding a list of substances and their corresponding data sheets is very important, but does not in itself constitute a proper COSHH (or risk) assessment process.

**Risk:** The extent of risk to which one is exposed when dealing with hazardous substances is dependent on the hazards, be it toxic, irritant, harmful, corrosive, etc. **and** the availability for contact between the substances and the persons exposed. This could be affected by how volatile or how 'dusty' the material either is, or it becomes, during use. An assessment should be made that estimates the risk, taking account of these aspects, and then that should be followed by what **Control measures** are needed to reduce the risk to an acceptable level, see para 2.5. Also required are emergency procedures (e.g. special Fire and First Aid precautions), methods of waste disposal, and any monitoring methods that may be needed to ensure compliance.

**Type of assessment:** It has been recognised, however, that in certain scenarios, it is totally impractical to individually assess each and every substance used. In such a situation, when many similar substances are used in a standard setting, it is acceptable to perform **generic** (non-specific) assessments (referred to in previous issues of this Code of Practice as '**Standard Assessments**'). An example of this might be the use of various hardwoods in a **workshop**... it may be immaterial (from the aspect of health effects) that the substance used is Teak and not Mahogany. So the assessment could be for ... 'the machining of hardwoods'. It is the responsibility of the user to get assurance that the task in-hand, and the substance to be used, fit into the criteria that were considered at the time of assessment. It is also considered a valid technique to combine a COSHH assessment with that of other risks (e.g. mechanical, electrical, etc.) involved in a process, to produce an complete integrated Risk Assessment for the task in hand (see Risk Assessment Code of Practice).

Other examples may be found in the **domestic** type situations. One detergent may have the same hazardous properties as another, as may descalers, or bleaches. Gloss paint has different properties to emulsion paint, so each belongs to it's own generic family. It must be remembered though, that a product that is applied by spraying may affect people far more than the same product when applied by brush. Each task would need a separate assessment. In a **laboratory** situation, chemicals do fall into groups on account of their properties, and so this sort of assessment can be perfectly valid, depending on the use to which they are to be put. Some reactions also follow standard patterns, so may be generically categorised along with the reagents... not to forget bi-products (residues and emissions).

Some guidance is attached on page 18 (Appendix E) to help establish generic levels of risk and the subsequent control measures applicable.

If generic assessments are to be used, then it is recommended that a list is maintained departmentally of the named products that are accepted as belonging to that group. Should other products be purchased for a similar use, then their details should be added to that list. MSDSs should be attached to the relevant assessments.

By default, those substances and tasks that do not fall into generic groups, with their subsequent Standard assessments, must be covered by an individual assessment specific to that scenario. This is then the "**Special Assessment**" that was formerly (CoP 1995) described as needing to satisfy certain criteria (ie severe hazards needing more than standard controls), and whose definition may have been open to misinterpretation. This revision attempts to clarify and simplify that process.

Another approach to the generic assessments is to produce an integrated document detailing the departmental expectations of its staff and how they should carry out their duties safely. This would take account of all aspects of routine risks involved with their jobs, but would also refer to specific risk (and COSHH) assessments. Various scenarios could be covered by this method, and a suggested heading for this type of document, depending on the department involved, may be "Good (or safe) Laboratory (or Kitchen or Workshop) Practice", or "Standards for Safe Housekeeping" etc. In them, they may describe the training requirements or capabilities expected of different levels of worker, and the jobs that they may be expected to perform. Guidance on the content or format of these statements can be given by contacting the Safety Office.

**So long as each hazardous substance, and/or task which gives rise to potential harm, is covered by a current valid and suitable risk assessment, then this part of the regulations is being complied with.**

The assessment method proposed in the following paragraphs is one suggested way but it is emphasised that Departments are free to adopt their own variation of the method to suit their own particular requirements, provided the method is such that each of the parameters in para 2.1 is covered adequately for each of the activities

Such documents may supplement or complement the departmental local rules but in all cases must be read alongside them, and understood by all the relevant staff and students.

## **ESSENTIAL ASSESSMENT REQUIREMENTS**

It is crucial to remember that the COSHH Regulations require that the assessment of any particular **activity** which employs hazardous substances should include the following:

**2.1 "Named Task" (experiment, job, or activity)** with listed materials used (chemicals, or products with hazardous chemical ingredients) is the crux of the assessment. Without this, there is no evidence that anything has been considered other than the primary hazards. The task should be described to take account of amounts and strengths of substances used, and frequency of use i.e. it may only involve 5 ml portions, but it could be handled, in batches of one hundred, every five minutes, every day. Alternatively, it may cover the dispensing of 5 litres of material only once a month.

And subsequently, under the full description of that task:

- Identify the hazards of all substances involved (used or produced),
- Identify persons, or types of persons, potentially exposed,
- Routes of exposure (skin, eyes, inhalation etc) to all personnel, so the potential risk,
- Control and containment measures necessary to reduce exposure (residual controlled risk),
- Emergency procedures in case of accident - spillage; fire etc, 1<sup>st</sup> Aid
- Exposure monitoring, and Health monitoring requirements,
- Training requirements
- Access restrictions, including third parties...cleaners, visitors, or passers-by;
- Accepted waste disposal route (with consideration of environmental impact).

