

Chemical Hygiene Plan

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Introduction

Purpose

In 1990, the Occupational Safety and Health Administration (OSHA) adopted a health standard, "Occupational Exposure to Hazardous Chemicals in Laboratories," 29 CFR 1910.1450, to protect laboratory workers from chemical hazards in the workplace. (This Standard, as well as the other OSHA regulations mentioned in this document, can be found on the [OSHA website.](#)) The objective of this Standard is to protect employees from health hazards associated with hazardous chemicals in laboratory settings. A Laboratory is defined as a place where:

- Chemical manipulations are carried out on a laboratory scale. That is, the work with chemicals is in a containers of a size that could be easily and safely manipulated by one person.
- Multiple chemical procedures or chemicals are used.
- Protective laboratory practices and equipment are available and commonly used.
- The procedures involved are not part of a production process whose function is to produce commercial quantities of materials, nor do the procedures in any way simulate a production process.

This Laboratory Standard requires written health and safety practices and procedures in all laboratories that use hazardous chemicals. This written document is called a Chemical Hygiene Plan (CHP). A Chemical Hygiene Officer (CHO) must be appointed to develop, implement, and maintain the CHP.

This document describes the Chemical Hygiene Plan for Grinnell College. In accordance with the Laboratory Standard, this Chemical Hygiene Plan will explain the policies and procedures that will allow employees to know the health hazards associated with chemicals both in the laboratory and in other areas of the work environment, and how to limit exposure to these chemicals. The Laboratory Standard also requires record keeping, employee information and training, use of personal protective equipment (PPE), labeling and hazard identification, exposure monitoring, and medical surveillance.

This plan is made readily available to the employees of Grinnell College, employee representatives, and upon request to others if so requested.

Scope

OSHA's definition of a hazardous chemical is a substance for which there is statistically significant evidence, based on at least on scientific study, showing that acute or chronic harm may result from exposure to that chemical. This includes any substance or chemical which is a "health hazard" or "physical hazard," including: chemicals which are carcinogens, toxic agents, irritants, corrosives, sensitizers; agents which act on the hematopoietic system; agents which damage the lungs, skin, eyes, or mucous membranes; chemicals which are combustible, explosive, flammable, oxidizers, pyrophorics, unstable-reactive or water-reactive; and chemicals which in the course of normal handling, use, or storage may produce or release dusts, gases, fumes, vapors, mists or smoke which may have any of the previously mentioned characteristics. (Full definitions can be found at 29 Code of Federal Regulations (CFR) 1910.1200.)

The laboratories at Grinnell College that are covered by this CHP are the departments of

Chemistry, Biology, Physics, Psychology, Art, and Theater and Dance. Personnel who work regularly within these laboratories must follow the rules of the CHP. In addition, this also includes personnel such as custodial, maintenance and repair personnel who spend a significant amount of their time within a laboratory.

The primary emphasis of the CHP is as an administrative control necessary to protect workers from overexposure to hazardous substances in laboratories. Each department covered can add Standard Operating Procedures (SOP) to this CHP to cover their own specific uses of hazardous chemicals. There should be SOP for classes of substances that present a high degree of hazard or techniques that require a high degree of skill.

The Permissible Exposure Limit (PEL) and/or the Threshold Limit Value (TLV) of most chemicals are listed in their Safety Data Sheets (SDS). Employee exposure to hazardous chemicals should not exceed these limits.

Special attention should be given to substances on OSHA's list of Particularly Hazardous Substances. There is a list of these substances [on this website from the Oak Ridge National Laboratory](#).

The OSHA regulations were developed for the protection of employees. Because students are not employees, they are not officially covered by these provisions. However, Grinnell College extends the provisions of the Chemical Hygiene Plan to our students in addition to our employees, with only minor exceptions:

- If medical consultation or examination is required due to exposure, the student will be responsible for the payment, and therefore students should be properly insured.
- Certain Personal Protective Equipment, such as splash goggles, will be charged to the student as part of their lab fees.
- In the reading of all other parts of the Chemical Hygiene Plan, the word "student" can be substituted for "employee" as necessary, and students will be expected to come under this plan accordingly, including training and recordkeeping.

The Director of Facilities Management will ensure that outside contractors are advised, in person, of:

- Any chemical hazards that may be encountered in the normal course of their work on campus.
- The labeling system in use.
- Protective measures to be taken.
- Safe handling procedures to be used. Location and availability of MSDS.

Each contractor bringing hazardous chemicals onto the campus, to which Grinnell College employees may be exposed, must provide the Director of Facilities Management with the same hazard information regarding those chemicals.

Furthermore, when the employees of one contractor may be exposed to hazardous chemicals brought onto the campus by another contractor, the same hazard information must be exchanged.

Responsibilities

The responsibility for chemical safety rests at all levels, from the highest administrative level to the individual laboratory employee. The specific aspects of this responsibility are assigned to those employees best suited to carry them out.

College President

The College President has the ultimate responsibility for the safety and health of the faculty, staff and students at Grinnell College.

Dean of the College

The Dean of the College has the responsibility to appoint the CHO and ensure that the CHP is written, implemented, and updated. He/she will provide for the ongoing health and safety program that provides for chemical hygiene, and will provide the resources to evaluate laboratory safety practices and facilities.

