

# Storage of Hazardous Chemicals in Laboratories

## Information Sheet

November 2012

### Scope

The aim of this guidance is to provide advice on the identification and assessment of risks associated with the storage of hazardous chemicals in laboratories. If you are storing larger quantities of chemicals also, please refer to the “Short Guide on Storage of Hazardous Chemicals in Warehouses & Drumstores”.

Storage guidelines are included for hazardous chemicals that are very toxic, toxic, oxidizing, explosive, flammable (including highly and extremely flammable), dangerous for the environment, water reactive (i.e. violent reaction with water and toxic gas evolution in contact with water) and corrosive. The specific safety data sheet (SDS) is required to be assessed in order to adequately review the chemical properties and hazards associated with the substance. The SDS should also provide specific information on conditions for safe storage in section 7, and details of incompatible materials and conditions to avoid in section 10.

### Risk Assessment for Storage of Chemicals

Laboratories that have not been subject to an adequate hazardous chemical storage assessment may have no defined storage system or may have an unsuitable system such as an alphabetical storage system. The following is a non-exhaustive list of examples of inadequate storage systems and practices commonly found in laboratories;



- Chemicals stored on laboratory worktop benches, floors.
- Chemicals stored on unsuitable shelving, e.g. damaged shelves, inadequately secured shelves, absence of drip trays on shelves, shelves positioned above eye level and difficult to reach.
- Insufficient storage space resulting in chemical containers being stacked on each other.
- Chemical container unsuitable for chemicals or poorly maintained e.g. labels illegible or damaged, damaged or incorrect fitting caps.
- Fume hoods designed for chemical experiments/dedicated chemical reactions being used to store chemicals.
- Flammables not stored in fire proof cabinets.
- Excessive quantities of chemicals such as flammables stored in laboratories.
- Gas cylinders unnecessarily located in laboratories.
- Gas cylinders not secured against falls.
- Prolonged storage of waste chemicals including accumulation of excessive quantities of waste chemicals.
- Absence of a chemical inventory management system, e.g. missing or inadequate labelling, out of date chemicals, damaged containers.

An appropriate chemical inventory management system, which as a minimum includes an inventory list, would assist in monitoring laboratory chemicals on a regular basis.

Safety Data Sheets (SDS) must be readily available for all hazardous chemicals stored, and these should be referred to for advice on storage, accidental release measures and incompatibilities.

**Note: SDS should be supplied in accordance with REACH Regulation (EC) No. 1907/2006.**

All hazardous chemicals being stored should carry correct labelling to indicate hazards, according to CLP Regulations (EC) No. 1272/2008.

Visual inspection of the chemical and its container should be carried out on a regular basis and a procedure in place for dealing with any issues that may be identified, such as damage to the container, illegible labels, etc.

## Segregation Scheme

Incompatible chemicals need to be properly segregated according to the chemical hazard class ensuring that like chemicals are stored together and away from other hazard chemical groups. Segregation in this manner will greatly reduce or even eliminate accidental adverse reactions that may occur due to container breakage in the storage areas. When segregating chemicals by hazard class it is important to ensure that all the hazardous properties associated with the chemicals are identified. This information is contained in section 2 "Hazards Identification" of the safety data sheets (SDS) which the chemical supplier is obliged to provide in respect of hazardous chemicals.

When putting in place the segregation scheme it is important to identify all the hazard properties of a chemical. Many chemicals have multiple hazards and a decision must be made as to which storage location within the warehouse or drum store is the most appropriate for each individual



chemical. Normally the storage area will be determined by the more hazardous property of the chemical and having assessed the consequences in the event of an accident in the storage area. For example, if a chemical is both flammable and corrosive it would be appropriate for the chemical to be stored with other flammables. However if a chemical is both flammable and very toxic then other factors need to be considered before selecting the appropriate storage area, such as the physical properties of the chemical and the quantity being stored.

If the chemical emits very toxic gases or vapours then the chemical may need to be isolated within the flammable storage area. There will always be some chemicals that will not fit neatly in one category or another, but with a proper identification of the chemical hazards and assessment of consequences of an accident release using the information available in the SDS, most chemicals should be assigned to appropriate storage areas. In addition to the SDS there are many industry documents and guidance available on chemical hazard classes, reaction hazards and segregation policies, please see list of references at end.

