

WESTERN CONNECTICUT STATE UNIVERSITY

CHEMICAL STORAGE AND COMPATIBILITY GUIDELINES

PROCEDURE S-118

Issued 6/4/02 Reviewed 7/17/2009 Revised 11/14/2018; 2/3/2020

Please direct any questions or comments about the applicability of this document to David Serino, Director of Environmental Health & Safety

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1.0 <u>INTRODUCTION</u>

The chemical storage and compatibility guidelines have been developed to aid chemical users at Western Connecticut State University (WCSU) to meet the requirements of the Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA). They have been developed using references issued by the National Fire Protection Association (NFPA) and the Federal Department of Transportation (DOT). This is a guidance document and is not intended to address all potential chemical storage scenarios.

2.0 <u>GENERAL OPERATING PRINCIPLES</u>

- Minimize chemical storage in laboratories
- Utilize dedicated storage rooms and solvent storage areas
- Flammable storage in excess of 10 gallons must be in a flammable storage cabinet and cannot exceed 60 gallons per laboratory
- Storage cabinets must be vented to the outdoors or sealed
- All containers must be labeled with
 - Contents listed in plain English
 - Manufacturer's name
 - Primary hazard statement
- When in doubt, use secondary containment

3.0 <u>CHEMICAL STORAGE AREA</u>

- Chemical storage areas should be away from exits, heat and direct sunlight.
- Shelves shall be of substantial construction, resistant to chemicals and should have a 1-inch lip to prevent chemicals from falling.
- Chemicals should be stored at shoulder height (of the average employee) or below.
- Proper ventilation of the area needs to be supplied and special ventilation may be required.
- Secondary containment <u>shall</u> be provided for liquids that are flammable, corrosive, highly toxic or highly volatile. It <u>should</u> be provided for all other aqueous solutions.
- Flammable chemicals require an approved storage cabinet if more than 10 gallons is present at any one time. A maximum of 60 gallons may be stored in a flammables cabinet at any one time.
- Flammables cabinets and flammable chemicals may not be stored in the path of egress.
- Bench tops shall not be used as chemical storage areas.
- If refrigeration is required, then an approved refrigerator for flammable of explosive storage (and proper signage) must be provided.
- Chemicals shall not be stored on the floor.
- Gas cylinders shall be stored away from heat sources, in an upright position and individually secured with a chain or strap to ensure that it will not fall over.

- Area should be inspected regularly for leaking or defective containers and chemicals that have been placed back in the wrong place.
- Chemicals must be inventoried annually. Maximum quantities on hand at any one time shall be included in this inventory procedure.

4.0 <u>CHEMICAL CONTAINERS AND GAS CYLINDERS</u>

- Containers shall be constructed of a material that is compatible with the chemical they will contain.
- Containers and cylinders shall be physically sound with no rusting or bulging.
- All containers shall be labeled with the contents and hazards of the chemical. For chemicals that have been transferred to a secondary container, a label must be applied indicating contents, manufacturer, and primary hazard.
- Gas Cylinders must have the cap installed when not in use.
- Gas cylinder storage tags must be used at all times (see Appendix 1).

5.0 <u>COMPATIBILITY</u>

Chemicals must be stored in such a manner to avoid interaction between incompatible chemicals. There are many systems to ensure proper storage and many are based on color-coding the chemical's labels, with compatibles being the same color. Once segregated into compatible groups the chemicals can be put in alphabetical order.

In general, flammables must be stored together and away from other chemicals. Flammable chemicals with an NFPA rating of 2 or above (flash point above 100°F) should be stored in a flammable's cabinet.

Toxics or poisons are often indicated by a blue label and may need to be stored in a separate, secured area.

General use chemicals without significant incompatibilities may be stored together using an alphabetical system and are usually indicated by an orange or gray label.

General guidelines for the storage of acids and bases include the following:

- Acids and bases shall be stored separately.
- Secondary containment is required for all liquid corrosives. Each grouping may share the same secondary containment, but each group listed below must be in separate secondary containment.
- Secondary containment shall be able to contain 110% of the acids being stored within the containment. Secondary containment shall not react or become compromised if it comes in contact with the acid. Polyethylene tubs are recommended.
- Separate and store acids according to the guidance below. Any acid not listed below should follow the J.T. Baker system which may be found at http://www.jtbaker.com (or its equivalent)

Acids in Compatibility Group	Hazard family
Picric Acid	Flammable hazard
Propionic Acid	
Butyric Acid	
Acrylic Acid	
Formic Acid	Incompatible with other acids and
	alcohols, Flammable
Phosphoric Acid	Contact hazards, Corrosive
Hydrochloric Acid	
Hydrofluoric Acid	
Hydroiodic Acid	
Hydrobromic Acid	
Oxalic Acid	
Dichloroacetic Acid	
Fluoboric Acid	
Acetic Acid	
Lactic Acid	Incompatible with other acids,
	contact hazard, corrosive
Nitric Acid	Reactivity hazard, strong oxidizer
Perchloric Acid	
Sulfuric Acid	
Chromic Acid	

Note¹: The red group acids can be stored in a flammable storage cabinet as long as they are stored in a secondary containment. OSHA does not consider all acids listed in the red group to be flammable. This means that they are not required to be stored in a flammable storage cabinet as long as less than 20 gallons per 110 ft² are being stored. Twenty gallons per 100 ft² is used for a non-instructional laboratory unit per NFPA 45.