In more detail:

**2.2 Hazard information** of a substance can be found from a variety of sources and includes:

- ◆ The label on the original delivery container (or as transferred onto secondary container),
- ◆ Hazard data sheets (**MSDS**) provided by the manufacturer or supplier,
- ◆ Health and Safety Executive (HSE) Guidance Notes and other publications
- ◆ Technical reference sources (textbooks, scientific/technical papers, trade journals etc),
- ◆ Professional institutions or trade associations.
- ◆ The departmental safety advisor (DSA) or supervisors.

The Safety Office holds much relevant material in its library, which is open and available for reference by University personnel during normal working hours, upon request.

**NB Identification of Substances** Containers of chemicals should be clearly and permanently identified with the name of the chemical they contain. At no time should a situation arise where the contents of a container are unknown. Containers should be robust, well stoppered and stowed so that they cannot fall or be knocked over. Preferably they should be stored in suitable cupboards rather than on open shelves (see refs 7, 11, & 12).

It should be remembered that not all hazardous substances are encountered because they have been purchased as such; they may be produced as a reaction by-product NB (i) Bleach and Descaler may emit toxic Chlorine gas (ii) a wooden table is not a hazardous substance until it is sawn or sanded. When vacating a workplace, it could be construed as a criminal offence to leave hazardous materials unattended and available for abuse, especially if they are incorrectly labelled (see Waste Disposal section of assessments, and the corresponding University Code of Practice).

### **2.3 Persons at risk** Before a substance is even handled, it can present a risk, especially to the person responsible for accepting 'goods-in'

- ◆ Primary containment is provided by the supplier/manufacturer, and is governed by strict regulations for packaging and labelling (see ref. 7). This may be in the form of bottles or boxes; if the substances are to be removed for any reason to be kept or stored in an alternative container, the original materials of packaging should be emulated as near as possible, as indeed should the labelling.
- ◆ Secondary containment will form the basis of safe storage, the choice being determined by the level of hazard and likely exposure, and the potential reaction with other materials stored alongside. This must take account of accidental damage, for example in the event of a fire.

The primary person to be considered in the assessment must be the user of the substance, or the operator of apparatus or machinery that may emit 'fumes' etc. This may have to be specific named people, precluding the task from anyone else. In a generic assessment or statement of 'Good Practice' a description should be made of the range of persons (grade, training and qualifications etc.) that might be expected to perform such tasks.

The potential of exposure to 'Secondary persons' should then be considered...workmates alongside the bench, passers-by (in the workplace or outside if relevant).

What may be described as 'tertiary' persons affected are those who are discrete from the task or work area at the time of use, but who may visit at a later date. These might be the cleaners who go into a workshop the day after a solvent-based paint has been used, and the doors and windows have been secured all night. The atmosphere may be very hazardous, the person entering the room being unaware of the situation until it is too late, and may also be the only person in the building.

Waste might also present a significant hazard to persons responsible for its removal and disposal.

Special consideration must be made in this risk assessment for individual susceptibilities or circumstances as they arise eg allergy, disability, or pregnancy. For instance, certain chemicals may carry the risk phrases R40 45, 46, 49, 61, 63, 64 or 68 all of which have implications on **new or expectant mothers**. (see HSE's HSG122).

### **2.4 Potential Exposure** An analysis of the particular activity has to be undertaken in order to determine the likely exposure to personnel. Reduction of exposure is centred round the principle of control or containment. Risk is a function of both severity of inherent hazard, and the likelihood of harm occurring.

Exposure risks occur mainly through ingestion, inhalation or direct contact on the skin. Ingestion can cause ill effects both by the physical mechanism of aggressive (corrosive or irritant) materials on the digestive system, and by the chemical/medical effect following absorption into the blood stream. Similarly, substances can affect the respiratory system, and the skin or eyes, in each case allowing

absorption as well as direct damage. If the skin is already suffering injury from open cuts or puncture wounds, then substances can readily pass directly into the blood to be transported around the body. Different substances have specific effects upon different organs.

It must be remembered when making this assessment that substances can have immediate or fast effects on the body (acute response), or alternatively may produce a chronic or cumulative effect over many days, months, or even years. This can be relevant for some chemicals not considered to be highly toxic, but that could accumulate in the organs very gradually with detrimental effect on health. This may be caused, in extreme cases, by something as simple as the biting of ones nails, or the handling of cigarettes or sweets, associated with poor personal hygiene. Correct labelling of substances will ensure, as far as possible, that no hazardous materials are mistaken for foodstuffs. Varnish can regularly be found stored on workshop or garage shelves in Honey jars, and bleach in squash bottles. It does happen!!

## **2.5 Controlling exposure...Ventilation, PPE, Good working practice, etc.**

**Part of the assessment must describe the control measures that are necessary to carry out the task, and what the residual risk level is when these are adopted.**

As with when considering all other risks, COSHH dictates that a hierarchy of measures should be adopted where practicable to reduce the extent of potential harm. **Personal Protective Equipment (PPE including masks, gloves, goggles etc.) should only be employed where all other measures fail to adequately and practicably reduce the risks.**

- The first consideration should be as to whether the substance can be entirely eliminated, or substituted for a safer alternative
- The substance might actually be available and suitable for this specific use in a safer form ie dustless pellets instead of powder
- The system to be employed in the application of the substance may be altered to make safer ie brush on a paint rather than spraying it, making less substance airborne
- Engineering controls could then be applied to either isolate the operator from the substance, or to vastly reduce the potential exposure. This includes ventilation
- Exposure may be limited by changing the time that a person uses a substance. This may be done by spreading a job out over a longer period, or by rotating or alternating staff
- Having considered the practicability of all these methods, and adopting them where applicable, PPE may then be applied if necessary to reduce risk to an acceptable level, or as good practice, beyond this to as low a level as possible.