Chemical Hygiene Officer

The Chemical Hygiene Officer has the following responsibilities:

- To write, implement, and update the CHP.
- Provide technical advice with regard to chemical and laboratory safety as well as current legal requirements concerning regulated substances.
- To work with departments to develop and implement standard operating procedures (SOP) for the handling and storage of hazardous materials, and the disposal of hazardous waste according to state and federal regulations.
- To inspect laboratory spaces annually and report the findings to the Safety Committee.
- Recommend PPE for laboratory works, and ensure that PPE is available and in good working condition.
- Explain process control and handling requirements for regulated substances.
- To identify and minimize dangers to persons working in the laboratories and to report these dangers to the administrator who has the authority to suspend operations that do not conform to the CHP.
- Provide training for employees that will work with hazardous chemicals.
- Train summer students annually on safety and chemical handling.
- Train student employees on safety and chemical handling at the beginning of each semester.
- Maintain master inventory for all chemicals used at Grinnell College.
- Keep records on inspections and training. Records for medical documentation and incident reports for accidents, spills and emergencies shall be forwarded to Human Resources.

Chemical Safety Committee

The Chemical Safety Committee will be comprised of the CHO, a representative from the Dean's office, the director of Environmental Health and Safety, a representative from Facilities Management and Security, as well as a representative from the following departments: Chemistry, Biology, Physics, Psychology, Art, Theater and Dance. Meetings will be held at least annually, and more frequently as necessary. The committee has the following responsibilities:

- To annually review the Chemical Hygiene Plan and recommend updates.
- Work with the CHO to implement the standard operating procedures.
- To annually review the safety protocols and accident reports in their departments.
- Discuss laboratory safety issues with members of their departments.
- Resolve apparent conflicts with the application of safety rules and practices or engineering controls.
- Assist in the annual inspections of lab spaces in their departments.

Department Chair

The Department Chair in each department that works with hazardous chemicals is responsible for chemical safety in his/her department and must understand the goals of the CHP. He/She is responsible for facilitating the implementation of the CHP. They have the following responsibilities:

- Ensure the completion of an annual inventory of all chemicals
- Notify the CHO of the creation or closing of laboratories.
- Ensure lab safety training of all lab personnel in his/her department is completed.
- Require routine inspections of all laboratories by the CHO and the Safety Committee.
- Designate the department's representative to the Chemical Safety Committee.

Laboratory Personnel

Laboratory Personnel: Professors, Primary Investigators, Research Advisors, Laboratory Supervisors, Department Technicians, and MAPS Research Students have the following responsibilities:

- Understand and follow the safety training and the SOP.
- Implement the procedures and requirements of the CHP.
- Understand the function and proper usage of all personal protective equipment (PPE) and wear them in accordance with the standard operating procedures in the lab.
- Know where the safety equipment and evacuation routes are located for their laboratories and periodically check to be sure that the emergency equipment is present, unobstructed, and inspected.
- Have an understanding of the current legal requirements associated with regulated substances used in the investigator's laboratory or studio area.

- Ensure that facilities being used for the material hazards in that space are adequate, and that proper training for the use of those materials has been completed.
- Maintain a current chemical inventory, and have copies of SDS for those chemicals in the correct binders or entered into CEMS (Chemical Environmental Management System, by UNH). Inventories need to be done not only for departments, but for each PI's research lab.
- Prepare standard operating procedures (SOP) relevant to safety and health considerations to be followed in their research or classroom settings if those SOP have not already been developed.
- They must notify the CHO, their Department Chair, and HR of any accidents, reportable spills and unsafe conditions.

Students

- Students who work in a laboratory have the following responsibilities:
- To follow the procedures and guidelines of the CHP.
- Understand the function of PPE and wear the appropriate equipment in the laboratory.
- Have knowledge of the evacuation routes and location of safety equipment.
- Notify a laboratory employee who will then notify the CHO, Department Chair, and HR of any accidents, reportable spills, and unsafe conditions.

Facilities Management Personnel and Security Officers

Facilities Management personnel and Security Officers must receive annual training with regard to general laboratory safety rules and regulations. Special attention will be given to the signs of a leak or spill and the importance of engineering controls such as fume hoods, ventilation of the building, safety showers and eyewash stations.

Outside Contractors

Outside contractors must follow the general laboratory safety rules and regulations.

Visitors

Visitors are not allowed in laboratories without a Grinnell College employee escort. No children are allowed in the laboratories unless they are participants in one of Grinnell College's programs or functions. Pets are not allowed in the laboratory.

General Principles

Minimize routine exposure

It is important to minimize all chemical exposures, even for substances of no known significant hazard. Few chemicals are without hazards, therefore general procedures for handling all hazardous chemicals must be followed.

For work with substances which present special hazards, additional precautions must be taken. Personal Protective Equipment (PPE) must be used in accordance with standard operating procedures.

There must be no eating, drinking or smoking in areas where hazardous materials are used.

Inhalation of chemicals and direct skin contact with chemicals should be avoided.

Use of hoods or other ventilation devices is recommended to prevent the release of airborne substances.

If in doubt about any operation, chemical use, or safety issue, ask before proceeding.

Grinnell College will determine the level of exposure to any harmful substance regulated by an OSHA Standard (29 CFR 1910.1001 through 29 CFR 1910.1050) which requires monitoring if there is reason to believe exposure levels for the substance routinely exceed the Permissible Exposure Limit (PEL) and/or the Threshold Limit Value (TLV). If monitoring is deemed necessary, and this initial monitoring demonstrates that an employee's exposure was above the Permissible Exposure Limit (PEL) and/or the Threshold Limit Value (TLV), monitoring will continue and steps will be taken to lower the exposure. Monitoring will continue until it is demonstrated that exposure has dropped to below the allowed PEL/TLV. If monitoring demonstrates that exposure is under the PEL and/or TLV, then no further action or monitoring is required.

If it is determined that the use of respirators is necessary to maintain exposure below permissible limits, appropriate respiratory protection shall be provided at no cost to employees. Respirators shall be selected and used in accordance with requirements in 29 CFR 1910.134(b)(d)(e) and (f). Grinnell College will notify employees of the results of required monitoring of exposure limits in writing either individually or by posting results online within 15 working days after the receipt of these results.

