

**Chemical Emergencies**

**Introduction**

When working with chemicals it is almost inevitable that some spillages will occur, even when tasks are undertaken by experienced individuals and working practices are very good. In most cases, spillages are small and easily controlled and will present a relatively low level of risk to people in the area. If the substance involved is not hazardous then it is usually a simple matter to clean up the spillage using normal methods such as sweeping up solid spills and absorbing liquids. However, in some cases, where a spillage is large or the substance involved is hazardous, safely cleaning up the spill can become a complex task.

To reduce the risk to staff and students it is important to develop an emergency plan in advance so that when a spillage does occur appropriate remedial action can be taken quickly and safely. The first, and arguably the most important, step when working with any hazardous substance is to complete a suitable and sufficient CoSHH risk assessment which includes details on the procedures to be followed in the event of an emergency such as a leak or spillage. This should help laboratory users ensure that the appropriate procedures (including availability of spill control equipment) are available before work begins. A good plan for spill mitigation will consider the following:

* The location where the work will take place and how this may affect the ease with which a spill can be contained or removed e.g. the use of a fume cupboard may help to contain a spill.
* The use of secondary containment trays or protective materials such as Benchkote to control how far a spill will spread and reduce the risk of contaminating the work surface.
* Provision of materials for absorbing or neutralising chemical spills (e.g. absorbent granules or sodium carbonate for acid spills) should be made, with appropriate spill kits available close to the working area to avoid delays in taking the required actions.
* In some special cases there may be a requirement for the provision of specialist treatments or antidotes to mitigate the health effects where a person may come into contact with the spilled substance e.g. calcium gluconate gel in areas where hydrofluoric acid (HF) is in use.

**Managing Chemical Spills**

When a spill involving a hazardous substance does occur, the first action taken should be to immediately assess the possible outcomes and effects of the spillage to help determine a prompt and effective course of action. Consider asking the following questions:

* Is it safe for me to remain here and tackle the spillage?
* Who else might be placed at risk as a result of this incident?
* What are the hazards associated with this incident?
* How can I make the area safe and control the spillage?
* What other safety precautions should be taken (e.g. evacuation, ventilation, protective equipment)?
* Who should be informed?
* What learning points can be identified from the incident?

The second action that should generally be taken when dealing with a spillage of a hazardous material is to inform someone else so that assistance can be obtained. Remember to ensure your own safety and that of others at all times during the process, for the most part this is a simple matter of telling your colleagues what has happened but if the risk is severe then it may be necessary to raise a general alarm. Anyone not directly involved in dealing with the spillage should leave the area if possible. If the incident is very serious (e.g. a very large spillage or an extremely dangerous substance) then it may be necessary to request the attendance of the emergency services or a specialist contractor to help deal with the situation. If this is deemed necessary then you should contact security (extension 4444 for the Gilmorehill Campus and 2222 for the Garscube Campus) and explain the situation, they will arrange for the emergency services to be called and appropriate precautions to be taken e.g. evacuation of the building if required. It is also good practice to arrange for a competent person with knowledge of the substances involved to stand by to help advise the emergency services.

**Other Relevant Factors**

Several factors will affect the level of risk and may determine what remedial actions will need to be taken to control the release, these include:

**1. The Nature of the Substance**

The properties of the substance(s) involved will be one of the key factors in determining what precautions need to be taken when making the area safe including any PPE that might be required by people involved. The actions taken will depend on the properties of the substance(s) e.g. while many chemical spills can be easily contained and controlled by absorbing with an inert material, some spills e.g. strong acids may require neutralisation or dilution whereas spillages of flammable liquids usually require ignition sources to be removed and ventilation of the area as well ensuring that the spillage does not enter the drainage system.

Where spillages would require special precautions such as neutralising agents, special containment etc. then it is good practice to have these easily to hand during use of the substance and ensure that anyone involved in the process is familiar with the required precautions and spill procedures.

**2. The Physical Form of the Substance(s) Involved**

The physical form of the substance can have a significant effect on how far a spillage will spread as well as affecting the likelihood of exposure and the ease of decontaminating the affected area.