**Limits** There are provisions in the regulations to help employers to assess whether control of inhalation hazards is deemed adequate. These are accessible in a guidance document issued annually by the Health and Safety Executive called “Occupational Exposure Limits-EH40” (ref.6). Apart from the various aspects of guidance, there are two ranges of numerical limits (together known as **OELs**) listed. When writing a COSHH assessment, it is necessary to refer to these limits when applicable, so a brief explanation follows:

- **Maximum Exposure Limits (MELs)**...substances are assigned such a limit if toxicological studies have shown that there is no documented ‘statistically safe’ lower level of exposure. The limits have been quantified as being accepted as ‘practicably achievable’ by compilation of industrial data and statistics. Adequate control of personal exposure to a ‘MEL’ substance is only demonstrated if it is kept **as low as is reasonably practicable**, but in any case, **below that limit at all times**. The best control is to not use any product containing a ‘MEL’ substance, i.e. substitute. **For University purposes, it is deemed practicable to treat the use of all carcinogens as if they were assigned an MEL, and to control their usage accordingly.**
- **Occupational Exposure Standards (OESs)**...this is a more extensive list than MELs, and they have been assigned to substances statistically shown to have a ‘safe’ (ie no-adverse-health-effect) exposure limit by toxicological studies. An additional safety factor is then applied to that proven ‘safe’ limit, then

becoming the OES. Adequate control of personal exposure to an 'OES' substance is demonstrated by keeping personal exposure **to that limit** (good occupational hygiene practice would reduce this further as is practicable)

All OELs are presented as average concentrations (parts per million, ppm, and/or milligrams per cubic metre, mg/m<sup>3</sup>) and over specified time-bases, either 8-hour or 15-minute. Each of these time-bases is employed to cater for Chronic and Acute effects respectively.

Should atmospheric monitoring be necessary in order to prove compliance with these limits, then advice should be sought from the Safety Office

**2.5.1 Engineering Controls...(see also refs. 9,10)** Such physical control and containment measures against airborne contaminants may involve local exhaust ventilation (LEV) systems, including in laboratories ducted fume cupboards and, to a far lesser extent, ductless (filtered and recirculating) fume cupboards. In workshops or similar situations where fixed machines emit hazardous fumes or vapours in significant quantities, there should be other extraction equipment fitted eg welding extractor fans with flexible hoses. Even hand-held machines (drills, saws, sanders etc.) can be fitted with some sort of air cleaner, possibly either dedicated (fitted) filters, or portable vacuum apparatus with appropriate filters.

**(a) Ducted Fume Cupboards:** These are units whose exhaust is ducted to the outside atmosphere, usually via a stack/chimney whose height above roof level is designed to ensure full and proper dispersion of the fumes away from all areas where persons might be affected. The fitting of such units is subject to planning permission and control by local environmental authorities, as organised by the responsible building surveyor in Building Services.

These units need to be fully tested and serviced at least once a year (legally every 14 months to comply with COSHH), and the following checks and records made:

- The air in-flow (face velocity)
- The static pressure in the duct
- The physical condition (sash cords, hinges, 'glass' etc.)
- The integrity of containment using a smoke test or equivalent
- The supply systems, electrical (including alarms and interlocks), water, and gas.

University Building Services (**UBS**) organise these tests, depending on them being aware of the units' existence. They keep a register of all fume cupboards with their maintenance records and carry out the required maintenance on behalf of Departments. Hence Departments should notify them of any changes to holdings, preferably after seeking their advice. As for all statutory testing that is carried out by persons from outside a department, there is a requirement upon the department to ensure that tests are performed by the necessary date. The Departments must allow such persons to carry out their duties safely; this will entail good communications by both parties ie sufficient notice of UBS intention to attend, and a departmental response to ensure a clean, tidy environment for them to work.

The quality of control afforded by these units is variable across the University, so the test-reporting regime has a requirement to label each unit annually with its face velocity and a categorisation. This is described as follows, and refers at present only to units with vertical sliding sashes. If a department has units with horizontal 'sliding windows', a specific test regime will need to be agreed to coincide with the commissioning tests...(contact UBS and Safety Office for advice)

**Category A...** achieves a minimum average face velocity of 0.5 m/s, even with the sash fully open. To use any fume cupboard in this manner is not normally considered to be good practice for laboratory work, but if followed through necessity the procedure must be approved by a responsible departmental representative in writing as part of the COSHH assessment. If the sash is lowered to an effective working height (maximum 500mm), then better airflows than this may be achieved.

**Category B**...achieves at least 0.5 m/s at a sash height of 500mm, but not when fully open. When used with the sash at or below 500 mm, then most hazardous emissions encountered in lab work will be adequately controlled and contained. If the risk is deemed too great to use a certain chemical or process (violent emission/spray etc.) in this category unit, then further precautions must be employed, possibly total containment (eg glove box), **but not necessarily a Cat. A unit!** Check first, and assess the risk.