Avoid underestimation of risk

Most chemicals in a laboratory, studio or theater can present a hazard if used or stored improperly. Chemicals purchased by manufactures will have the appropriate warnings on the labels and Safety Data Sheets (SDS). It is recommended that before materials are received, information on proper handling, storage, and disposal should be obtained and understood.

Many mixtures of chemicals are used or prepared in labs. All mixtures should be treated as though they are more toxic than their most toxic component.

Know the location of emergency items such as fire extinguishers, spill kits, eyewash stations, safety showers, and first aid kits.

Be aware of other operations in process in your area before using Bunsen burners and stirring/hot plates. The use of these around flammable materials can cause a fire.

Provide adequate ventilation

The Permissible Exposure Limits (PEL) of OSHA and the current Threshold Limit Values (TLV) of the American Conference of Governmental Industrial Hygienists must not be exceeded. Refer to specific SDS for these values.

The best way to prevent exposure to airborne substances is to prevent their escape into the working atmosphere by the use of hoods and other ventilation devices. General ventilation in

Grinnell College laboratories provides for comfort and make-up air for local exhaust ventilation systems. General ventilation must not be relied on to control chemical vapors, gases, and mists. Chemical fume hoods should be used when recommended by a substance's SDS.

Work with radioactive materials is regulated by the Nuclear Regulatory Commission, and requires special ventilation and controls on exhaust of radioactive gasses. All radioactive materials and work with radioactive materials are controlled by the Grinnell College radiation safety program under management of the Radiation Safety Officer (RSO). Laboratory managers and workers are advised that radioactive materials and their use are controlled by the RSO, and they are to work cooperatively with the RSO.

Chemical Hygiene Plan

A Chemical Hygiene Plan must be written and maintained by the College.

There must be at least yearly reviews of the CHP and adjustments made when necessary.

All personnel working with hazardous chemicals in laboratories, studio and theater must follow the rules of the CHP.

Components of the Chemical Hygiene Plan

Basic rules and procedures

The following are general safety and health rules that must be followed for all who work with hazardous chemicals. It is required that employees review and comply with these basic safety rules.

Personnel may need to modify these rules to provide additional protection from chemical and physical hazards associated with the specific operation being conducted.

The laboratory is not the place for horseplay. Avoid practical jokes or other behavior which might confuse, startle, or distract other workers.

Personal apparel

Shoes that cover the entire foot must be worn at all times: no sandals, perforated or open-toed shoes.

The specific type of shoes, length of shorts, skirts, dresses or sleeves is determined by faculty and supervisors. For those who work with highly hazardous materials or processes, stricter personal apparel regulations, such as requiring clothes that fully cover legs and upper body or use of laboratory coats with long sleeves, must be determined by the instructor and enforced.

Loose clothing is also a hazard and should be avoided.

Long hair should be tied back to reduce the risk of catching on fire, becoming contaminated with chemicals, or getting caught in equipment.

Preventing chemical exposure

It is important to develop and encourage safe habits.

Exposure to chemicals by inhalation, absorption through skin or ingestion should always be avoided.

Chemicals must not be smelled or tasted.

Eating, drinking, chewing gum, or application of cosmetics is prohibited in areas where hazardous materials are used or stored.

No chemicals are to be stored in any refrigerator that stores food for human consumption.

Hands should be washed thoroughly after handling any chemical, especially before eating or drinking.

Storage or consumption of food or drinks in rooms with chemicals is prohibited.

Refrigerators used for chemical storage must be approved as safe for the chemicals they will contain, and must be clearly labeled as containing chemicals only and nothing for human consumption.

Mouth suction for pipetting or starting a siphon is prohibited.

Goggles must be worn in areas where they are required.

Gloves should be worn when the SDS for the chemical recommends so.

A visual inspection of gloves and glove boxes should be done before use.

Hoods should be used as much as possible, and always used when required by a chemical's SDS.

Housekeeping

Safety equipment must never be blocked and exits must be kept clear. Aisles, walkways, hallways, and exits must be free of chemical containers, obstructions, and tripping hazards.

Spills must be cleaned up and disposed of in the proper manner and place (section 10 of CHP). Contaminated or dirty glassware should not be left in the work area.

Glass that is being discarded must be placed in the "Broken Glass" containers.

The fume hoods should not be used for chemical storage except as required and or noted by the CHO.

Chemicals should be returned to their proper location after use.

Work areas should be cleaned up upon completion of an operation or at the end of each day. There should be no risk of the person working in that space after you coming into contact with a hazardous material you had been working with earlier.

Choice of chemicals

Only chemicals for which there are controls available to minimize exposure should be used.

Whenever possible, less hazardous chemicals should be substituted for highly hazardous chemicals.

The smallest possible quantities of chemicals possible for an experiment or technique should be purchased and used. The practice of searching for existing inventories and use of chemicals in stock before purchasing new chemicals should be followed.

Procedures for procurement and distribution of chemicals

Initial receipt and storage by receiving personnel will be performed in accordance with each department's written protocols for receipt, handling, and storage of hazardous materials. These protocols and any revisions must be reviewed and approved by the College Safety Committee.

No container should be accepted without an identifying label.

All SDS that are packaged with chemicals must be filed in a binder in the location where the chemical is stored or used.

Whenever a chemical is purchased, either someone in that department should add it to the inventory on CEMS (Chemical Environmental Management System, by UNH), or the name and vendor of the substance should be sent to the CHO for this purpose.

