

COMPATIBILITY OF CHEMICALS AND BULK CHEMICAL STORAGE

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COMPATIBILITY OF CHEMICALS



Occupational Hygiene

Occupational Hygiene is the science devoted to the:



of factors and stresses, arising in or from workplaces, which may cause sickness, impaired health or significant discomfort and inefficiency among workers.



Anticipation

Design of work process, equipment, workplace and storage facilities.

- It is essential to provide specialist inputs during the design, construction, fitting and commissioning phases of a facility / building / plant so as to:
 - ❖ anticipate any health and safety issues that may arise during future operations.
 - ❖ ensure compliance with statutory requirements and recommended standards.

Compatibility of Chemicals

The single most important rule of chemical storage is segregation of incompatible chemicals to prevent accidental mixing which could cause fire, explosion, or release of toxic gases / fumes.

- Hazardous chemical reactions can occur from improper storage when incompatible chemicals mix because of:
 - ❖ Accidental breakage and / or container failure.
 - ❖ Mixing of gases or vapors from poorly closed containers.
 - ❖ Mistakenly storing incompatibles together because of improperly labeled containers.
 - ❖ Absence of a chemical segregation system.

Compatibility of Chemicals

Is a measure of how stable a substance is when mixed with another substance.

If substances mix and change or react with one another they are considered **incompatible**.

For example, bleach and ammonia, both commonly used cleaners, are not compatible chemicals, they react.

The reaction in this case is dangerous so care must be taken not to allow these chemicals to mix.

Common Storage Mistakes

Alphabetical Storage

- Chemicals should be stored / organized by **COMPATIBILITY** – not alphabetically. Some examples of potential problems with alphabetical storage include, but is not limited to:
 - ❖ Aluminium metal accidentally mixed with ammonium nitrate may cause an explosion.
 - ❖ Sodium nitrate accidentally mixed with sodium thiosulfate may cause an explosion.

Common Storage Mistakes

Storage by Hazard Class

- Storage of chemicals only by hazard class such as Flammable, Corrosive, or Poison is too broad and will result in a number of incompatibility issues.
 - ❖ One example, is that nitric acid mixed with tannic acid, may react and cause a fire.

Compatibility of Chemicals

Chemical Reactivity Worksheet – Version 4.0.2

American Institute of Chemical Engineers



CRW4

Compatibility of Chemicals

Recommended Steps to Compatibility

- Step 1 – Take Inventory of all the Chemicals. Ensure all chemicals are labelled so as to ensure segregation.
- Step 2 – Reduce Inventory.
- Step 3 – Reorganize remaining chemicals into compatible chemical families by making use of a compatibility tool / chart.

BULK CHEMICAL STORAGE



Bulk Chemicals Storage

Is secure storage facilities, equipped to hold the stock of flammable or combustible liquids and other hazardous chemicals used during laboratory experiments and / or research.

Proper chemical storage is required to minimize the hazards associated with leaks, spills and accidental mixing of incompatible chemicals.

Bulk Chemicals Storage

Generally 2 types of “Storage Solutions” are available within teaching / research Facilities:

➤ Bulk Chemical Stores

- ❖ Specifically designed building to store large volume, small variety of chemicals.



➤ Chemical Storage Cabinets

- ❖ Specifically designed cabinets to store small volume, large variety of chemicals.



Bulk Chemicals Storage

Bulk Chemical Stores

➤ Advantages

- ❖ Order large volume chemicals – Cost and availability.
- ❖ Reduction of chemical storage within laboratories.

➤ Disadvantages

- ❖ Travel distance from bulk store to Laboratory.
- ❖ Compartmentalization of bulk facility per department.
- ❖ Stock Control.

Bulk Chemicals Storage

Chemical Storage Cabinets

➤ Advantages

- ❖ Risk of accidents caused by improper chemical storage minimized in laboratories .
- ❖ Chemicals managed on-site as close to operations as possible is preferable for day-to-day usage.
- ❖ Stock Control

➤ Disadvantages

- ❖ Delivery rate of chemicals would need adjustment.
- ❖ Space.

Bulk Chemicals Storage

Bulk Chemical Stores – Design Specifications

- Constructed of fire-resistant material.
- Either a bund or open-grated trench to hold the volume of chemicals to be store + 10%.
- Suitable fire suppressant system.
- Mechanical ventilation system to produce a negative pressure inside the store.
- Bulk Chemical Store equipped with explosion-proof (intrinsically safe) light fixtures and light switches.

Bulk Chemicals Storage

Chemical Storage Cabinets – Design Specifications

- Double-walled sheet steel construction, with a space of not less than 40 mm between the walls.
- Shelving shall be perforated for free air movement.
- Shelving shall be constructed of non-corrosive and non-flammable materials.
- Spill trays as secondary containment.
- Mechanical ventilation system to produce negative pressure inside the cabinet.



Thank you