**Category C**...achieves at least 0.2 m/s at a sash height of 500 mm, but less than 0.5 m/s. This category unit affords adequate control over many chemical emissions of moderate to low risk, particularly those whose major concern is for odour control (except possibly for the most offensive odours eg Mercaptoethanol and similar)

**Category D**...should not be used as a control measure under COSHH, and should be referred to solely as 'ventilated storage cabinets'. A face velocity of less than 0.2 m/s is achieved at the sash height of 500 mm.

**(b) Ductless Fume Cupboards** are self-contained units where a filter absorbs the contaminant and the exhaust is clean enough to be discharged back into the room. Their selection for fitting and use must be very seriously considered, and every effort should be made to primarily choose to fit / use a permanently ducted unit in preference to this sort. Before fitting a new cabinet of this type, please consult the Safety Office.

If there appears to be no alternative other than to use a ductless unit, then the COSHH assessment must pay extra attention to the constraints on its use.

They may be maintained and tested by an outside contractor or by UBS, so again it is imperative for departments to ensure their list corresponds to the actual holdings, and they keep track of the test period. As well as face velocity and containment testing, it is essential that the efficiency and integrity of the filters are assured both at statutory test time (again 14 months), and possibly, at regular interim times. It must be remembered that should the filtration break down, then contaminated air is returned to the workplace. The Safety Office will arrange filtration testing if requested.

After testing, the unit must be labelled with the results. Categorisation may be as in **(a)** but there must be a reference to the sash condition (height) relevant to each result...it is suggested that the usual working conditions are used to perform the tests. Filter efficiency should also be recorded.

**(c) Local Exhaust Ventilation** servicing should be on a similar basis to fume cupboards. Airflows, pressures, fans, interlocks and filter integrity (if fitted) should be checked at least once a year. This work may also be performed by UBS provided the system has been logged on their database. They will only be able to test in accordance with design and performance criteria as detailed by the department on the advice of the manufacturer/ supplier, so categorisation is inappropriate. The tests should include:

- Capture efficiency (velocity or smoke test)
- Face velocity (of hood where applicable)
- Duct velocity (and static pressure)
- Filter integrity/efficiency (pressure differential, or air monitoring)

**(d) General, or dilution, ventilation**...not the preferred, or even a very efficient, method of personal exposure control, but still considered valid, this may be encountered where a 'vent-axia' type extractor is used to exchange the air within a room. If this kind of extraction has been fitted to remove contaminants from the workplace, its size and speed should have been designed to take account of the room size, and a supply of 'fresh' make-up air resulting in an engineered parameter of 'room air changes per hour'. This will need periodic tests/maintenance as for all the above controls, and can be performed by UBS with the criteria that they will test against design specification. If the fan speed (or the airflow rate at its face) was shown to provide a certain air change at commissioning, then provided it is in good condition and circumstances are

unchanged, this is all that requires annual testing (alongside statutory electrical 'fixed-equipment' tests).

**(e) Drains** should be kept clear, and sink U-bends should not be allowed to dry out as this can cause vapours, gases and odours to flow back into the laboratory from other waste being disposed of. (Note - only certain waste can be flushed down drains: see Disposal of Chemical Waste Code of Practice.)

Should maintenance on sinks/drains in a hazardous area be necessary, then the plumber (through UBS) will need a safety assurance by discussion with the department in the form of a signed-off 'Permit to work'. This will be to ensure that the plumber knows the potential risks so that control measures (Personal Protective Equipment) can be adopted as necessary. They may also need to apply chemicals that could react with any residues in the system. Basically, the area should be made as safe as possible for the work to proceed safely.

All test results and maintenance records of Fume Cupboards and LEV systems must be kept for five years to comply with COSHH.

As part of a generic assessment, the following type of containment categorisation might be used to group certain materials together (see also page 18)

- a. No containment, eg open laboratory bench in a well-ventilated laboratory (8-10 room air changes per hour).
- b. Intermediate containment, eg general purpose fume cupboard.
- c. Extreme containment, eg specially designed facility including such features as a closed glove box for handling.

### **2.5.2 Personal Protective Equipment (PPE) and Prudent practices**

Once justified, PPE should be properly selected, used, stored, and maintained. **In other words, it must be managed.** Issue must be carried out alongside instruction and training.

Selection of PPE is crucial, as incorrect equipment may give the wearer a false sense of security, so potentially causing them more harm than good. As part of the assessment, the actual material, style, and even possibly the make of PPE should be specified, as these aspects should all have been considered as part of the selection process. For example, gloves might need to be gauntlet length and made of Nitrile rubber for a specific task. **It is not sufficient to merely state 'Eye protection (or gloves etc) should be worn.' This does not demonstrate any specificity to the task.**

The persons that need to use the PPE should be involved in its selection, as they will be the ones wearing it.

If more than one item of PPE is to be worn, their compatibility should be considered so that none detrimentally affects the efficiency of any other. It could be that a machine operator has to wear safety glasses to comply with COSHH, and earmuffs to comply with the Noise at Work Regulations. It is difficult to wear both effectively and comfortably.

The following basic precautions should be taken whenever handling hazardous substances:

(i) **Ingestion:** To avoid accidental ingestion of chemicals the following rules should be followed:

- Pipetting should be carried out using a pipette bulb or some other mechanical means. Mouth pipetting is not allowed.
- Eating, drinking, smoking and the application of cosmetics are not allowed in laboratories or other rooms containing chemicals.
- Hands should be thoroughly washed at the end of a working session.
- Substances should be properly contained and labelled.