When particularly hazardous chemicals are hand carried, the container should be placed in an outside container or bucket. Use of wheeled carts with a design capable of containing leakage or spillage and negotiating uneven surfaces (e.g. expansion joints or floor drains) without tipping the chemical container or cart is preferred.

Chemicals should not be transported on passenger elevators unless there is no freight elevator or it is out of service.

All chemical containers will be transported closed so that no vapors, gases, or mists are emitted.

Plastic coated bottles should be purchased if there is a choice.

When transporting gas cylinders, an appropriate hand truck should be used. The valve cover cap should remain on until the cylinder is in place.

Chemical storage

Amounts of hazardous chemicals being stored should be as small as possible. All containers must be in good condition and properly labeled.

Storage on bench tops and in hoods is not advisable. Spill trays, secondary containment, and proper receptacles should be used. Shelves that have a built-in secondary containment will fill this requirement.

Bottles of chemicals greater than 500 mL should not be stored on shelves higher than 6 feet. Flammables must be stored in approved safety cabinets. Total quantities of flammable and combustible liquids allowed must not exceed 60 liters in one cabinet.

Ventilation to laboratory exhaust systems must be provided for cabinet or under hood storage of

flammable or carcinogenic liquids.

Refrigerators used for the storage of flammable liquids must be explosion proof and properly labeled as such.

Compressed gas cylinders must be fully secured at all times and away from heat sources. Caps must be on these cylinders when not in use. Compressed gas cylinder valves will be closed when not in use.

The date of receipt must be added to each container of peroxide forming chemicals. Peroxide forming chemicals must be disposed of within an appropriate time. Exposure to heat or direct sunlight should be avoided. A list of common peroxide forming chemicals can be found in Appendix E.

Highly toxic substances should be segregated in a well-identified area, preferably in a locked cabinet.

The chemical stockroom should be under the control of one person, with personnel working in the stockroom under his/her control. No unauthorized personnel shall be allowed in the stockroom.

Stored chemicals should be examined periodically (at least annually) for replacement, deterioration, and container integrity.

Every chemical should have an identifiable storage place and be returned to that location after use.

Chemicals must be stored to ensure the segregation of incompatible chemicals. Common categories for storage are: Toxic, Corrosive, Flammable, Combustible, Irritant, Reactive, and Non-hazardous.

Labels must be maintained on all stored materials.

Equipment and glassware

Glassware should be handled and stored with care to avoid damage.

It should be inspected for damage prior to each use. Damaged glassware must not be used. It must be disposed of in a designated glass-only container.

Adequate hand protection should be used when inserting glass tubing into rubber stoppers or corks, or when placing rubber tubing on glass hose connections. Tubing should be fire polished or rounded, and lubricated. Hands should be held close together to limit movement of glass should fracture occur. The use of plastic or metal connectors should be used instead of glass if possible.

Care should be taken with large volumetric flasks, as it is possible to snap the neck off if the flask is held by the neck.

Extra care should be taken with Dewar flasks and other evacuated glass apparatus. They should be shielded or wrapped to contain chemicals and fragments should an implosion occur.

All high vacuum glassware should be shielded or taped. Only glassware designed for vacuum work should be used for that purpose.

Separatory funnels containing volatile solvents may also build up considerable pressure when stoppered and shaken. Users should be aware of this, and should vent them at regular intervals.

All equipment should be used only for its designed purpose.

Damaged equipment or electrical equipment with frayed wiring must be discarded or repaired.

When appropriate, mechanical equipment should be adequately furnished with guards that prevent access to electrical connections or moving parts (such as belts and pulleys of a vacuum pump). Emergency shutoff devices should be provided when possible.

Unattended operations

Leave room lights on, and post an appropriate sign on the door stating that an unattended operation is in progress and listing the name and number of responsible persons.

Containment for toxic substances in the event of failure of a utility service (such as cooling water) to an unattended operation is necessary.

Whenever possible, automatic shutoff devices on long term or unattended operations should be used (water, over-temperature, etc.).

Working alone

Faculty and supervisors should avoid being alone in their workspace when performing procedures that are hazardous or that involve hazardous substances. They should notify a department member if they choose to work alone with hazardous chemicals or procedures after normal working hours.

Students may not work alone under normal circumstances. If an exception must be made, they must receive permission from a faculty or supervisor. The faculty/supervisor should notify security that they have permission to be in the lab space after regular building hours. If Security has not been notified, they will escort students out of the building. Permission should be denied if the procedure or substances are particularly hazardous. Students must tell someone else, such as a friend or roommate, where they will be and for how long when working in the evening and weekend hours.

Personal protection equipment (PPE)

Eye protection

Appropriate eye protection must be worn when handling hazardous chemicals or working with processes that may endanger the eyes. When in a chemistry department laboratory, prep room or stockroom, appropriate eye protection must be on and covering your eyes (not on your forehead or throat) regardless of what you are doing. Goggles will be made available by the college for a fee. In some circumstances (such as welding), face masks may be recommended. Each laboratory and supervisor must develop Standard Operating Procedures (SOPs) on the appropriate eye protection. Students in the chemistry department are expected to wear splash goggles at all times unless instructed otherwise by their instructor or supervisor.

The following spaces are approved by the chemistry department for alternative eye protection:

- The microscope station in Noyce 2008, no protection required.
- The laser laboratory in Noyce 2212, laser eye protection is to be worn.
- The NMR laboratory in Noyce 2210, while working on the computer, no eye protection required.

All splash goggles and safety glasses should comply with the Standard for Occupational and Educational Eye and Face Protection (Z87.1) established by the American National Standards Institute. Safety glasses with side shields may not be appropriate protection with some chemicals. Goggles give side and top protection from chemical splashes, and are required in most laboratory and classroom spaces in chemistry, as outlined in the preceding paragraphs.

