



**DESERT SANDS UNIFIED SCHOOL DISTRICT**  
*The Future Is Here!*

**CHEMICAL HYGIENE PLAN**  
**FOR**  
**DESERT SANDS UNIFIED SCHOOL DISTRICT**  
**REVISED AUGUST 2023**

## PURPOSE AND SCOPE

The Desert Sands Unified School District (DSUSD, District) is committed to providing a safe and healthy working and learning environment for all teachers, staff members, and students. This Chemical Hygiene Plan is written in compliance with California Code of Regulations (CCR), Title 8, Sections 5191 (*Occupational Exposures to Hazardous Chemicals in Laboratories*), 5209 (*Carcinogens*), and 5154.1 (*Ventilation Requirements for Laboratory-Type Hood Operations*), and will be updated as District protocols change. The goal of this plan is to provide employees information and training pertaining to various health and safety hazards pertaining to hazardous chemicals which may be present in the employee's work area. Elements of the Chemical Hygiene plan include employee training; proper labeling, handling, and management of chemicals and chemical waste; installation and upkeep of engineering controls; maintenance of records pertaining to safety inspections and chemical inventories, and provision of appropriate personal protective equipment and (if necessary) medical monitoring for employees.

This Chemical Hygiene Plan is primarily geared toward teachers, staff, and students working in a classroom environment where hazardous chemicals are handled. (This environment meets the definition of "laboratory" according to CCR Title 8 Section 5191.) For all other working and learning environments involving chemical handling, transportation and awareness, please refer to the District's Hazard Communication Program. Use of chemicals solely for cleaning and disinfecting (e.g. custodial work) does not qualify as laboratory use of hazardous chemicals.

## POLICY

With the goal of providing a safe and healthy learning and working environment for all laboratory occupants, the District has adopted and incorporated this Chemical Hygiene Plan as part of the overall DSUSD Injury and Illness Prevention Program. Emphasis is provided to the following points:

- All laboratory occupants are protected at all times from the health hazards associated with hazardous chemicals present in the classroom.
- Employee exposures are kept below the OSHA Permissible Exposure Limits (PELs) and Action Levels as identified in California Code of Regulations, Title 8, Section 5155.
- The District complies with all state, federal, and local regulations pertaining to hazardous substance use, storage, and disposal.

## RESPONSIBILITY

The DSUSD Director of Risk Management is the ***Chemical Hygiene Plan Administrator***. The Safety and Industrial Hygienist Manager, working under the direction of the Director of Risk

Management, is the designated **Chemical Hygiene Officer** and is therefore responsible for oversight and implementation of various elements of the Chemical Hygiene plan, such as proper management of chemicals, access to Safety Data Sheets, and employee training. The Safety and Industrial Hygienist Manager is also responsible for reviewing the Chemical Hygiene plan at least annually and notifying Department Supervisors of any changes to the program.

**Department Supervisors** are responsible for identifying District employees who work in laboratory environments and ensuring that these employees take training specific to the chemicals and associated hazards present in their working environments. (Recall that employees who do not handle chemicals in a laboratory environment, but handle chemicals in other situations, will most likely need to take Haz Com training.) The Safety and Industrial Hygienist Manager is available for training assistance, if desired.

**Site Coordinators** include all employees (teachers, staff, and management employees) who are engaged in at least one of the following scopes of work:

- 1) Using hazardous substances (chemicals);
- 2) Storing hazardous substances;
- 3) Ensuring that the containers holding such substances are properly labeled.

Please refer to the District's Hazard Communication Program for more information on Site Coordinator responsibilities.

**Teachers and Staff Members** who either instruct students and/or have student employees or volunteers under their immediate supervision are responsible for ensuring that these individuals are appropriately trained as to the health and safety hazards, handling and disposal protocols, and personal protective equipment requirements associated with chemicals being handled in the laboratory.

**All Students, Employees, and Volunteers** are responsible for:

- Understanding and complying with District and school site health and safety policies and procedures;
- Notifying their supervisor or Risk Management if any hazardous conditions are observed on the work site;
- Reviewing Safety Data Sheets (SDSs) to become familiar with the hazardous substances used in their area;
- Utilizing all appropriate safety equipment and clothing properly and routinely.

## **STANDARD OPERATING PROCEDURES (General Guidelines)**

The following guidelines should be adhered to in all areas where chemicals or other hazardous substances are to be handled:

- When planning and conducting experiments, the quantity of chemical used should be limited to the smallest amount necessary to achieve the desired learning objective.
- The use of personal protective equipment (PPE) in the classroom must be in line with the chemical manufacturer's guidelines (refer to the Safety Data Sheet). If cost is a factor in procuring PPE, then a less-hazardous substitute should be considered.
- All chemicals must be labeled in such a way that the identity and associated hazards are readily identified by all individuals.
- All staff, teachers, and volunteers must know how to access the Safety Data Sheet(s) for their hazardous substance(s). Students must be provided the SDS upon request.
- Chemicals presenting a hazard via inhalation must be handled in well-ventilated areas. This applies not just to pure chemicals but also to biological specimens which may be preserved in a chemical solution (e.g. formalin).

## **THE HIERARCHY OF CONTROLS**

Hazardous chemicals pose a unique challenge to the teaching and learning environment. The Hierarchy of Controls is often referred to by professionals in industrial hygiene (occupational health and safety) as a foundation for controlling exposures to chemicals that can be dangerous to their users.

Where possible, the various methods of hazard reduction have been placed into one of the Controls. Sections that do not fit neatly into a Control will be presented independently in this document, immediately following the Hierarchy.

The various Controls are listed in order of greatest impact first; however, it is important to note that all Controls are essential for achieving the goal of maintaining workplace and classroom safety.

- Elimination / Substitution
- Engineering Controls
- Administrative Controls
- Personal Protective Equipment

### **Elimination / Substitution**

Elimination is the highest-ranked Control in the Hierarchy. If a hazard can be eliminated altogether, that is the ideal situation. However, this is rarely feasible because there is a level, however small, of risk associated with the handling of chemicals in a working and teaching environment. In a laboratory environment, it is likely that eliminating the hazard means eliminating the use of any and all chemicals that are capable of creating the hazard.

*Substitution* of chemicals is generally more feasible than elimination. Teachers and staff members should determine if a chemical used in a particular experiment can be substituted for a less-hazardous one while still achieving the same desired outcomes. Safety Data Sheets can be particularly helpful in comparing and contrasting chemicals. Pay particular attention to eye and skin damage categories as well as NFPA “diamond” ratings.

(For more information on Safety Data Sheets, please refer to the District’s Hazard Communication Program.)

All efforts should be made to *avoid* using chemicals which fall into one or more of the following categories:

- High acute toxicity
- Carcinogens (can cause cancer)
- Teratogens (can cause birth defects)
- Mutagens (can cause changes to DNA)
- Reproductive toxins
- Explosives; or potentially explosive

If it is determined that use of a chemical which falls into one or more of the aforementioned categories is necessary for the learning environment and cannot be substituted out, please reach out to the Risk Management department to obtain written permission for use of this substance. Please also consult **Appendices A and B** of this document for further guidance.

If you have any questions regarding suitable chemicals for the laboratory environment, please contact the Safety and Industrial Hygienist Manager.

