

Storage of Hazardous Chemicals in Warehouses & Drum Stores

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 *warehouses and drum stores*.

For information on the safe storage of *laboratory chemicals*, please refer to our “Guide on Storage of Hazardous Chemicals in Laboratories”.

These guidelines cover the safe storage of 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 hazardous chemical safety data sheet (SDS) must first be assessed in order to adequately review the chemical properties and associated hazards.

This guidance is specific to packaged chemicals, i.e. chemicals that are packaged in containers of varying sizes and materials of construction. For example, drums used to store liquids are normally of plastic or metal construction and range in capacity from 20 litre to 250 litre, while intermediate bulk containers (IBCs) normally have a design capacity of up to 1000 litre. Solids, and in particular, powders may be packaged in bags usually between 15 kg to 25 kg in weight and may also be packaged in flexible intermediate bulk containers (FIBCs) weighing up to 1000 kg. Pressurised gas cylinders come in wide combination of size, weight and pressure.



Risk Assessment for Storage of Hazardous Chemicals

Warehouses and drumstores 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 warehouses and drum stores;

- Chemicals stored on passageways including forklift truck routes, other vehicle routes such as truck access routes to loading bays, pedestrian walkways etc.
- Absence of a suitable vehicle and pedestrian traffic management plan including defined forklift truck routes with appropriate speed limits, etc.
- Emergency exits obstructed by chemical containers.
- Chemicals stored on damaged, or inadequately secured racking or on damaged pallets.
- Warehouse racking not suitably designed or constructed to withstand the anticipated loading of chemical containers placed on it.

- Absence of secondary containment and spill kits.
- Inadequate/no training provided for forklift truck drivers.
- Where applicable, the absence of a suitable area for the transfers of chemicals from a large to smaller packaging, e.g. for production or laboratory use, batch kitting, etc.
- Cylinders not properly secured against falls.
- Inadequate / no emergency response plan for dealing with chemical incidents such as liquid spills, toxic gas releases or fires.
- Chemicals stored by poorly chosen categories, such as all acids (inorganic and organic, strong oxidizers) together; all organics stored together.

Many of these issues should be addressed by having an appropriate chemical inventory management system, which as a minimum includes an inventory list; this would assist in monitoring chemical storage practices on a regular basis.

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

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.

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 the Safety Data Sheet (SDS) which the chemical supplier is obliged to provide in respect of hazardous chemicals and can be found in section 2. "*Hazard Identification*".

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.

Storage Issues

Where chemicals are transferred from large containers (e.g. 200 L drum or IBC) to smaller containers (e.g. 20 L drum), the user must ensure that the relevant hazard information is transferred to the smaller container.

Warehouses and drumstores should have dedicated set down areas for incoming chemicals where the chemicals containers can be inspected and associated safety documentation can be retained.

Gas cylinders should be securely stored on a flat dry surface in an adequately ventilated building or part of a building specifically reserved for this purpose. Cylinders should be protected from external heat sources that may affect their mechanical integrity and should be stored such that they are not at risk from vehicle impact. Gas cylinders should also be stored away from sources of ignition and other flammable materials, due to the potential for explosion.

Secondary containment (e.g. a bunded area) should be put in place to minimize the spread of any chemical spillage within a storage area, and should be ideally be designed into the warehouse or drum store at the time of construction. If the storage area does not have built in secondary containment then the use of specialised chemical cabinets, individual container bunded trays, bunded pallets etc. should be considered.

Racking systems are required to be designed and constructed by competent persons to ensure suitability for the anticipated maximum loading which they will be subjected to and should be inspected at appropriate intervals. Damage to racking, such as impact damage caused by a forklift truck, should be immediately repaired or replaced. Where chemicals are intended to be stacked on top of one another without the use of racking then a safe maximum stack height must be determined, having taken account of the load bearing capability of the packaging.

Flammables

The use and storage of flammable chemicals presents one of the highest hazards in warehouses and drumstores due the risk of fire either by direct ignition or the fuelling of a fire originating from other sources. A risk assessment in relation to storage of highly flammable chemicals may need to be completed where an explosive atmosphere is likely to be present or may arise from time to time, and in some cases an Explosion Protection Document (EPD) may have to be prepared. For more information about explosive atmospheres in the workplace, please refer to Part 8 of the Safety, Health and Welfare at Work (General Application) Regulations S.I. 299 of 2007 titled "Explosive Atmospheres at Places of Work."



Emergency Preparedness

Chemical warehouses and drumstores 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 storage area, i.e. toxics, oxidizers, explosives, flammables, dangerous for the environment, water reactive and corrosive chemicals.

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

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 or by phone, **1890 289 389**.

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

HSG51 The storage of Flammable Liquids in Containers, available from Health and Safety Executive (U.K.), 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

EN 14470-2 Safety Cabinets for Pressurised Gas Cylinders, available from the National Standards Authority of Ireland, 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