(ii) **Inhalation** - The inhalation of any volatile or dusty chemicals should be avoided by conducting the work in a 'well ventilated place'. The nature of such a place should be dictated in the

assessment. It may demand the use of a fume cupboard (engineering controls), or could be outside or in another relatively open space. Whenever weighing or manipulating fine (dusty) toxic powders, or if regularly handling large amounts of any powder, a dust mask is normally necessary as a subsidiary to ventilation.

(iii) **Direct Contact** - Protective overalls should be worn where necessary (from the assessment) in the workplace **but laboratory coats should always be worn when working in laboratories** and removed on leaving. For similar reasons, open-toed or open-topped shoes offer little protection to spilled chemicals. Where chemicals could possibly be splashed into the eyes, eye protection should be worn. Although safety spectacles do not comply with European Standard specifications for protection against liquid splashes, ie chemicals, it is universally accepted that these are most suitable and necessary for general laboratory wear. This applies to anyone entering a laboratory where hazardous chemicals may be used, whether or not the persons are directly dealing with such materials. **This fact should be brought to everyone's attention, by proper signage, instruction (in local rules), and where necessary, enforcement.** There may be special circumstances where staff feel that they cannot work in safety glasses. A specific assessment should be carried out and agreed with the Head of Department, who is the person responsible for Health and Safety in the department.

When using more hazardous materials, goggles and/or a face shield should be employed. This would normally be only for periods of short duration, as they are relatively cumbersome and uncomfortable. For substances that could attack the skin, gloves and safety glasses and/or a face mask must be worn.

**The wearing of masks is not generally routine practice and hence activities requiring such protective equipment should be specifically assessed.**

## **2.6 Emergency precautions**

**2.6.1 First Aid:** Workers should all know what immediate action to take until qualified medical help arrives. A Departmental First Aider should be called in the first instance.

- **First Aiders** There needs to be an adequate number of trained First Aiders available (see Fire, First Aid and Emergency Precautions Code of Practice) in each Department. Additionally, it is a legal requirement that in areas where cyanides or hydrofluoric acid are being used, the appropriate First Aider(s) should have extra instruction to deal with these particular hazards.
- **Reporting** A report of any accident or dangerous incident should be made on the appropriate form to the Safety Office, and articles used from the First Aid box should be replaced as soon as possible.

The standard procedures for First Aid are written up in the Fire, First Aid and Emergency Precautions Code of Practice but the aspects relevant to chemicals coming into contact with the human body are repeated below:

- Eyes** The eye should be washed out with clean, cool water for at least 10-15 minutes and the person should then be sent to hospital with the eye covered with an eye pad. It is accepted and usually expected that the mains water supply is adequate for this purpose. Eye wash bottles may be provided in areas where clean running water is not immediately available. **These contain sterile water, and have a finite shelf life, and so not only demand continuing budgetary consideration, but also the burden of their management.** If irritation still remains after the flushing period, or returns later, then medical help should be sought.
- Skin** Remove contaminated clothing not stuck to the skin and flush with plenty water for 10-15 minutes. Apply a sterilised dressing to the exposed, damaged skin and send to hospital. If the contamination is by material containing hydrogen fluoride (hydrofluoric acid) then wash the burnt area as before but for only 1 minute and then apply calcium gluconate gel on or around the burn and massage it in with clean fingers and continue to do so until 15 minutes after the pain in the burn has subsided. Send to hospital. A supply of calcium gluconate gel must always be to hand where hydrogen fluoride is a potential hazard and can be obtained from the

Safety Office, Chemistry Department stores or the Medical Faculty stores. This should be highlighted on the assessment form, and so necessarily held in reserve.

- iii. **Lungs** Use suitable protective equipment and move casualty to fresh air. Send to hospital with a note of the chemical involved.
- iv **Mouth** If the chemical has been confined to the mouth, give copious amounts of water as a mouth wash, ensuring that the mouth wash is not swallowed. If the chemical has been swallowed and the patient is conscious, give him/her a pint of water to drink immediately and send to hospital with details of the chemical swallowed.

**2.6.2 Spillage:** Adequate account should be documented in the assessment of precautions necessary in the event of accidental spillage or breakage of equipment. It should include the identification of any materials that should be held in reserve for use in such circumstances ie spillage granules, or other absorbent materials, and should ensure that the location of these is apparent to the person performing the task.

**2.6.3 Fire:** Although the flammability of a substance is not officially covered by COSHH, there is little better place to keep the fire risk assessment of a particular task or use of substances than alongside the corresponding documentation. This is most applicable when considering that as an emergency precaution, a user should know what to expect in the event of a fire, and what to do about it. Some otherwise innocuous materials can produce toxic gases at high temperatures or when ignited.

**2.7 Health Surveillance and Monitoring** requirements should be identified on the assessment, but is expected **not** to be required for persons involved in **most** university operations. It may therefore only be relevant when certain special activities are involved (and should be agreed and arranged through the Safety Office).

**2.7.1** Some particular ranges of substances (chemical and biological) will need to be considered under the first heading, namely those known to cause allergic (including asthmatic) effects, and certain carcinogens. It may be deemed appropriate to have regular lung-function tests.

Mineral oils and some Chromates (found in paints) are known to cause skin disorders, so those persons at risk in workshops should undergo some kind of routine surveillance, which may involve regular self-inspection.