### **Engineering Controls**

Engineering controls often refer to equipment in the room which can reduce user exposure to the chemical. (This is not to be confused with *Personal Protective Equipment*, which is covered later in the document.)

#### ***Fume Hoods***

Chemical fume hoods are a classic example of an engineering control in the classroom environment. Fumes and vapors emitted from the open chemical container are “sucked up” and away from the user’s breathing zone, to the outdoors.

Fume hoods should be utilized when working with chemicals which meet one or more of the following criteria:

- Particularly hazardous (see the list of chemicals in the previous section, “Elimination/ Substitution” – this is assuming a risk assessment has been performed and it is determined that using this chemical provides the best learning outcome for students in this course)
- Chemicals with an NFPA Health rating of 3 or 4
- Flammable
- Corrosive
- Irritating
- Reactive
- Chemicals susceptible to spattering or aerosolizing when heated or agitated
- Chemicals with low odor thresholds (hazardous or non-hazardous)
- Chemicals with a Safety Data Sheet that indicates that “exhaust ventilation or other engineering controls” should be used to control vapor concentrations.

Please note that chemical fume hoods must perform according to the specifications listed in CCR Title 8 Section 5154.1. An average air velocity of 100 linear feet per minute (measurements taken at the fume hood “face,” or sash location) must be maintained, with no individual reading of less than 70 feet per minute. To help ensure this standard is met, and to maintain the safety of fume-hood users, please abide by the following guidelines:

- Fume hoods should not be used for long-term storage of chemicals, *unless* the fume hood has been designated as a “Storage Only” fume hood.
  - To designate a fume hood as a “Storage Only” hood, written permission must be obtained by the Assistant Principal and DSUSD Risk Management (Safety and Industrial Hygienist Manager).
- All items not pertaining to the experiment or operation at hand should be removed from the fume hood (unless the fume hood has been designated for storage).
- Items should be placed at least 6 inches away from the fume hood “face”/ sash.
- The bottom lip of the sash should not be raised higher than the “Maximum Height” sticker or stopper, while the hood is actively being used. Only Maintenance & Operations (MOT) may remove or otherwise modify the stopper.
- If the user finds the fume-hood alarm to be activated, this indicates a potential malfunction with the fume hood. The supervising teacher or staff member should notify MOT and their Assistant Principal as soon as possible and *immediately* cease use of the hood. *Do NOT mute the alarm with intent to continue using the fume hood!*
  - In situations where the fume hood is out of commission, the teacher or staff member should work with the Assistant Principal to identify a suitable alternative hood, if feasible.
- MOT may “tag out” a malfunctioning hood (i.e., out of service) until such time the problem is identified and repairs are made. *Under no circumstances* may school staff remove the tag or otherwise use the hood. Any questions regarding a fume hood being serviced should be directed to MOT.

- Per code, fume hoods must be certified at least annually for proper air flow. (This is generally the responsibility of MOT.)

### **Administrative Controls**

Administrative Controls are often referred to as housekeeping controls. In order to protect students and employees from chemical hazards, it is vital to know what is being worked with, how much of the chemical is present, and which specific health hazards are associated with the chemical.

### ***Standard Operating Procedures for Chemical Storage and Use***

Please refer to **Appendix A** of this document for standard operating procedures for the following chemical categories:

- Flammable/ Combustible Liquids
- Corrosives
- Chlorinated Hydrocarbons/ Solvents
- Oxidizers
- Compressed Gases/ Aerosols
- Toxics
- Reactives
- Organic Peroxides

### ***Control Measures for Extremely Hazardous Substances***

Please refer to **Appendix B** of this document for control measures for extremely hazardous substances. These measures apply to the handling of any chemical identified in Appendix A. It is strongly recommended that Department Supervisors and Site Coordinators share these measures with all students and personnel expected to handle these chemicals, and have the documentation signed and dated as acknowledgement of receipt and understanding of the guidelines.

### ***Chemical Inventory***

An inventory of hazardous chemicals located at the District and school sites is maintained by the Department of Risk Management and updated periodically in coordination with Keenan & Associates. Any employee may request a copy of the chemical inventory for their work site by reaching out to the Risk Management department.

### ***Chemical Labeling***

All containers used for chemical storage (including hazardous wastes) must be appropriately labeled with information regarding substance identity, hazard identification, and other pertinent details. For more information regarding chemical labeling, please refer to the DSUSD Hazard Communication Program.

### ***Safety Data Sheets (SDSs)***

All Safety Data Sheets pertaining to hazardous substances stored on District sites must be readily accessible by employees as well as emergency responders. DSUSD Risk Management, in coordination with Keenan & Associates, will maintain a central repository of digital SDSs. The Department Supervisors are responsible for ensuring that SDSs are accessible, and school staff are responsible for determining how best to maintain the SDSs in their respective work areas. For more information regarding Safety Data Sheets, please refer to the DSUSD Hazard Communication Program.

### ***Signs and Labels***

All posted signs and labels must be clearly visible and maintained in good condition.

Signs and labels should include:

- Emergency information:
  - Important telephone numbers
  - Names and numbers of supervisors and emergency response personnel
  
- Location signs:
  - Eyewash stations
  - Deluge showers
  - First-aid equipment
  - Fire extinguishers
  - Exits
  
- Warnings for areas or equipment which pose special hazards:
  - Flammable storage areas
  - Oxidizer storage areas
  - Bulk corrosives storage areas
  - Compressed gas storage
  - Toxic storage
  - Radioactives



- Biohazards
- Automatic-starting equipment
- Extremely hot or cold equipment
- Miscellaneous signs:
  - Identify where food and beverage storage and/or consumption are not permitted.
  - Identify “No Smoking” areas.
  - Identify non-potable water supplies.
- Container labeling:
  - Labels on incoming containers should not be removed or defaced.
  - All chemical containers should be labeled with at least the chemical identity or contents and hazard warnings. (Refer to the DSUSD Hazard Communication Program for more information.)
  - Hazardous waste containers should be labeled appropriately – refer to the “Chemical Procurement & Waste Mitigation” section for more information.

### ***Employee Training***

Under the oversight of the Safety and Industrial Hygienist Manager, or their designee, employees who handle or may otherwise be exposed to particularly hazardous substances will be provided with laboratory-specific training and information. Where particularly hazardous substances are not used, general Hazard Communication training will suffice and will be provided.

Training will be provided, at minimum:

- For new employees (at the time of initial work assignment); and
- Prior to assignments involving new exposure situations.

The Haz Com Program training will cover:

- The requirements of Title 8, Section 5194 of the California Code of Regulations (Hazard Communication);
- Operations where hazardous chemicals are present;
- Location and availability of the written Haz Com Program;
- Location and availability of the Safety Data Sheet central database;
- Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area;
- Common physical and health hazards which may be encountered in the work area;
- Protective measures that employees can take to stay safe from the aforementioned hazards;

- Chemical labeling requirements;
- The rights of an employee:
  - To personally receive information regarding hazardous chemicals to which they may be exposed;
  - For their physician or collective bargaining agent to receive information regarding hazardous chemicals to which the employee may be exposed;
  - Against discharge or other discrimination due to the employee's exercise of the rights afforded pursuant to the provisions of the Hazardous Substances Information and Training Act.