## Storage – General Issues

Quantities of chemicals should be kept to a minimum and any bulk quantities of individual chemicals (more than 5 litres) should be stored in dedicated external storage areas (e.g. chemical warehouse or chemical drum store). Where chemicals are transferred from large containers (e.g. 200 L drum or IBC) to smaller size laboratory containers, the user must ensure that the relevant hazard information is transferred to the smaller container.

Chemicals should not be stored on worktop benches, floors and fume hoods. The risk of containers being knocked over is greatly increased by work activities on benches and fume hoods and especially by pedestrian traffic across floors. In the event of an accidental spill on a bench there will not be a means to contain or restrict the spill from spreading. Likewise, an accidental spill of a container containing a flammable chemical in a fume hood may be ignited by heat sources being used at the time, such as Bunsen burners or non-intrinsically safe electrical equipment. Storage of chemical containers in fume hoods also negatively impacts on extraction performance. Chemicals should always be immediately returned to dedicated safe storage areas after use.

Gas cylinders, where possible, should be located in well ventilated external areas with a fixed pipe supply to the laboratory. Where the use of cylinders in the laboratory cannot be avoided, the cylinder must be properly secured to a fixed structure such as a wall or work bench. Gas detection should be provided where toxic, corrosive or flammable gases are used. In particular, the need for gas detection where inert gases are used, such as nitrogen, helium, etc., should be subject to a risk assessment to

determine if there is a risk of asphyxiation to personnel due to air displacement by the inert gas in the work area. The risk assessment also needs to take account of the potential for explosion associated with pressurised cylinders.

The practice of accumulating waste chemicals must be subject to a detailed assessment to determine the compatibility or otherwise of each of the waste chemicals and in general, waste chemicals should never be accumulated in large containers for disposal at a later date.

Where possible secondary containment such as drip trays should be used in order to minimize the spread of spillages. The use of a raised lip along the outer edge of shelves will help to prevent containers from slipping and falling. Sufficient space should be provided on shelves so as to avoid contact between containers.

## Storage of Flammable Chemicals

Flammable chemicals must be stored in fire safety storage cabinets which satisfy the requirements of EN 14470-1 and quantities of flammable chemicals should be kept to a minimum.

Flammable materials should never be stored in domestic-type refrigerators. Only explosion-proof or specially designed flammable material refrigerators should be used for storage of these chemicals within a laboratory environment.

## Emergency Preparedness

Chemical laboratories are required to have appropriate emergency response and first-aid equipment readily available and personnel trained in the use of such equipment.

Fire-fighting equipment must be suitable for the fire scenarios identified such as flammable liquid, flammable solid, electrical equipment fires, etc.

Emergency response plans are required to be prepared and implemented for accident scenarios involving the full range of chemical hazard classes identified in the laboratory, i.e. toxics, oxidizers, explosives, flammables, dangerous for the environment, water reactive and corrosive chemicals.

Equipment such as fire extinguishers, first-aid, emergency showers/eye washes should be inspected and tested at suitable intervals and records of same maintained.

## References/Further Information

Brethericks' Handbook of Reactive Chemical Hazards

Sax's Dangerous Properties of Industrial Materials, Tenth Edition

**HSG71** Chemical Warehousing: The Storage of Packaged Dangerous Substances, available from Health and Safety Executive (U.K.), [www.hse.gov.uk](http://www.hse.gov.uk)

**HSG51** The storage of Flammable Liquids in Containers, available from Health and Safety Executive (U.K.), [www.hse.gov.uk](http://www.hse.gov.uk)

**EN 14470-1** Safety Cabinets for Flammable and Explosive

products, available from the National Standards Authority of Ireland, [www.nsai.ie](http://www.nsai.ie)

**EN 14470-2** Safety Cabinets for Pressurised Gas Cylinders, available from the National Standards Authority of Ireland, [www.nsai.ie](http://www.nsai.ie)

Safety, Health and Welfare at Work (General Application) Regulations, S.I. 299 of 2007 titled "Explosive Atmospheres at Places of Work", which is free to download from the Office of the Attorney general website, [www.irishstatutebook.ie](http://www.irishstatutebook.ie)

HSA Guidance documents "Your Steps to Chemical Safety" which is free to download from HSA website, <http://www.hsa.ie/eng>

Further information and advice on chemicals is available from the HSA, through a dedicated Chemicals Helpdesk which provides a direct query service by e-mail, [chemicals@hsa.ie](mailto:chemicals@hsa.ie) or by phone, **1890 289 389**.