Face shields should be worn when maximum protection is needed. These are not a substitute for splash goggles. If splash goggles are required, they should be worn behind the face shield. Specialized goggles or masks should be used to protect against laser hazards and ultraviolet light sources.

Special note to contact lens wearers: Many studies within the past few years have highlighted the hazards of contact lenses in laboratories. If a corrosive liquid gets behind a lens, the process of washing out the eye is not effective unless the lens is removed. However, the natural reflex to close the affected eye makes removal of the lens nearly impossible. In addition, the newer "soft" lenses can actually absorb and concentrate vapors from the lab atmosphere, leading to eye irritation and, in some case, to damage to the lenses themselves. Regulations no longer forbid the use of contact lenses in the lab. If you choose to wear them, be aware of the potential risks, and be sure to wear safety goggles.

Gloves

Appropriate gloves must be worn whenever it is recommended in the SDS for that substance, or whenever the potential for contact with toxic materials exists.

Different gloves provide protection from certain chemicals. Refer to the information in Appendix F on the resistance to chemicals of common glove materials.

Gloves should be inspected before each use, and replaced periodically.

Disposable gloves must be discarded immediately following overt contamination with highly toxic materials.

Gloves should be removed before handling objects such as doorknobs, computer keyboards, telephone, etc.

Protective clothing

The principal investigator or laboratory instructor is responsible for determining the protective clothing needed for laboratory personnel. The CHO should be consulted during protective clothing selection to confirm compatibility using the ACGIH publication, Guidelines for the Selection of Chemical Protective Clothing.

Hearing protection

Hearing protection will be provided for anyone working in an area where the noise level exceeds 85 dBA.

Respirators

Fume hoods and other devices are the preferred method of control. If the engineering controls are not sufficient to provide adequate protection, testing and subsequent evaluations will be done to determine how best to correct the situation. The solutions could involve new engineering controls, a re-design of the existing system, use of less hazardous materials, change in procedure, use of respirators, or cessation of process.

If the use of respirators is necessary, personnel must first undergo fit testing, medical approval, and training.

If an accident or malfunction occurs and toxic fumes are emitted, evacuation is required and the CHO, Security, and Environmental Health and Safety must be notified immediately.

Protective equipment

Fume hoods

A fume hood should be used when handling toxic chemicals that could result in the release of toxic chemical vapors, fumes or dust. When working with particularly hazardous materials, a fume hood must be used.

In addition to yearly inspections, adequate hood performance should be tested before regular use to see if it is functioning properly. A piece of tissue paper or other thin paper can be held at or near the surface of the hood. When the hood is working properly the paper should be drawn into the hood.

Hoods should always remain on.

The hood sash should be lowered to the height (or lower) recommended by the inspectors.

If the inspection sticker is more than one year old, do not use the hood. Contact Facilities Management for repair or inspection when necessary. FM shall arrange to have hoods inspected at least annually.

Materials stored in hoods should be kept to a minimum and not allowed to block vents or airflow located in the rear of the hood.

The chemicals should be kept at least six inches behind the plane of the sash.

No one should put their head inside an operating fume hood.

Large pieces of equipment should not be placed inside the fume hood as this can change the airflow patterns and make the hood unsafe.

A hood with an automatic night or timed setback should not be used when conducting long-term procedures with acutely toxic materials.

Facilities Management must approve any alteration of the laboratory hoods.

Laboratory hoods should have the following specifications:

- 2.5 linear feet of hood space per person for every 2 laboratory workers.
- Air flow monitors should be installed.
- At half sash height, an average exhaust velocity of 60-150 fpm at the hood face shall be provided according to hood classification.

Fire extinguishers, safety showers, eyewash facilities

Everyone working in a laboratory, studio or theater should know the location of the fire extinguishers, and where required, safety showers and eyewash stations before they begin work.

Safety equipment must be accessible to everyone and the areas must be obstacle free. Portable eye wash containers are not a substitute for fixed eyewash stations.

Contact Facilities Management for repair or inspection of equipment when necessary.

If there is a fire, first pull the fire alarm, and then notify security. Only after those two steps are taken can an attempt at dealing with the fire be taken.

Personnel are discouraged from extinguishing fires that occur in their work areas unless the fire is very small and contained (a fire in a wastebasket or no larger than a desk chair). Evacuate the building if an attempt to extinguish a small, contained fire is not quickly successful.

Do not use a fire extinguisher unless trained.

If a fire extinguisher is used, the CHO and Facilities management must be informed.

Electrical hazards

All electrical outlets should provide a grounding connection requiring a three- pronged plug.

All electrical equipment should be wired with a grounding plug.

All wiring should be done by Facilities Management or their sub-contractors.

Any electrical equipment that has been wetted should be disconnected at the main switch or breaker before being handled.

The use of extension cords should be minimized and placement of them across traffic areas is prohibited.

Motor driven electrical equipment should be equipped with a non-sparking induction motor.

An induction motor that operates under a load should not have its speed controlled with a variable auto-transformer. This will cause the motor to overheat.

Kitchen appliances, such as mixers and blenders, should not be used in laboratories where

flammable materials may be present.

Hoods should be equipped with an outside electrical shut off for all electrical devices used within the hood.

Labeling and identification

Personnel must ensure that labels on containers of hazardous chemicals are not removed or displaced.

Chemicals transferred from stock bottles to other secondary containers must be labeled immediately with the following information:

- Chemical name (do not use chemical symbols)
- GHS pictogram
- Signal word (Warning or Danger)
- Hazard statements
- Manufacturer

This information can be found in section 2.2 of the SDS.