Training elements specific to the District's Chemical Hygiene Plan include:

- The contents of 8 CCR 5191 ([click here](#) to access the code excerpt);
- The location and availability of the Chemical Hygiene Plan ([click here](#) to access the DSUSD Risk Management web page);
- The exposure limits for Cal/OSHA regulated substances ([click here](#) for Cal/OSHA) or recommended exposure limits for other hazardous chemicals where there is no applicable Cal/OSHA regulation ([click here](#) for the NIOSH Pocket Guide – refer to NIOSH Recommended Exposure Limits, also known as RELs);
- Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory.

### **Medical Consultation and Medical Evaluations**

In accordance with CCR Title 8, Section 5191(g), the District will provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations as deemed necessary by the examining physician, under the following circumstances:

- Whenever an employee develops signs or symptoms associated with exposure to a hazardous chemical in a laboratory setting;
- Where exposure monitoring reveals an exposure level above the action level (or, absent an action level, the permissible exposure level) for a Cal/OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements;
- In the event of a spill, leak, explosion, or similar event resulting in the likelihood of a hazardous exposure.

All medical examinations and consultations will be provided to the employee free of charge.

For more information or to request a medical evaluation, please reach out to the Risk Management department.

## ***Student Training***

Before handling a new chemical or encountering a new hazard, students must be trained on the following:

- Identity and location of the chemical;
- Particular hazards associated with accidental contact (e.g. skin, eye);
- Proper personal protective equipment (what is required for use, and how to use the equipment);
- Proper operation of appliances and equipment which can pose a unique hazard (e.g. Bunsen burners);
- Proper waste disposal methods;
- Location of the hazardous waste container;
- Emergency response procedures (refer to the “Emergency Procedures” section).

## ***General Housekeeping and Safety Rules***

The following collection of rules is not meant to be all-inclusive, but should cover the general scope of classroom laboratory settings.

- Students should show up to lab dressed appropriately. Closed-toed shoes are generally required universally. A lab coat or long-sleeved shirt, and long pants may be required. The use of disposable (nitrile) gloves and/or eye protection may also be required.
  - See the “Personal Protective Equipment” section for more information.
- Long hair should be tied back in a ponytail or bun.
- Jewelry and other loose accessories such as bracelets, watches, dangling or hoop earrings, long necklaces, and scarves should be removed prior to lab work.
- Backpacks, bags, and other large personal items should be stored in cubbies (if available) or in areas which do not obstruct aisles and egress paths.
- Eating and drinking are not allowed in the laboratory. This includes chewing gum.
- Students should refrain from using personal items not essential to lab work (e.g. cellphone) while handling hazardous chemicals.
- Broken glass and other sharp objects which need to be disposed of should be thrown in a broken-glass waste container, *not* the trash can.
- Experiments involving deliberate chemical contact with skin (e.g. students handling methane-filled soap “bubbles”) are ***forbidden***, as these experiments often involve open flame and/or ignition of said chemical.
- Students should be familiar with the locations of their nearest exit, fire extinguisher, fire blanket (if available), and emergency eyewash/shower station.
  - Emergency procedures are discussed in greater detail in the “Emergency Procedures” section.

### ***Chemical Procurement & Waste Mitigation***

Hazardous chemicals for use at school and District sites **may not** be brought from home, other institutions, or any source other than vendors approved by the Risk Management and Purchasing Services departments. Extenuating circumstances (e.g. chemical is difficult to procure or is no longer on sale) may be considered and approved by Risk Management prior to procurement.

By law, vendors and manufacturers of chemical products must provide a Safety Data Sheet to the purchaser upon request. DSUSD is required to provide this information to its employees under the Hazard Communication standard. To that effect, Risk Management *will not* approve any product where a Safety Data Sheet cannot be provided by the vendor/ manufacturer.

Chemicals used in the laboratory environment should be scaled to as small an amount as practicable, to mitigate student exposure as well as to reduce the amount of hazardous waste. The State of California considers DSUSD to be a business enterprise in the world of hazardous waste management, meaning that some “household” chemicals which would typically be safe enough to dump down the drain at home cannot be handled in a similar way at school. Used chemicals must be placed in an adequately-labeled hazardous waste container which contains at minimum, the following information:

- “HAZARDOUS WASTE” in large font at the top of the label;
- All chemical constituents which are present or may be present in the container (no abbreviations, e.g. write “Hydrochloric acid” instead of “HCl”);
- Date of waste generation, i.e. date of “first drop” in the container;
- Physical state (solid, liquid, etc.);
- Hazard classification (flammable, toxic, corrosive, reactive, etc.);
- Name and address of the waste generator.

As the District is considered a small quantity hazardous waste generator, all hazardous waste containers must be taken off-site for processing and disposal no later than 180 days from “first drop” – *regardless of the amount of waste in the container*. Site Coordinators should reach out to their Assistant Principal to coordinate a hazardous waste pick-up. For technical assistance, please contact the Safety and Industrial Hygiene Manager.

### ***Chemical Storage***

Site Coordinators are responsible for ensuring that chemicals are stored properly. This means that the chemical containers are in good condition; labels are present, easy to read and in good condition; and chemicals are stored in accordance to their compatibilities. For a general overview of chemical compatibility groups and potential hazards associated with incompatible chemicals, please see **Appendix C**.

### ***Safety and Regulatory Inspections***

Inspections of classrooms, shops, laboratory setups, and chemical storage areas will be conducted on a regular basis by the Safety and Industrial Hygienist Manager and their loss-control consultant, Keenan & Associates. Regulatory agencies such as Riverside County Department of Environmental Health may also inspect these spaces periodically to ensure that chemicals and hazardous wastes are properly stored and labeled. Every attempt will be made to inform school-site administrators and staff members of a scheduled site visit/ inspection.

Any questions regarding safety or regulatory inspections should be directed to Risk Management. For more information on safety inspections, please refer to the District's Injury and Illness Prevention Plan.

### **Personal Protective Equipment**

Although personal protective equipment (PPE) is often the most visible part of laboratory safety, the reality is that it is considered the "last line of defense" in the Hierarchy of Controls. The effective implementation of substitution methods, engineering controls, and administrative controls will provide for greater hazard control than reliance on PPE alone. However, the proper use of PPE can prevent chemical exposures in situations involving accidents and lack of user oversight.

### ***General Guidelines***

The District is required to provide PPE appropriate for the work environment to employees free of charge.

To ensure appropriateness to the laboratory environment, the bringing of PPE from home or sources not approved by the school site or District is discouraged.

### ***Eye Protection***

Protective equipment for the eyes generally comes in two forms: safety goggles (which forms an airtight seal against the user's face) and safety glasses (which generally provide a contour around the face, but is not airtight). "Face shields" which are used for COVID-19 protection should *never* be used in the laboratory for chemical protection, as they are not rated to provide protection against liquid chemical sprays or splashes.

Safety goggles are the preferred PPE when working around liquid chemicals or flying dust and debris. Safety glasses are more common for protection from flying objects (think large items).

Safety glasses are acceptable where the quantity of liquid chemical handled is low enough that the risk of liquid chemical exposure is limited to splatters instead of splashes.

Goggles worn for protection against chemical splashes must be indirect-vented. It is common for some (less expensive) goggles to have small holes in the frame of the goggles (usually to promote ventilation). However, this configuration can allow liquid chemicals or vapors to breach the goggle.

If possible, all users should be provided with their own set of safety goggles or safety glasses; sharing equipment should be avoided. If it is necessary to share PPE, ensure that the safety goggles or glasses are adequately disinfected in between uses.