For special activities that may require Health surveillance, Heads of Departments should seek the advice of the University's Occupational Health Consultant, through the Safety Office. If found to be necessary, a health surveillance regime might be involve the following:

- a. Filling in a health questionnaire intended to identify the hazards being encountered by individuals.
- b. Following up with a medical examination.
- c. Issuing a contact card to each individual, listing colleagues in the workplace who should be contacted in case of illness of the individual.
- d. Keeping a record at the workplace of each person's GP
- e. Regular medical examination thereafter.

Because of the potentially long time between exposure and the effect of some of the diseases being monitored, health surveillance records must be kept for at least 40 years. The archiving of the records will normally be carried out by the Occupational Health Departments

**2.7.2** The same procedure should be followed if reactive health inspection is deemed necessary following a suspected exposure that causes perceived ill health. Again, the Health Safety Office arranges this with Occupational Health on the request of the affected person directly, or preferably through the Head of Department or Safety Advisor.

Atmospheric monitoring be necessary in order to prove compliance with Occupational Exposure limits, or to prove the efficiency of ventilation control, advice should be sought from the Safety Office. This might entail a programme of area or personal monitoring as agreed with the department. A full and

comprehensive report will need to be written, and this kept on file for 5 years (area not relating to named persons) or 40 years for personal monitoring results.

In some instances, departments may feel that they need equipment on hand to directly monitor the atmospheric concentration of some acutely hazardous substances, either with or without alarms. This is to be encouraged providing the equipment is obtained advisedly, and it conforms to certain standards and provides assured results. Such equipment should be regularly tested for efficiency, and where necessary should carry a valid certificate of calibration. A range of equipment is available for monitoring many substances, both on a personal or area basis.

**2.8 Training:** Specific training requirements may be needed over and above those described in the section covering both persons exposed, and expectations of Good Practice. This might include special First aid training, equipment or apparatus training, or even academic qualifications. There will be very few instances where this training will have to be accessed externally, but it is possible. In such a case, attendance and attainment of standards should be certificated e.g. use of pesticides.

**2.9 Access restrictions and Signage:** If certain categories of persons are to be excluded from the area covered by the assessment, then this should be written into the assessment, and a copy sent to those persons via their relevant managers. It is far more likely that access to areas will be restricted to specific persons, in which case the areas should be clearly and properly labelled (see ref.22). This will need to be well planned, as too many signs are counterproductive, ie all signs would be ignored because of superfluous/old/or insignificant 'over-signing'. It will be necessary to label a room containing hazardous unattended equipment with information regarding the responsible person and the relevant hazards of substances contained.

**2.10 Waste Disposal:** Sustainability is responsible for co-ordinating the waste disposal of chemically hazardous substances. Due to the complexity of recent legislation on the subject and the cost of disposal, it has been necessary to prepare a separate Code of Practice on the subject. This has the title Disposal of Chemical Waste and should be consulted by all persons contemplating disposal of chemicals. In order to ease the problem of disposal, there are three environmental principles to be observed, namely:

- a. If a less hazardous substance can be used for the purpose in mind, then it should be considered. Some substances can be legitimately disposed of to the drainage system under a trade effluent consent, with obvious cost saving implications. Please check with Sustainability.
- b. Only the minimum quantity that is needed for identified purposes should be purchased or made up in order to reduce the amount of waste for eventual disposal. This also has primary safety implications from the aspect of the storage and management of large amounts of hazardous materials. Excess chemicals should be offered to other departments where appropriate to avoid them becoming waste.
- c. A substance's identity should never be lost as unknown chemicals can be very costly to identify by analysis. All chemical waste must be labelled correctly. The full cost of disposal of such materials will have to be charged to Departments.

### **3 RECORD KEEPING**

The assessments should be kept centrally in the department alongside the policy and protocols. A copy should then be held local to the work that is taking place, so that it is a reference **and not a token gesture.**

The assessment records should be reviewed whenever circumstances or situations change significantly, and anyway at least annually. This review should be documented (signed and dated).

The records should be kept for a minimum of 40 years if they contain monitoring or health surveillance results that refer to individual members of staff by name, and otherwise for a minimum of 5 years.

<b>Department</b>		
<b>Names/type of persons involved</b>		
<b>Procedure description</b>		
<b>Substances used (including amounts)</b>	<b>Hazards identified + the exposure routes, and the estimated risk when using all controls as specified</b>	<b>Exposure Limit/ toxicity (OES/MEL or e.g.LD<sub>50</sub>)</b>
<b>Control/containment measures</b>		
<b>Emergency procedures</b>		
<b>Health surveillance/Monitoring required</b>		
<b>Special training requirements</b>		
<b>Access restrictions / Signage</b>		
<b>Special waste/ decontamination requirements</b>		
<b>Name/signature of assessor</b>		
<b>Head of Department/Departmental Safety Advisor/Supervisor</b>		<b>Date</b>

Suggested COSHH Assessment format (worked example follows)