Solid materials are often considered to be the easiest to control and can often simply be swept up and contained for disposal. However, fine powders and dusts can easily become airborne and behave in a manner similar to aerosols and mists posing a risk of inhalation to anyone in the area and potentially spreading contamination over a wide area. Respiratory protection can often be required when dealing with spillages of very fine powders.

Liquids (especially those with low viscosity) tend to be more mobile than solids and will flow down gradients and into drains making liquid spillages much more likely to spread and as a result they can be more difficult to contain. If a liquid is corrosive, volatile or reactive then it may also generate harmful or flammable vapours after a spillage introducing a need for further precautions such as ventilation, removal of ignition sources or the use of respiratory protection for those involved in the clean-up. Spilled liquids should be contained to as small an area as possible and then depending on the nature of the risk absorbed using a spill kit, neutralised or simply diluted to reduce the risk. Acid spillages may often be diluted with water to reduce the risk and then neutralised using a suitable material such as sodium carbonate. Spillages can be contained using commercially available spill control kits which may include absorbent granules (e.g. cat litter), pads or flexible booms to contain larger spills. In the absence of a more formal spill kit sand or other inert materials can often be used to absorb or surround a spill to prevent it from spreading. The use of paper towels or other organic absorbents can be helpful in some cases although they should not be used to clean up some reactive substances such as strong acids or oxidising agents.

Gases and vapours may be released due to a failure of containment or due to the reaction of two or more substances, remember that some materials will react with oxygen or moisture to produce harmful vapours. Releases involving gases and vapours can be hard to contain due to their mobility and generally ventilation of the area is

Critical. This may be achieved by natural ventilation or using the existing LEV or mechanical ventilation systems. However, care should be taken to ensure the safety of anyone involved which may require evacuation of non-essential people, the use of respiratory protective equipment or managing the ventilation form a safe area e.g. opening external doors from outside if possible. Consider the example of a spillage of the flammable, narcotic solvent diethyl ether. Diethyl ether is extremely volatile producing a heavier than air vapour which is flammable in a wide range and can easily spread into low lying areas until it encounters an ignition source causing a fire or explosion.

**3. The Scale of the Spillage / Leak**

Clearly the larger the amount of material spilled, the greater the risk and the higher the likelihood that outside assistance may be required to manage the incident. The risk of a major incident is high when a large volume of a flammable, volatile toxic or highly corrosive substance is released. In areas where such substances are used, stored or transported in large quantities then robust emergency plans should be put in place and rehearsed to ensure they are both practical and clearly understood.

**4. The Number of People Who May be Affected**

Obviously the more people who are in the affected area at the incident, the more people are likely to be at risk due to contact with the substance or any vapour produced. Care should therefore be taken to evacuate the area of an incident of all non-essential personnel and to prevent any others from entering the hazard area until the spillage has been cleared. In some cases e.g. spillages of volatile liquids it may be necessary for an area to remain unoccupied during ventilation to allow and harmful or flammable vapours to disperse.

**5. The Location of the Spillage**

The risks associated with a spillage will vary depending on the location where it happens. A spillage of a volatile liquid in a well ventilated area with few occupants in a remote location is easily managed whereas the same spillage in a small room or high traffic area (e.g. entrance corridor) poses a much higher risk to staff and students. Therefore, when transporting hazardous substances through public areas either within a building or from one building to another, special precautions should be considered. Ideally, hazardous substances should be transported in robust, tightly sealed secondary containers to contain any spilled material in the event of a leak or accident, high traffic routes should be avoided where possible and movements carried out when fewer people are around i.e. avoiding lecture changeover times.

The location in which a spillage occurs may also have an impact on the risk e.g. a spillage of a flammable liquid in an area which contains multiple ignition sources or release of heavier than air vapours close to basements or other low areas can introduce a risk of asphyxiation or a build-up of toxic or flammable vapours if the area is poorly ventilated.

Further information can be obtained by contacting the Safety and Environmental Protection Service (SEPS)

**General Office:** 0141 3305532

**Chemical Safety Adviser:**  0141 3302799