All safety goggles and safety glasses must meet ANSI Z-87.1 standards.

Safety goggles and glasses must be inspected prior to each use. Dispose of the eyewear when the goggle straps are damaged or loose; the goggle plastic is cracked or does not seal properly around the face; or the lens is clouded, badly scratched or otherwise damaged.

### ***Hand Protection***

Disposable gloves must be used when handling hazardous chemicals. Refer to the Safety Data Sheet to determine if gloves are needed, and if so, which kinds of gloves are appropriate. Nitrile gloves are generally a good choice where an alternative is not named. Latex should be avoided, as some users may have latex allergies.

Glove wearers should inspect their gloves regularly during lab work and immediately replace their glove if it gets cut, punctured, or wet.

Gloves should be removed prior to handling personal items, such as a backpack or cellphone, and then re-donned prior to resuming lab work. Gloves should also be removed prior to leaving the classroom for any reason and re-donned upon return.

### ***Hearing Protection***

The use of hearing protection (e.g. earplugs) is not anticipated to be needed during most classroom laboratory settings. If you believe that hearing protection is necessary for your operation, please consult with the Safety and Industrial Hygienist Manager.

### ***Respiratory Protection***

Respirators (e.g. N95, half-face, full-face, SCBA) *may not* be used without approval from Risk Management and school-site Administration. Please refer to the District's Respiratory Protection

Program (RPP) for more information. There is potential liability associated with the use of respirators without proper training and medical evaluation. Engineering controls in the laboratory should be sufficient to control the airborne contaminant. If engineering controls are not present or not sufficient to mitigate exposure, the teacher or staff member should look into substituting-out this chemical for a less-hazardous substance. If it is determined that the employee *must* wear a respirator for routine job duties, the employee must be enrolled in the District's RPP. Requirements of the RPP potentially include medical evaluations and respirator fit testing.

It is worth noting that N95 masks are only effective for particulate hazards and will not prevent exposure from chemical gases or vapors.

### **Lab Coats**

Lab coats should be inspected regularly; any holes or rips should be repaired at the earliest opportunity. If someone should encounter a chemical splash onto their lab coat, they should take off their lab coat immediately and don a new coat (if available).

Follow manufacturer's instructions for laundry and care. Lab coats should be laundered separate from regular clothes to avoid chemical contact to the latter.

## **EMERGENCY PROCEDURES**

### **Emergency Evacuation**

All laboratory occupants should be prepared to leave the classroom quickly and head directly to the designated evacuation assembly area under the following conditions:

- Earthquake – *IF you are instructed to do so, or you feel it is unsafe to remain inside the building.*
- Fire
- Fire alarm activation – regardless of visible presence of fire
- Chemical Spill (large spill, or a spill of a particularly hazardous substance)

In these situations, seconds matter. Instruct students not to delay evacuation by grabbing personal belongings. Leave the building quickly but in a calm manner.

Once at the evacuation site, the teacher or staff member should follow the directions provided by the Principal or designee(s). Students may not leave the assembly area until the "All Clear" message to return has been given, or school site administrators dismiss classes.

## Chemical Spills

All chemical spills must be cleaned up or otherwise addressed immediately. Unless the chemical is particularly hazardous, or it is a large spill (greater than 1 gallon), chemical spills can be handled by a teacher or staff member, as long as the employee has been trained on spill clean-up, a spill kit or similar equipment is present in the room, and proper PPE for clean-up is available and is worn by the employee. It is advised that students not clean up spilled hazardous chemicals.

Depending on the size of the spill, either a neutralization or absorption spill kit (up to 300 milliliters spilled) or an absorption spill kit (300 milliliters to 1 gallon) is recommended. Be sure that the spill kit you use is appropriate for the chemical spilled. If you would like technical assistance in purchasing the appropriate spill kit for your laboratory, please reach out to the Safety and Industrial Hygienist Manager.

A brush and scoop should be used to pick up any broken glass and/or spent absorbent material. Be sure the broken glass and absorbent is placed in an appropriate container for disposal (not the trash). Please reach out to your Assistant Principal to arrange for hazardous-waste disposal.

For large spills (greater than 1 gallon) or for spills of particularly hazardous chemicals, call the Security Agent on site or District Security & Safety Services at (760) 771-8645 (Monday-Friday 7:30 am – 4:30 pm) or after hours at (760) 568-2677. Do not attempt to clean this spill yourself without proper equipment and prior authorization.

Depending on the chemical spilled, respiratory protection may be required. Refer to the chemical Safety Data Sheet to determine if a respirator is required or recommended for spill clean-up. If respirator use is indicated, and you have not been trained per the District's Respiratory Protection Program, *do not* attempt to clean the spill. Contact the Security Agent on site, or District Security & Safety Services.

## Earthquake

As in a general classroom environment, the same principles apply when it comes to protecting yourself in an earthquake:

- DROP where you are, onto your hands and knees;
- COVER your head and neck with one arm and hand;
- HOLD ON until shaking stops.

In an active laboratory setting, there is a higher likelihood of appliances and glassware falling from the work bench. Face away from the edge of the bench/ table as you crawl underneath. Be careful to avoid any fallen items when you emerge from under the table.

If you decide to evacuate the building, be sure that the shaking has stopped before you leave.



If safe to do so, turn off natural-gas appliances before leaving the room.

Minor earthquakes should not prompt you to evacuate. Unless the earthquake was major, you are generally safer inside the building than outside. Regardless of earthquake severity, ALWAYS defer to the direction of your school-site Principal or designee(s) if a decision is made to evacuate the building. Please refer to your school site's current School Building Disaster Plan for more information.

## **Fire**

### ***Fire Alarm Activation and Building Egress***

Per California Fire Code section 403.5, school building occupants are required to activate the fire alarm signal upon discovery of fire. Periodic fire drills (a minimum of monthly for grades K-8 and semi-annually for grades 9-12) are also required.

While school-site administration will provide advance notice of a fire drill, do not assume that the activation of a fire alarm is always a "drill" situation. Be prepared to leave the building immediately and proceed to the designated evacuation area if the fire alarm is activated (siren and strobe lights).

### ***Emergency Equipment***

Special consideration will be provided to installing the following equipment in science buildings/ classrooms upon initial construction or renovation:

- Eyewash stations
- Deluge or quick-drench showers
- Fire blankets
- Fire extinguishers
- First-aid kits
- Telephones
- Spill clean-up stations
- Personal Protective Equipment stations (eye protection and respiratory equipment storage)

All employees, students, and volunteers should make themselves familiar with the locations of all of these equipment upon initial occupancy of the classroom.

### ***Chemical or Material on Fire***

If you see a fire, immediately evacuate the building. Close the door behind you, if you are the last person leaving the classroom. Activate the fire alarm via the pull station if the fire alarm has not already been activated. Proceed to the designated evacuation area. Call 911 once you are outside the building and in a safe location.

Fire extinguishers are available for use in the classrooms. The primary goal should be to get all occupants out of the room as quickly and safely as possible. Use the fire extinguisher if you are trained on its use, and doing so does not pose a risk to your safety. For large fires, or fires involving volatile or explosive chemicals, the safest response is to evacuate the building and wait for emergency response from the local fire department.