If a portion of chemicals is to be used up immediately, a label is not necessary. However, if the container is to be moved to another room, then it must be labeled, even if it is going to be used right away.

If necessary, labels can contain chemicals symbols instead of the full name as long as a key is posted in the area where the containers are stored and used. It is also permissible to make labels that have only the signal word and pictogram, as long as a reference sheet with this full information is kept in the room with the container, and can be easily used as a reference.

Containers of solutions or mixes made in the lab must be labeled in the same manner as secondary containers.

All bottles of chemicals and waste must be labeled with the full name of the chemical as soon as it is put in use. (This is important because in an emergency, first responders may not be familiar with chemical symbols.) If symbols must be used due to container size, a key must be posted in the area where the containers are stored and used.

When a waste collection bottle is put into service, the name of the expected waste should be put on the label, as well as the date collection begins. If waste is added that is not on the original label, the name of that should be added to the label.

Special signs should be placed in the work areas where the hazard indicated is present: Acid/Caustic, Corrosive, Flammable, Combustible, Carcinogen, and Chemical Storage Area. Prominent signs and labels of the following types should be posted: Emergency telephone numbers for Public Safety and Health Services, as well as location signs for safety showers, eyewash stations, fire extinguishers, first aid supplies, and exits.

There should be warning signs at areas or equipment where special or unusual hazards exist.

Chemical inventory

A chemical inventory must exist for each laboratory, studio, theater space, and stockroom.

Each year the inventory must be updated.

The inventory will consist of the name of the location (building name and room number), the person's name in charge of the room, (if it is in a stockroom, the person responsible is the person who manages the stockroom), the name of the substance, the approximate amount stored or purchased, and the name of manufacturer.

The substances contained in these inventories should be entered into CEMS (Chemical Environmental Management System, by UNH).

The CHO should receive updated copies of the inventory from each department every semester.

New SOP must be written to reflect current chemical use and storage whenever the CHO and the Safety Committee reports that the current use and storage SOP are not meeting current needs.

Fire, accident, and spill reporting

If a fire occurs, first pull the fire alarm, and then notify security (ext. 4600). Only after those two steps are taken can an attempt at dealing with the fire be taken.

Personnel are discouraged from extinguishing fires that occur in their work areas unless the fire is very small and contained (a fire in a wastebasket or no larger than a desk chair).

Evacuate the building if an attempt to extinguish a small, contained fire is not quickly successful. Do not use a fire extinguisher unless trained.

If a fire extinguisher is used, the CHO and Facilities Management must be informed.

In the event of an accidental spill, leak, or chemical fumes, the following procedure should be followed:

- Remove effected people from the location. Call for emergency medical help if necessary.
- Notify the Security (ext. 4600) of the situation.

If you are properly trained in the substance, if it is not acutely toxic, and if the volume of the spill or leak is small enough for you to safely deal with it, you can begin cleanup. Do not attempt to clean up a spill or leak if you are not sure what the substance is, if you are uncertain of proper cleanup procedures, if the material is too toxic or if it is potentially explosive, or if the volume is more than 2 liters. In those situations, evacuation is recommended.

The CHO, Security and EH&S together shall determine the source of the substance, its hazard, and whether the building can be safely occupied.

If the spill or leak has not been cleaned up before this point, the CHO and EH&S, working with Facilities Management or potentially the local Fire Department or Hazmat Response Unit will

work on cleanup.

Hazardous substances may be used as part of building maintenance and repair. Precautions will be made to keep these substances at a minimum, but there is the potential of exposure when such work is being done. If exposure to these substances is causing dizziness, headaches, nausea, breathing problems, or other physical symptoms, the employees should leave the area of exposure, and Security should be notified. Then the CHO, Security, and EH&S should assess the situation as soon as possible. If it is determined that the substance causing the symptoms is hazardous, the previous procedure for accidental spills, leaks or fumes should be followed.

Prior approval

Grinnell College has certain procedures or activities that require prior approval of/notification to the Chemical Hygiene Officer before implementation. Such procedures include:

- Work with large quantities of substances on OSHA's list of Particularly Hazardous Substances. This list of substances can be found on [this webpage from Oak Ridge National Laboratory](#).
- Purchase of more than 100 grams of any chemical on the EPA's "P" list of hazardous substances. This list of substances can be found [on the EPA's website](#).

Procedures for work with particularly hazardous substances (regulated by OSHA)

There are special provisions for additional employee protection for work with chemicals that are on OSHA's list of Particularly Hazardous Substances. A list of these substances and the reason they are on this list can be found on [this website from the Oak Ridge National Laboratory](#). These include substances that are "select" carcinogens, reproductive toxins/teratogens, and substances which have a high degree of acute toxicity.

Special rules must be followed when working with these substances.

The minimum Personal Protective Equipment for these substances, as required by OSHA, are gloves and safety goggles. These PPE should be used any time an employee is working with one of these substances in a concentrated or pure form. When leaving the lab, PPE must be removed and the employee should then wash his/her hands.

In most cases, these concentrated or pure substances should be handled in fume hoods.

Glassware used should be decontaminated in fume hoods before being sent to the stockroom to be washed.

Any spill of a concentrated form of one of these substances should be reported to the CHO.

Further protective actions will be determined by the employee's supervisor.

When working with dilute solutions of these substances, the relative dangers should be assessed by the employee's supervisor or the PI (Primary Investigator), and the decision on PPE and procedures should be made accordingly.

If an employee will be using a concentrated or pure substance on this list for an extended period

of time, an SOP should be developed by the employee's supervisor for the proper handling of the substance, and protective measures to limit exposure. The SOP must be read by an employee and signed before the employee begins work with these substances.