**APPENDIX A**

<b>Department</b>		
<b>Names/type of persons involved</b> Primarily the Environmental assessment Postgraduate group (experiment), Lab. Technicians and cleaners secondary		
<b>Procedure description</b> Soxhlet extraction of Crude Oil from Contaminated soil samples. Weigh out 50g of air-dried sample into Soxhlet thimbles. Solvent (Toluene) extraction (250 ml per thimble) by reflux on heating mantle for 1 hour. Subsequent evaporation to dryness before reweighing of receiver flask and thimble.		
<b>Substances used (including amounts)</b>	<b>Hazards identified + the exposure routes, and the estimated risk when using all controls as specified</b>	<b>Exposure Limit/toxicity (OES/MEL or e.g.LD<sub>50</sub>)</b>
Toluene (as substitute for Benzene)	Harmful by inhalation, defatting of skin if splashed, severe eye irritation (splash or vapour), narcotic vapour: Highly Flammable	<b>OES:</b> 50/150 ppm (8hr/15min)
Crude Oil	Carcinogenic by skin contact	<b>LD<sub>50</sub></b> to be investigated
Residues	Potentially toxic and carcinogenic by skin contact (and inhalation of thimble contents)	<b>Not determinable</b>
<b>Control/containment measures</b> Sample preparation (air-drying) to be carried out on bench in prep room B12. Fume cupboard to be used for all analytical procedures, sash lowered during heating. Use of glassware and heating mantles according to Dept. rules (see Good Lab Practice). PPE: Safety specs. throughout; heavy neoprene gloves for sample-handing and preparation, disposable Nitrile gloves for analytical stage.		
<b>Emergency procedures(not otherwise covered by Departmental Good Lab Practice)</b> Soak up any sample or liquid spillages with 'granules'; bulk these with used thimbles for incineration. Be aware of location of nearest Fire extinguisher/blanket, eye-wash, and 1 <sup>st</sup> Aid kit. Wash with soap!		
<b>Health surveillance/Monitoring required</b> Daily self-inspection of skin (hands, forearms, face) for any unusual blemishes or abnormalities. Possible contaminants in the soil samples may cause chloracne, warty growths, or skin cancers. Continue the inspections on a periodic basis after project ends.		
<b>Special training requirements</b> P/Gs and unit staff only, U/Gs may attend as observers only.		
<b>Access restrictions / Signage</b> Authorised unit staff only (as signed on lab doors). Cleaners to attend only to floors and waste bins. U/G student observers must be supervised at all times. Sample drying trays in prep room must be clearly labelled 'Toxic-do not touch'. Fume cupboard must not be left unattended during reflux period.		
<b>Special waste/ decontamination requirements</b> Unused dried sample must be carefully double-bagged (polythene) with the paper tray-liners. This should be kept for bulking with any spilled materials and used thimbles. Incineration arranged via Safety Office. Used solvent bulked in 'non-chlorinated' container kept in Fume Cupboard 3 Researcher to remove bulk of flask residues (ie solvent to waste) before passing safely to lab steward		
<b>Name/signature of assessor</b>		
<b>Head of Department/Departmental Safety Advisor/Supervisor</b>		<b>Date</b>

Example COSHH assessment

<b>Department</b>		
<b>Names/type of persons involved</b>		
<b>Task / Activity description (frequency/duration)</b>		
<b>Substances, machines, tools, etc. to be used</b>	<b>Hazards identified</b>	<b>Estimated risk when using precautions as specified</b>
1		
2		
3		
4		
5		
6		
<b>Precautions(relate to numbers above)</b>		
<b>Emergency procedures</b>		
<b>Special training requirements</b>		
<b>Access restrictions / Signage</b>		
<b>Waste Disposal</b>		
<b>Name/signature of assessor</b>		
<b>Head of Department/Departmental Safety Advisor/Supervisor</b>		<b>Date</b>

Suggested Risk Assessment format (worked example follows)

**APPENDIX C**

<b>Department</b>		
<b>Names/type of persons involved</b> Engineering workshop technicians		
<b>Task / Activity description (frequency/duration)</b>  Machining of Medium Density Fibreboard (MDF) on Profiler. Using 4 sheets of 1.5 m square MDF laminated with PVA glue one week per term, 1 hour each day of that week. NB although the hazardous dust produced needs controlling as low as practicable, this frequency (therefore the risk) does not justify permanent controls to be fitted.		
<b>Substances, machines, tools, etc. to be used</b>	<b>Hazards identified</b>	<b>Estimated risk when using precautions as specified</b>
1. MDF	Severely irritant eye/ breathing (as wood-dust) (MEL under COSHH 5mg/m <sup>3</sup> 8-hour average)	LOW
2. Profiler	Moving parts could trap/cut hand and loose clothing	LOW / MEDIUM
3. Laminated sheet	Heavy awkward load-back or arm strain	LOW
4		
5		
6		
<b>Precautions(relate to numbers above)</b>  1. Use <u>portable vacuum extraction unit</u> with filtered outlet. Locate suction hood as close to blade as practical (review to position for optimum protection). <u>Goggles</u> .Secondary (comfort) protection by FFP2 <u>disposable dust mask</u> . Call Safety Office to monitor dust levels / extract efficiency on first occasion. 2. Check blade guard is in place. Do not wear loose clothing (tie, shirt sleeves undone) and tie back long hair as necessary. Keep alert at all times. 3. Positioning of the laminate should be carried out by 2 people using 'best lifting techniques'		
<b>Emergency procedures</b> Ensure dust bag is emptied before starting work, and that the filter is not blocked / damaged. Dust is very flammable so isolate from any ignition sources.		
<b>Special training requirements</b> Standard operating procedures and machine risk assessments. Essential training for use of PPE		
<b>Access restrictions / Signage</b> Workshop is locked to unauthorised people. Gangway for access is marked.		
<b>Waste Disposal</b> Wear dust mask to empty bag (outside or in ventilated area).		
<b>Name/signature of assessor</b>		
<b>Head of Department/Departmental Safety Advisor/Supervisor</b>		<b>Date</b>

Example integrated Risk / COSHH assessment

**APPENDIX D**

**TABLE 1**  
General guidelines for determining hazard categories

EXTREME HAZARD	Substances of known or suspected exceptional toxicity (eg carcinogens)
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 (ie those in the 'extreme' category)
MEDIUM HAZARD	Substances meeting criteria for CPL* classification as 'Harmful' or 'Irritant'
LOW HAZARD	Substances not matching criteria for CPL* classification as 'Harmful' or 'Irritant'

\* CPL – the Classification, Packaging and Labelling Regulations 1984. (SI 1244, as amended from time to time).