### ***Person on Fire***

If a person's clothing has caught fire, they should:

- STOP where they are;
- DROP to the ground and cover their eyes and mouth with their hands;
- ROLL over and over, and back and forth, until the flames are out.

If for some reason the person with clothing on fire is not able to execute the STOP, DROP, and ROLL technique, they should be directed to the emergency shower or fire blanket (if available). Other persons should be ready to assist in donning the fire blanket on the person on fire. *NEVER use a fire extinguisher to extinguish a fire on a person.*

### **First Aid**

For minor cuts, punctures, and abrasions, the first-aid kit in the classroom should be used. For more severe injuries, the student should be sent to the school nurse. Have the student accompanied to the nurse's office, if necessary. For very severe injuries, call 911 immediately and notify the Security Agent on site or District Security & Safety Services at (760) 771-8645 (Monday-Friday 7:30 am – 4:30 pm) or after hours at (760) 568-2677.

## ACKNOWLEDGEMENTS

The District Risk Management department wishes to acknowledge the following departments, institutions and publications for their assistance and contributions to this Chemical Hygiene Plan. Thank you!

- DSUSD – Security & Safety Services
- Boston University – Environmental Health & Safety
- California State University, Fullerton – University Police
- Keenan & Associates
- National Institute of Health (NIH)
- National Fire Protection Association (NFPA)
- Princeton University – Environmental Health & Safety
- *Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards*, National Research Council (2011)
- University of Texas/Health Science at Houston

## APPENDICES

- Appendix A – Standard Operating Procedures for Chemical Storage and Use
- Appendix B – Control Measures for Extremely Hazardous Substances
- Appendix C – Chemical Segregation and Storage Table

## CHEMICAL HYGIENE PLAN REVIEW LOG

REVIEW DATE	CHANGES MADE?	SUMMARY OF UPDATES	REVIEWED BY:
May 2022	N/A	N/A – Original Version	F. Waynick, M. Nguyen
December 2022	Yes	Clarification of legal requirements for hazardous-waste labeling.	F. Waynick, M. Nguyen
August 2023	Yes	Clarification of District approval protocols for school-site chemical procurement.	F. Waynick, M. Nguyen

## APPENDIX A

### STANDARD OPERATING PROCEDURES FOR CHEMICAL STORAGE AND USE

The following standard operating procedures are provided as basic procedures intended to ensure a safe and healthy workplace for laboratory personnel during the use of hazardous chemicals. These procedures are provided for basic “groups” or “families” of chemicals, and should be used in conjunction with appropriate Safety Data Sheets (SDSs) to ensure specific operating procedures for individual chemicals are communicated and followed.

#### Flammable/ Combustible Liquids

- Store in a **well-ventilated** area away from oxidizers, ordinary combustibles, and sources of heat or ignition.
- Always store in **covered containers**.
- Use approved safety cans for dispensing at the point of operation.
- Air pressure shall never be used to remove liquids from a drum or tank.
- Provide **spill containment** for drum and bulk storage areas.
- Storerooms used for flammables must have either gravity or mechanical **ventilation**. Mechanical ventilation is required if Class I flammable liquids (flash point below 100°F) are dispensed.
- Flammable liquids stored in work areas or general-purpose storerooms in quantities exceeding 10 gallons should be stored in **approved flammable-liquid storage cabinets**.
- All flammable-liquid storage areas shall be clearly identified with signs or symbols.
- Flammables used at the point of operation should not be dispensed from containers larger than one (1) gallons, unless from an approved safety can. If an approved safety can is used to dispense flammables, then the can may be up to two (2) gallons in size.
- It is strongly recommended that only **approved safety cans** be used to dispense flammable liquids at the point of operation.
- 55-gallon drums used for dispensing flammable liquids shall be **bonded** and connected to a suitable **ground**.
- The school site shall immediately notify the Risk Management department of the purchase of flammable liquids of quantities of **55 gallons or greater**, to ensure inclusion of the chemical in the District’s Hazardous Materials Business Plan.
- Appropriate **fire extinguishers** for Class B (flammable or combustible liquid) fires shall be available within 50 feet from where flammable liquids are stored or used.
- Flammable-materials storage and use areas shall be **clearly marked** with “No Smoking or Open Flame.”

## Corrosives

Corrosive chemicals in concentrated form pose an immediate danger to personnel upon contact to any human tissue. Because of the acute health hazard and the potential for permanent injury, the following guidelines apply:

- Storage and use of corrosives shall be in **well-ventilated areas**.
- When feasible, corrosives shall be stored in **cabinets** dedicated to corrosive storage.
- Bulk storage areas shall have **spill-containment barriers**.
- Large bottles containing corrosives are to be transported in appropriate **bottle carriers** which can encapsulate the liquid and glass in the event of a drop/ spill.
- Acids shall be segregated from chemicals that generate toxic gases upon contact (such as chlorides, cyanates, fluorides, hydrides, and sulfides).
- Oxidizing acids shall be segregated from organic acids and flammables.
- Nitric acid shall be segregated from all other acids.
- Personnel using or handling corrosives shall always wear **splash-proof eye goggles**.
- Personnel involved in any operation using corrosives with a high probability of splashing, should consider wearing **face shields, rubber gloves, and rubber aprons** in addition to the splash-proof eye goggles.
- Areas where corrosives are stored or used in one-gallon containers (or larger) should be equipped with **plumbed-in eyewash stations** and deluge showers.
- Due to the potential for falls, spills, splashes, and personnel contamination from storage at high levels, corrosives should be stored **at or below waist level**. Storage at higher than eye level is discouraged.
- Corrosives in laboratories shall be stored in approved **corrosive storage cabinets**. Small quantities may be stored on shelves in polyethylene or ceramic trays to contain spills or leaks.
- Personnel using corrosives should be aware of the potential for permanent eye damage should a corrosive contact the eye. Therefore, persons using corrosives shall be familiar with **locations of eyewash stations** and deluge showers. Furthermore, they shall be familiar with the proper **flushing technique** (eyelids must be pulled back and eyes “rolled around” while flushing for at least 15 minutes). The affected person should always contact a physician post-incident for further guidance.

## Chlorinated Hydrocarbons/ Solvents

- Use only in **well-ventilated** areas.
- Do NOT use from open containers, unless **ventilation** is adequate to draw vapors away from the work area (e.g. fume hood).
- Keep away from open flames or excessive heat.
- Provide **spill containment** where drum or bulk storage areas exist.

## Oxidizers

- Store in a **well-ventilated** area.
- Store away from combustibles, organic matter, reducing agents, and sources of heat or ignition.
- Keep oxygen cylinders free of oil, grease, dirt, or other contaminants.