If special equipment, respirators, skills or techniques are required to safely handle the substances, the employee must be personally trained by their supervisor or another qualified person before they begin working with the substance. This is in addition to, and not instead of, reading and signing the SOP.

A record of any training should be documented on a signed SOP, stating that the employee was shown how to perform the required tasks, and demonstrated that ability. This should be signed and dated by both the employee and the supervisor or person doing the training.

Outreach programs

Only students working through a Grinnell College sponsored program are permitted to conduct demonstrations or hands-on experiments that use chemicals.

The students handling the chemicals must have completed the College's chemical safety training requirements.

Prior to the event, the students must inform the program's faculty advisor of the demonstrations and experiments they intend to perform as well as a list of the chemicals they will be using. The advisor will discuss how to conduct the demonstrations and experiments in a safe manner, as well as the potential hazards associated with the chemicals or procedure.

The faculty advisor makes the final decision as to which activities can be done and which chemicals can be used.

When hazardous materials are used at any event, the advisor or another qualified employee must be present.

Prior approval for vehicle transport must be obtained from the chemical hygiene officer. No student will transport hazardous chemicals in a private or College owned vehicle without transportation training.

At the event, the students must give the participants a brief overview of the safety precautions necessary to handle the chemicals and assume responsibility for ensuring the proper use of personal protective equipment. The safety data sheets (SDS) must be copied in advance and present at the function.

The handling of any hazardous waste and spent chemicals must be discussed in advance with the faculty advisor and carried out properly by the appropriate person.

Biohazard safety plan

Grinnell College has a comprehensive Biohazard Safety Plan that can be found on the [Institutional Biosafety Committee page](#).

Employee Information and Training

Information

Personnel must be provided with information about the hazards of chemicals present in their work area.

This information must be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations.

They must be made aware of the CHP, told of its location and availability.

The location and availability of reference material on the hazards, safe handling, storage and disposal of hazardous chemicals must be discussed.

It is the responsibility of the employee's supervisor to make sure that the employee is made aware of this information.

Training

Grinnell College provides employees with information and training on hazardous chemicals in their work area at their time of initial employment and prior to assignments involving new exposure situations.

Additional training may be required for individual departments, or for personnel working with complex or highly reactive or explosive chemical operations.

Receiving and stockroom/storeroom personnel shall be trained about the hazards, handling equipment, protective apparel, and relevant regulations pertaining to chemicals handled by them. They shall receive SDS for chemicals from suppliers and provide copies of these to laboratory personnel at the time of requisition.

Initial information on chemical hazards and training sessions for new employees will be arranged by the employee's supervisor. Departments may choose to have group training sessions at regular times throughout the year.

A record of the employee's training, signed by the employee and the person doing the training, must be filed with the department head or the Chemical Hygiene Officer, depending on the requirements of that particular department.

Training must cover the following information:

- A summary of contents of the Occupational Exposure to Hazardous Chemicals in the Laboratories Standard 29 CFR 1910.1450 and its appendices.
- The location and availability of the Chemical Hygiene Plan.
- The signs and symptoms associated with exposures to hazardous chemicals they may be working with.
- The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory, including but not

limited to Safety Data Sheets (SDS) received from chemical suppliers.

- The measures employees can take to protect themselves from chemical hazards, including specific procedures which have been implemented by individual departments, such as appropriate work practices, Personal Protective Equipment (PPE), and emergency procedures.

Chemical Safety training for new students in departments that use hazardous chemicals must be conducted annually and before chemical work is started. The training must include the location of safety equipment, rules about working alone, proper personal protection equipment, emergency procedures, and the individual hazards.

Custodians and repair personnel, who occasionally do cleaning or repair work in a laboratory, studio or theater must receive initial training from the Director of Environmental Health and Safety. The training must consist of methods of observation that may be used to detect the presence or release of a hazardous chemical as well as proper safety protocols for reporting an accident or spill. Special attention will be given to the importance of engineering controls such as fume hoods, ventilation of the building, safety showers and eyewash stations which they will be required to test and maintain.

Security officers who regularly patrol areas with hazardous chemicals should also be trained at least every two years. The training must consist of methods of observation that may be used to detect the presence or release of a hazardous chemical as well as proper safety protocols for reporting an accident or spill.

Training records

Each Department will collect and maintain for the time of employment plus 30 years records of all training sessions provided to employees, including at the time of initial employment, review training, and special SOP training.

The date of the training, the topics covered, and the name and title of the person conducting the training should be included in the records.

These records will be kept as paper copies for 1 year. After that 1 year time period is over, PDF files of the signed sheets will be made and stored and the paper copies can be disposed of.

Hazardous waste

Definition

The Environmental Protection Agency (EPA) divides hazardous wastes into two broad categories: listed hazardous wastes and characteristic hazardous wastes. The listed wastes are presented in the Code of Federal Regulations (40 CFR 261.31-261.33).

The hazardous characteristics include ignitability, corrosivity, reactivity, and toxicity.

Some wastes are neither EPA listed nor Characteristic listed but are known to pose a potential hazard such as carcinogenicity, mutagenicity, etc. These should be considered hazardous and disposed of properly.

Small quantity generator

Grinnell College is a Small Quantity Generator (SQG). This means that no more than one thousand pounds of hazardous waste and less than 2.2 pounds of acutely hazardous waste are generated each month. The goal of the waste disposal program is to dispose of chemical waste in a manner that will prevent harm to people and the environment.

Locations and procedures

Within each room where waste is generated there must be a specific place where waste is temporarily stored. This is called the Satellite Accumulation Area (SAA).

There must be a sign identifying the area as a SAA.

The waste container should be as close as possible to the area of waste generation.