Note²: It is recommended that Hydrofluoric acid be stored by itself in a separate cabinet due to the extreme nature of the contact hazard. All containers used with or around Hydrofluoric acid must be plastic or nalgene and NOT glass.

COMMON CHEMICAL INCOMPATIBILITIES

The following are additional examples of common laboratory chemicals and their incompatibilities. This list is by no means exhaustive and should be used as guidance only. For specific chemicals of concern, refer to the Chemicals Material Safety Data Sheet (MSDS).

Chemical	Incompatibilities
Acetic Acid	Chromic acid, nitric acid, hydroxyl compounds,
	ethylene glycol, perchloric acid, peroxides,
	permanganates.

Chemical	Incompatibilities
Acetylene	Chlorine, bromine, copper, fluorine, silver, mercury.
Acetone	Concentrated nitric and sulfuric acid mixtures.
Alkali and alkaline earth	Water, carbon tetrachloride or other chlorinated
metals (such as powdered	hydrocarbons, carbon dioxide, halogens.
aluminum or magnesium,	
calcium, lithium, sodium,	
potassium).	
Ammonia (anhydrous)	Mercury (in manometers, for example), chlorine,
	calcium hypochlorite, iodine, bromine, hydrofluoric
	acid (anhydrous).
Ammomium nitrate	Acids, powdered metals, flammable liquids, chlorates,
	nitrites, sulfur, finely divided organic combustible
	materials.
Aniline	Nitric acid, hydrogen peroxide.
Arsenical materials	Any reducing agent.
Azides	Acids
Bromine	See chlorine.
Calcium oxide	Water
Carbon (activated)	Calcium hypochlorite, all oxidizing agents.
Carbon tetrachloride	Sodium
Chlorates	Ammonium salts, acids, powdered metals, sulfur, finely
	divided organic or combustible materials.
Chromic acid and	Acetic acid, naphthalene, camphor, glycerol, alcohol,
chromium	flammable liquids in general.
Chlorine	Ammonia, acetylene, butadiene, butane, methane,
	propane (or other petroleum gases), hydrogen, sodium
Chloring digvide	Ammonia mothana nhasnhina hydrogon sulfida
Connor	Animolia, methane, prospinie, nydrogen sunde.
Cupper Cupper bydronorovido	Acids (organia or inorgania)
Cumene nydroperoxide	Acids (organic of morganic).
Elemmehle liquide	Actus
Flammable liquids	Animonium muate, chronic acid, nydrogen peroxide,
Fluorine	All other chemicals (such as butane, propage, benzene)
Hydrocarbons	Fluorine chlorine bromine chromic acid sodium
Trydrocarbons	peroxide.
Hydrocyanic acid	Nitric acid. alkali.
Hydrofluoric acid	Ammonia (aqueous or anhydrous).
(anhydrous)	······································
Hydrogen peroxide	Copper, chromium, iron, most metals or their salts.
	alcohols, acetone, organic materials, aniline,
	nitromethane, combustible materials.
Hydrogen sulfide	Fuming nitric acid, oxidizing gases.

Chemical	Incompatibilities
Hypochlorites	Acids, activated carbon.
Iodine	Acetylene, ammonia (aqueous or anhydrous), hydrogen.
Mercury	Acetylene, fulminic acid, ammonia.
Nitrates	Sulfuric acid.
Nitric acid (concentrated)	Acetic acid, aniline, chromic acid, hydrocyanic acid,
	hydrogen sulfide, flammable liquids, flammable gases,
	copper, brass, any heavy metals.
Nitrates	Acids
Nitroparaffins	Inorganic bases, amines.
Oxalic acid	Silver, mercury.
Oxygen	Oils, grease, hydrogen, flammable liquids, solids or
	gases.
Perchloric acid	Acetic anhydride, bismuth and its alloys, alcohol, paper,
	wood, grease, oils.
Peroxides, organic	Acids (organic or mineral), avoid friction, store cold.
Phosphorus (white)	Air, oxygen, alkalies, reducing agents.
Potassium	Carbon tetrachloride, carbon dioxide, water.
Potassium chlorate	Sulfuric and other acids.
Potassium perchlorate	Sulfuric and other acids.
(see also chlorates)	
Potassium permanganate	Glycerol, ethylene glycol, benzaldehyde, sulfuric acid.
Selenides	Reducing agents.
Silver	Acetylene, oxalic acid, tartartic acid, ammonium
	compounds, fulminic acid.
Sodium	Carbon tetrachloride, carbon dioxide, water.
Sodium nitrite	Ammonium nitrate and other ammonium salts.
Sodium peroxide	Ethyl or methyl alcohol, glacial acetic acid, acetic
	anhydride, benzaldehyde, carbon disulfide, glycerin,
	ethylene glycol, ethyl acetate, methyl acetate, furfural.
Sulfides	Acids
Sulfuric acid	Potassium chlorate, potassium perchlorate, potassium
	permanganate (similar compounds of light metals, such
	as sodium, lithium) tellurides.

Appendix 1

Gas Cylinder Storage Tag or Equivalent



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University Certification

Procedure S-118 (Chemical Storage and Compatibility Guidelines), for the Western Connecticut State University campus located in Danbury, Connecticut, has been reviewed and approved by the appropriate personnel at Western Connecticut State University. The procedures in this plan will be implemented and amended, as necessary, due to expansions, modifications, and improvements at the campus.

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Signature:

Date: 4/22/2020

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