## Compressed Gases/ Aerosols

- Compressed gas cylinders shall always be **stored away** from external heat sources, and located such that they will not be damaged by passing or falling objects. Gas cylinders shall be stored upright with the cylinder secured.
- Cylinders not in use shall be stored with **valve-protection caps** in place.
- Oxygen cylinders in storage shall be **segregated** from flammable gas cylinders (such as acetylene and hydrogen) by at least 20 feet, or by a non-combustible wall at least 5 feet high.
- Oxygen cylinder storage areas shall be clearly marked "Oxidizer."
- Flammable gas-cylinder storage areas shall be clearly marked "Flammable Gas" and "No Smoking or Open Flame."
- Chlorine cylinders shall be stored **separate from any materials** with which it may react (such as hydrogen, ammonia, acetylene, fuel gases, most hydrocarbons, finely-divided metals, and organic matter).
- Chlorine cylinder storage areas shall be clearly marked "Oxidizer" and "Poisonous Gas".
- All gas cylinders shall be clearly marked with "Full" or "Empty," as appropriate.
- All compressed-gas cylinders shall be **legibly marked** with the chemical or trade name of the gas.
- Empty cylinder shall **not be refilled**, except by the supplier.
- All gas cylinder-connecting hoses, couplings, and pressure regulators shall be **regularly inspected** by the user for defects.
- When appropriate, a **check valve or trap** shall be installed in the discharge line to prevent hazardous backflow into the cylinder.
- Aerosols shall **not be stored** in areas where the temperature **may exceed 120°F**.

## Toxics

- Storage shall only be in containers clearly marked "Poison."
- When feasible, storage containers shall be kept in a **dedicated cabinet**, clearly labeled and kept locked when not in use.
- Toxics shall only be used in stored in **well-ventilated** areas.
- Cyanides, chlorides, and sulfides shall be segregated from acids.

- The cabinets or rooms used for the storage of highly-toxic materials shall have appropriate **warnings** and Poison Control Center **phone numbers posted**.
- Access to the cabinets or storage rooms shall be controlled, allowing only **access to authorized personnel**.
- Highly-toxic substances shall be used in the classroom only after District **Risk Management's written approval** and a review of health hazard, routes of entry, safety precautions, and first-aid procedures. Even then, use is only permitted under the **strict supervision** of the instructor.

## Reactives

- Storage shall only be in cool, dry, and well-ventilated areas.
- Reactives shall be kept away from **sources of heat** and ignition.
- Purchase only **small quantities** that can be used up in one semester.
- Water-reactive materials shall not be stored in a room with an **automatic water sprinkler system**, unless precautions have been taken to ensure that the materials can remain dry in the event of sprinkler activation.
- Pyrophoric materials such as sodium, potassium, lithium, and strontium shall be segregated from halogenated hydrocarbons, oxidizers, and moisture. Storage shall only be in containers with the materials completely covered with an **oxygen-free liquid** (such as toluene, kerosene, or mineral oil).
- Phosphorus shall only be stored in containers with the substance completely covered with water.

## Organic Peroxides

Organic peroxides have unusual stability problems, which makes them among the most hazardous laboratory substances. As a class, they are low-power explosives **sensitive to shock**, sparks, heat, friction, and the presence of strong oxidizing agents and reducing agents.

The following types of compounds are known to form peroxides:

- Aldehydes
- Ethers
- Compounds containing benzylic hydrogen atoms (e.g. cumene)
- Alkenes
- Vinyl and vinylidene compounds

Some specific chemicals from the above categories commonly found in laboratories include:

- Diisopropyl Ether
- Ethyl Ether (a.k.a. Diethyl ether)

- Tetrahydrofuran
- Tetrahydronaphthalene
- Cyclohexene
- P-Dioxane
- Dicahydronaphthalene

Preventative measures for peroxides include:

- **Identifying** all known peroxide-forming compounds in your storage areas.
- Establishing a laboratory routine to **test these chemicals** at a set time, or no later than every 3 months.
- Keeping a **register** of these compounds and logging test results.
- **NOT OPENING containers which do not pass the visual test:**
  - Liquid chemicals: Check for water content, discoloration, crystal deposits on the walls (inside or outside), white residue around the neck, or a “mossy” appearance around the neck of the bottle;
  - Solid chemicals: Check for discoloration and/or formation of a yellow-to-orange coating of superoxide (potential explosion/ fire hazard).
- **Properly disposing** of peroxide formers within the appropriate time periods:
  - Liquids: No later than 12 months from opening, or 3 years from date of manufacture (excluding ethyl ether);
  - Solids: No later than 3 months from opening (unless peroxide free);
  - Any peroxides which fail the visual test must be disposed of immediately, with appropriate safety precautions in place. Please reach out to Risk Management for more information and guidance.
- **Limiting quantities** of peroxides to the minimum required.
- Not returning unused, dispensed peroxides to the original container.
- Cleaning up spills immediately. Vermiculite can be used to absorb peroxide solutions.
- Not using metal utensils to handle peroxides. Ceramic or wooden utensils are acceptable.
- Avoiding smoking, open flames, friction, grinding, other heat sources, and all forms of impact around peroxides.
- **Not using glass containers** that have screw-cap lids or glass stoppers to store peroxides.
- Storing peroxides at the lowest possible, appropriate temperature. If a fridge is used to store peroxides, it must be rated for storage of flammable chemicals.
- Ensuring that peroxides are **disposed of properly**. For any questions, please contact the Safety and Industrial Hygienist Manager or the Risk Management department.



## APPENDIX B

### CONTROL MEASURES FOR EXTREMELY HAZARDOUS SUBSTANCES

General precautions are to be followed when working with any chemical that has been identified in the SOP section (Appendix A-1). These general rules, procedures, and precautions should be reviewed and followed when working with the following:

- Substances of moderate, chronic, or high acute toxicity;
- Substances of high chronic toxicity;
- Cal/OSHA or Federal OSHA-listed carcinogens, teratogens, mutagens, or reproductive toxins.

Additional control measures are appropriate when working with any substance falling into one of the above categories. Please refer to the following:

#### Substances of Moderate, Chronic, or High Acute Toxicity

- Follow all general rules, procedures, and precautions as discussed throughout this Plan.
- Review the **SDS or consult a reference** resource, which identifies toxic properties.
- **Maintain records** of the material, amounts used, and laboratory personnel involved.
- Procedures involving volatile, toxic substances, or those that may generate aerosols should be **conducted in a fume hood** or other suitable containment device.
- Plan to contain accidental **spills in the hood**, by storing containers of chemicals in this group in polyethylene pans or trays, or fit the hood with a removable liner of absorbent plastic-backed paper.
- If special toxicity hazards exist, the work areas should be posted with **“Restricted Access.”**
- Whenever cyanides are used or stored in hoods, “Warning” or “No Admittance” signs should be posted on **doors to fan lofts and roofs** (where the hood exhausts).
- A hydrogen-cyanide gas (HCN) **first-aid kit**, and an oxygen cylinder equipped with pressure gauge and needle valve, should be available on any floor of a building on which work with cyanides is in progress. The oxygen cylinder should be clearly marked for emergency HCN first aid. The HCN first-aid kit should contain a box of amyl nitrate pearls, a face piece, rubber tubing for administering oxygen, and a bottle of 1% sodium thiosulfate solution.
  - **Note:** Only trained and qualified personnel are authorized to use an HCN first-aid kit.
- Wastes of chemicals in this category should be placed in **closed, impervious containers**. The containers should be labeled with the contents, type of hazard, and the date in which accumulation began.

- Only personnel wearing appropriate **personal protective equipment** and having proper training should clean up spills.
- If work is to be done with highly or extremely toxic materials, at least **two (2) people** should be present at all times.