- NOTE: 1. The toxicity considered should be that of the substance or mixture handled, including any impurities.  
 2. Substances may have other properties (eg flammability) which may call for additional precautions.  
 3. The above general guidance may need to be supplemented by developing additional criteria with the help of expert toxicological advice. (Additional criteria may be developed using for example guidance given in HSE Guidance Notes such as EH40).

**TABLE 2**  
Typical basis for estimating exposure potential

SCORE	1	10	100
(A) QUANTITY OF SUBSTANCE	<1g	1-100g	> 100g
(B) PHYSICAL CHARACTERISTICS OF SUBSTANCE	dense solids, non-volatile liquids, no skin absorption	Dusty solids, hyphalised solids, volatile liquids, low skin absorption	Gases, highly volatile liquids, aerosols, solutions that promote skin absorption
(C) CHARACTERISTICS OF OPERATION ACTIVITY	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

Exposure potential is estimated by multiplying the individual scores A x B x C.

Here scores: A x B x C < 1000 would achieve a 'Low' exposure potential.  
 A x B x C = 1000 would rank as 'Medium' exposure potential.  
 A x B x C > 10000 would rank as 'High' exposure potential.

NOTE: Time factors, such as frequency and duration of the activity should also be considered. Short duration tasks, involving a few seconds exposure at infrequent intervals, should not affect the initial estimate, whereas continuous operations on a daily basis would probably raise the estimate to the next higher category.

**TABLE 3**  
Typical matrix for making a general evaluation of risk assessment and control determination  
(Risk = Hazard x Exposure Potential)

HAZARD CATEGORY (See Table 1)	EXTREME	Risks presented by the handling of such substances are unsuited for this procedure and must be addressed on an individual basis		
	HIGH	2	2/3	2/3
	MEDIUM	1	2	2
	LOW	1	1	1
		LOW	MEDIUM	HIGH
		EXPOSURE POTENTIAL (See Table 2)		

Containment regime determined from the above:

1. Open bench
2. Fume cupboard (or other specially vented area)
3. Special facility

In addition to the above containment regimes, it may be necessary to specify personal protective equipment (PPE) or other control measures, particularly where there may be exposure by the dermal route.  
 N.B. The detailed criteria for the assessment of hazard and exposure may vary as may the efficiency of containment regimes. If there is reason to doubt the adequacy of the containment to control the risks further advice should be obtained (eg from an occupational safety and health specialist).

#### 4. REFERENCES and further guidance:

1. **L5** "General COSHH, Carcinogens, Biological Agents"- Approved Codes of Practice (Third Edition) 1999 (HMSO)
2. "Safe Practice in Chemical Laboratories" (Royal Society of Chemistry)
3. "COSHH in Laboratories" (Royal Society of Chemistry)
4. "COSHH: Guidance for Universities, Polytechnics and Colleges of Further Education" (HMSO)
5. **HS(G)77** "COSHH and peripatetic workers" (HMSO)
6. **EH40** "Occupational Exposure Limits". Latest annual edition (HMSO)
7. **HS(G)126** "Chemicals (Hazard Information and Packaging for supply) Regulations (current version) (HMSO)...**[CHIP Regs]**
8. **L21** "Management of Health and Safety at Work Regulations 1999" Approved Code of Practice (HMSO)
9. **HS(G)37** "An introduction to Local Exhaust Ventilation" (HMSO)
10. **HSG54** "Maintenance, examination and testing of Local exhaust ventilation" (HMSO)
11. **HS(G)71** "Storage of packaged dangerous substances" (HMSO)
12. **HSG51** "The Storage of Flammable Liquids in Containers" (HMSO)
13. **HSG53** "The selection, use and maintenance of Respiratory Protective Equipment" (HMSO)
14. **L25** "Personal Protective Equipment at Work Regulations 1992" Guidance on Regulations (HMSO)
15. **HSG61** "Health Surveillance at work" (HMSO)
16. **L55** "Preventing Asthma at work" (HMSO)
17. **HS(G)86** "Veterinary Medicines. Safe use by farmers and other animal handlers" (HMSO)
18. **L9** "The safe use of pesticides for non-agricultural purposes" (HMSO)
19. "Pesticides: Code of Practice for the safe use of pesticides on farms and holdings" (HMSO)
20. **HS(G)162** "Carriage of Dangerous Goods explained Parts 1-4" (HMSO)
21. "Prudent Practices in the Laboratory" National Research Council (US) ISBN 0-309-05229-7-90000
22. **L64** Guidance on the Safety Signs and Signals Regulations
23. **HS(G)122** New and expectant mothers at work (**A guide for employers**)

Contact the Health and Safety Office for UoB Guidance on **Prescription only Medicines, Drugs and Poisons**