### Substances of Known High Chronic Toxicity





- **Written permission from Risk Management** must be obtained before these substances can be purchased or used.
- **Maintenance & Operations (MOT)** should also be notified so that they are aware, in case any work involving the fume hood or associated ductwork is needed.
- Follow all rules, procedures, and precautions identified above.
- Experimental work and disposal procedures for waste should be **pre-approved** by the Assistant Principal and Risk Management. Please feel free to reach out to the Safety and Industrial Hygiene Manager for consultation and advice.
- All chemical containers should be clearly labeled with appropriate **hazard warnings** (e.g. “Warning! High Chronic Toxicity” or “Warning! Cancer Suspect Agent”).
- All work of this nature should be done in a **controlled area** (such as a laboratory, portion of a laboratory, exhaust hood, or glove box designed and designated for use with highly toxic materials).
- Controlled areas should be **clearly marked** with signs such as the following:
  - “Warning! Toxic Substance In Use: Authorized Personnel Only”
  - “Warning! Cancer Suspect Agent: Authorized Personnel Only”
- Appropriate **personal protective equipment (PPE)** should be worn when transferring or handling substances of high chronic toxicity.
- Laboratory personnel should **remove** any protective apparel when leaving the controlled area, and **thoroughly wash** their hands, forearms, face and neck.
- Disposable apparel or absorbent paper liners should be placed in closed, **impervious containers** that are properly labeled. Consult with Risk Management to determine if the waste is considered “regulated” and must be disposed of via hazardous-waste hauler.
- Non-disposable apparel should be thoroughly **washed**, preferably by itself and not with street clothes (to reduce the chance of chemical contamination).
- “Normal” laboratory work (i.e., not involving highly-toxic chemicals) should not be resumed in an area that has been used as a controlled area, until it has been adequately decontaminated.

## Working with Carcinogens, Teratogens, Mutagens, Reproductive Toxins; or Items Suspected Thereof





- **Written permission from Risk Management** must be obtained before these substances can be purchased or used.
- **Maintenance & Operations (MOT)** should also be notified so that they are aware, in case any work involving the fume hood or associated ductwork is needed.
- Use only in a designated area with **suitable warning signs** to alert other workers (e.g. “Danger,” “Cancer Hazard”).
- Wear **protective clothing** and use the **approved fume hood** or other engineering controls.
- Use and store materials in **a chemically-resistant container** in an appropriately-ventilated, limited-use area.
- **Decontaminate** the designated area and all equipment in the hood before removing them.
- Use a **wet method** to clean up liquids. For dry materials, use a **vacuum with a HEPA filter** vented into the hood.
- All waste must be stored in a closed, labeled, and impervious container.

# APPENDIX C: Chemical Segregation and Storage Table



## Chemical Segregation

Class of Chemicals	Common Chemical Examples	Additional Concerns and Storage Recommendations	Common Incompatible Chemical Types	Possible Reaction if Mixed/Health Concerns
<b>Corrosive Acids-Organic</b> 	Acetic Acid Glacial Acetic Acid Butyric Acid Trifluoroacetic Acid Picric Acid Propionic Acid Formic Acid	Store in ventilated corrosives cabinet on protected shelving using secondary containment, keep away from water sources *Do not store under the sink *Do not store acids on metal shelving	Flammable Liquids Flammable Solids Bases Oxidizers Inorganic Acids Cyanides Sulfides Poisons/Toxins	Heat Gas Generation Violent Reaction * DO NOT POUR WATER INTO ACID
<b>Corrosive Acids-Inorganic</b> 	Nitric Acid Sulfuric Acid Perchloric Acid Phosphoric Acid Hydrochloric Acid Chromic Acid Hydrofluoric Acid	Store concentrated Nitric acid (≥68%) and Sulfuric acid (≥93%) in a secondary container Store in a corrosive cabinet labeled "Acid" or on shelving using a secondary containment *Do not store under the sink *Do not store acids on metal shelving *Hydrofluoric acid should be stored in an area accessible only by authorized personnel; do not store in glass; use plastic containers and secondary containment	Flammable Liquids Flammable Solids Bases Oxidizers Organic Acids Cyanides Sulphides Poisons/Toxins	Heat Gas Generation Violent Reaction *DO NOT POUR WATER INTO ACID *Perchloric acid vapor can form explosive compounds within fume hood ducts *Hydrofluoric acid can result in severe burns to skin and lungs
<b>Corrosive Bases-Organic/Caustic</b> 	Hydroxylamine Tetramethylethylamine Diamine Triethylamine	Store in separate cabinet, preferably with ventilation, corrosive cabinet or storage area with a spill tray, away from potential water sources (DO NOT store under the sink)	Acids Oxidizers Flammable Liquids Flammable Solids Inorganic Bases Poisons/Toxins	Heat Gas Generation Violent Reaction
<b>Corrosive Bases-Inorganic/Caustics</b> 	Ammonium Hydroxide Potassium Hydroxide Sodium Hydroxide Calcium Hydroxide	Store in separate cabinet, preferably with ventilation, corrosive cabinet or storage area with a spill tray, away from potential water sources (DO NOT store under the sink); Store solutions of inorganic hydroxides in labeled polyethylene containers	Acids Oxidizers Flammable Liquids Flammable Solids Organic Bases Poisons/Toxins	Heat Gas Generation Violent Reaction







## Chemical Segregation

Class of Chemicals	Common Chemical Examples	Additional Concerns and Storage Recommendations	Common Incompatible Chemicals Types	Possible Reaction if Mixed/Health Concerns
<b>Flammable Solids</b> 	Charcoal Carbon Paraformaldehyde Phosphorus Magnesium	Keep in a dry, cool area away from oxidizers and corrosives	Acids Bases Oxidizers Poisons/Toxins	Fire Hazard Violent Reaction
<b>Flammable Liquids</b> 	Ethanol, Ethyl Acetate, Methanol, Acetone, Benzene, Xylene, Toluene Diethyl Ether Tetrahydrofuran Acetonitrile Glacial Acetic Acid Acetone liquids with flashpoints < 100 F	Flammable storage cabinet or refrigerator rated for flammable/hazardous storage/explosion proof *Peroxide-forming chemicals must be dated upon delivery and opening (two dates)	Oxidizers Acids Bases Reactives Poisons/Toxins	Fire Hazard Heat Violent Reaction
<b>Poisons/Toxins</b>   <b>*Requires written approval from Risk Management prior to procurement.</b>	Chloroform Cyanides Heavy metal compounds (e.g. Cadmium, Mercury, Osmium, Oxalic Acid, Phenol, Formic Acid), Formamide, Carbon Tetrachloride, 2-Mercaptoethanol Phenol,  *Hydrofluoric Acid - Hydrofluoric Acid is a highly acute poison Acrylamide Ethidium Bromide Sodium Azide	Store in a dark, dry, ventilated, cool area in an unbreakable chemically resistant secondary container (polyethylene) * Store volatile toxins with evaporation rate above 1.0 - (ether =1.0) in flammable cabinet; Store non-volatile liquid poisons in a refrigerator or cabinet; amounts less than 1 liter can be stored in a cabinet above bench level, ONLY if the cabinet has sliding doors (not swinging)	Flammable liquids Acids Bases Reactives Oxidizers Corrosives Please consult Risk Management for assistance. *Hydrofluoric Acid should be stored in an area accessible only by authorized personnel; do not store in glass; use plastic containers and secondary containment	Generation of Toxic and Flammable Gas Combustion Heat Fire Hazard Explosion Hazard Violent Reaction Chloroform explosively reacts with chemically-reactive metals (e.g., Aluminum or Magnesium powder, Sodium, and Lithium), Strong Oxidizers, Strong Caustics (e.g., Alkalis), and decomposes in sunlight
<b>Explosives</b>   <b>*Requires written approval from Risk Management prior to procurement.</b>	Picric Acid Ammonium Nitrate Nitro Urea Trinitroaniline Benzoyl Peroxide Trinitrobenzene Trinitrobenzoic Acid Trinitrotoluene Urea Nitrate Trinitrophenol Diazoisbutylnitrile	Store in a secure location away from other chemicals; store in an area away from friction or shock	Please consult the SDS and Risk Management	Explosion Hazard Violent Reaction Heat Shock Friction



## Chemical Segregation

Class of Chemicals	Common Chemical Examples	Additional Concerns and Storage Recommendations	Common Incompatible Chemicals Types	Possible Reaction if Mixed/Health Concerns
<b>Oxidizers</b> 	Peroxides, Nitrates, Perchlorates Permanganates Sodium Hypochlorite Ethyl Acetate, Iodine, Benzoyl Peroxide Potassium Dichromate Chlorates, Bromates, and Superoxides, Ammonium Persulfate, Ferric chloride	Store in secondary containment separately from combustibles and flammable materials	Combustibles Flammables Organic Materials Reducing Agents	Fire Hazard Gas Generation Toxic Gas
<b>Peroxide Formers</b>   <i>*Requires written approval from Risk Management prior to procurement.</i>	Acrylonitrile Isopropyl Alcohol Ethers (e.g. Diethyl ether, Isopropyl Ether), Acetals and Ketals, especially Cyclic Ethers and those with primary and/or secondary Alkyl groups Aldehydes (e.g. Acetaldehyde, Benzaldehyde) Vinyl and Vinylidene compounds, Dienes Tetrahydrofuran Dioxane Butylated Hydroxytoluene (BHT) Isopropyl Ether	Store in airtight bottles, away from light and heat in a dark, cool dry area; avoid using containers with loose-fitting lids and ground glass stoppers; crystallization, discoloration, and formation or deposition of layers are signs a peroxide former may have become shock sensitive; do not use or move such containers: contact DEP; all bottles of peroxide-forming chemicals must have the received date marked on the container; when the bottle is first opened, the container must be marked with the date opened	Always consult the Safety Data Sheet (SDS) and Risk Management	Explosion Hazard Violent Reaction Shock Sensitive Combustion (Exothermic Reaction)  If an old or expired container of a peroxide-forming chemical or reactive is found, do not move it. Contact Risk Management for assistance in disposing of the container
<b>Water Reactive</b>	Sodium Metals Lithium Metals Potassium Metals Sodium Borohydride Alkali Metal Hydrides	Store in a dry, cool area away from potential spray from fire sprinklers and other water sources (DO NOT store under the sink)  Label this area for water-reactive storage	Aqueous solutions Oxidizers Please consult the Safety Data Sheet (SDS) and Risk Management	Heat Violent Reaction

## Chemical Segregation

Class of Chemicals	Common Chemical Examples	Additional Concerns and Storage Recommendations	Common Incompatible Chemicals Types	Possible Reaction if Mixed/Health Concerns
<b>Flammable Compressed Gases</b>  	Methane Acetylene Butane Propane Hydrogen Silane Ethane Arsine Germane	<p>Handle flammable compressed gases in a chemical fume hood</p> <p>Store in well-ventilated areas; store away from oxidizers, open flames, sparks, and other sources of heat ignition; post NO SMOKING signs around storage area(s) or entrance(s) to storage room(s); flammable gases stored outdoors where ambient temperatures exceed 125 deg F (51.7 deg C) shall be protected from direct sunlight</p> <p>Use a spark proof wrench to attach regulators and make other connections; install a flame/flash arrestor at the regulator outlet flow valve</p>	Oxidizers Toxic Compressed Gases	Fire Hazard Explosion Hazard
<b>Oxidizing Compressed Gases</b>  	Oxygen Chlorine Fluorine Nitrogen oxides Gas mixtures containing Oxygen higher than atmospheric concentrations	<p>Store oxidizers separately from flammable gas containers or combustible materials; minimum separation requirement from these materials is 20 ft or a 5 ft noncombustible barrier with a fire resistance rating of at least 30 minutes</p> <p>Clean equipment used for oxygen and nitrous oxide with oxygen-compatible materials free from oils, greases, and other contaminants</p> <p>Fluorine shall be handled in specially passivated containers and associated equipment</p>	Flammable Compressed Gases Toxic Compressed Gases	Fire Hazard Explosion Hazard
<b>Toxic Compressed Gases</b>  	Carbon Monoxide Hydrogen Chloride Hydrogen Sulfide Nitrogen Dioxide  <i>*Requires written approval from Risk Management prior to procurement.</i>	<p>Handle toxic compressed gases in a chemical fume hood</p> <p>Indoor storage or use of toxic compressed gases shall be provided with a gas cabinet, exhausted enclosure, or gas room</p> <p>Refer to the SDS information for additional guidance on the storage and compatibility requirements</p>	Flammable Compressed Gases Oxidizing Compressed Gases	Release of Toxic Gas Hydrogen Sulfide is a colorless, flammable, extremely hazardous gas with a "rotten egg" smell; Prolonged exposure may cause nausea, tearing of the eyes, headaches or loss of sleep, airway problems (bronchial constriction) in some asthma patients; possible fatigue, loss of appetite, headache, irritability, poor memory, dizziness and slight conjunctivitis

## Chemical Segregation

Class of Chemicals	Common Chemical Examples	Additional Concerns and Storage Recommendations	Common Incompatible Chemicals Types	Possible Reaction if Mixed/Health Concerns
<b>Strong Reducing Agents</b>	Acetyl Chloride Thionyl Chloride Maleic Anhydride Ferrous Sulfide	Store in cool, dry, well-ventilated location Water reactive Segregate from all other chemicals	Please consult the specific SDS and RM	Please consult the specific SDS and RM
<b>Carcinogens</b> 	Benzidine Beta-Naphthylamine Benzene Methylene Chloride Beta-Propiolactone Carbon Tetrachloride  <i>*Requires written approval from Risk Management prior to procurement.</i>	Label all containers as "Cancer Suspect Agents" or the equivalent. Store according to the hazardous nature of the chemical, using appropriate security when necessary	Please consult the specific SDS and RM	Please consult the specific SDS and RM
<b>Teratogens</b> 	Lead Compounds Mercury Compounds Benzene Aniline  <i>*Requires written approval from Risk Management prior to procurement.</i>	Label all containers as "Suspect Reproductive Hazard" or "Reproductive Effector"  Store according to the hazardous nature of the chemical, using appropriate security when necessary	Aniline incompatible with Nitric Acid and Hydrogen Peroxide Please consult the specific SDS and RM	Please consult the specific SDS and RM
<b>General Stock Chemicals</b>	Sodium Bicarbonate Sodium Chloride Agar Salt buffer Most non-reactive salts	Store on shelves, or laboratory benches or shelving preferably behind glass doors and below eye level with like chemicals	Please consult the SDS and RM	Please consult the specific SDS and RM

Adapted from Prudent Practices in the Laboratory: Handling and Disposal of Chemicals, National Research Council, 1995, University of Texas/Health Science at Houston and Boston University Environmental Health & Safety.