This space can be part of a hood area.

The waste containers must be kept in a secondary container at all times.

Waste containers should be labeled as fully as possible with the names of the anticipated waste products and the date accumulation begins before it is put into use. If further waste products are added, the names of those substances should be added to the label.

When the waste container is full the CHO should be notified that it is ready to be taken to the Main Accumulation Area (MAA).

The MAA is the place where the waste should be collected and stored until its final removal from the College, and is located in the waste shed southeast of Noyce Science Center.

In the MAA, waste can be stored for up to six months before removal.

Labels

All waste containers must have a label that clearly defines the container as Hazardous Waste.

The full chemical names of all the chemicals must be written on the label. Do not use not symbols or shorthand notations.

The date that accumulation of the waste began must be on the label.

There must be a white sticker that says "Hazardous Waste" on the orange label tag.

Orange label tags are available from the chemistry stockroom or the CHO.

Chemical waste consultant

All hazardous chemical waste generated must be collected for characterization and disposal. A chemical waste firm that specializes in hazardous waste management periodically inspects and picks up the waste stored in the SAA and MAA. Contact the CHO or Facilities Management if there are concerns about hazardous waste inspections or disposal.

Collection and disposal of hazardous chemicals

Liquid organic waste should be separated into halogenated waste bottles and nonhalogenated waste bottles.

Do not discharge to the sewer concentrated acids or bases, highly toxic, malodorous, or lachrymatory substances, or any substance which might interfere with the biological activity of waste water treatment plants, create fire or explosion hazards, cause structural damage, or obstruct flow.

Hazardous chemical waste should be separated, to the extent possible, according to classes and potential hazards.

Hoods must not be used as a means of disposal for volatile chemicals. However, hoods can be used as SAA as long as the waste containers are kept closed.

Caps should remain on the waste bottles unless waste is being added to the bottle. For convenience, there are funnel caps that can be put on collection bottles to make pouring waste into them easier. These funnels should remain closed when waste is not being poured.

Only one container at a time per SAA may be used to collect one waste stream (one type of waste). The waste bottles must be placed in secondary containment. Once a bottle is full, a vented cap should be put on the bottle to prevent pressure from building in the bottle. These caps can be obtained from the CHO. The bottle should then be moved to the MAA.

Solid hazardous waste should be collected in appropriate containers, labeled appropriately, and disposed of in the same manner as liquid waste.

Old neat chemicals that need to be disposed of can be picked up by our chemical waste consultants. The original labels must be intact and readable. Contact the CHO if you have unused purchased chemicals that you need to dispose of.

A list of all chemicals and waste containers and their contents that are being disposed of should be sent to the CHO, in order to ensure that we are not exceeding the limits allowed to us as a Small Quantity Generator. The CHO will identify all listed waste and ensure that these are classified correctly by our chemical waste consultants.

Collection and disposal of non-hazardous chemicals and materials

Gloves, paper towels, chromatographic adsorbent, glassware, filter papers, and filter aids can be placed in the trash if they are not contaminated with hazardous material. If these items are contaminated with hazardous material, they too are hazardous, and should be collected, labeled and disposed of appropriately. Glassware should be cleaned or rinsed before sending to the dishroom. The resulting liquid should be placed in a hazardous waste container if the contents of the glassware was hazardous.

Refer to Appendix H for the list of solid chemicals which are not considered hazardous and are therefore suitable for disposal with regular trash.

Waste glass not contaminated with a hazardous substance should be put in the special glass waste boxes that are in each lab. Glass that is contaminated should either be decontaminated

or disposed of as a solid hazardous waste in a puncture-proof container.

Biohazardous waste materials

Biohazardous materials (broth cultures, petri pates, plastic pipet tips, etc.) will be disposed of in labeled receptacles marked biohazardous waste. Consult [the Biohazards Safety Plan](#) for more details.

Hazardous waste training

Initial Hazardous waste training and certification in DOT Hazmat Transportation and RCRA is required for all personnel who are responsible for the disposal of hazardous waste. Yearly re-training is also required.

Inspections

Purpose and procedures

In order to ensure that overall safety is being maintained, inspections must be performed.

Routine inspections must be done by faculty and supervisors to ensure their areas are in compliance with the CHP.

Inspections by CHO must be conducted at least yearly and may be unannounced. These shall consist of maintenance checks of safety related equipment, general safety practices, and housekeeping.

Deficiencies will be categorized as:

- Critical – to be corrected as soon as possible.
- Important – to be corrected within 1-3 months.
- General – to be corrected within 6 months.

If a certain concern is noted, an email to the responsible party (such as the department head or principal investigator) will be sent detailing the problem and the corrective action. The room will be re-inspected after a determined period of time to verify that adjustments have been made.

If the corrective action has not been taken during this time, the Dean of the College will be sent a report.

The Safety Committee will be the primary point of contact for evaluations or inquiries regarding laboratory safety at Grinnell College.

OSHA inquiries or OSHA compliance officers shall be directed to the Vice President for Facilities Management.

Safety equipment

Chemical fume hoods should be checked before beginning any operation. If not working properly, Facilities Management must be contacted.

No work should be done in the hood until the problem has been resolved.

The sash should be positioned at the proper height.

The yearly inspection sticker on the side of the hood will mark the maximum height for the sash for safe operation.

Annual inspections must be completed on all hoods. The inspections will be coordinated by FM. Copies of the inspections must be maintained by FM.

Safety showers must be tested and flushed weekly. FM will coordinate the inspections. Copies of the inspections and weekly flushes must be maintained by FM.

To prevent possible infection with use, eye wash stations should be flushed on a weekly basis. These inspections and flushes will be completed by FM. Records of the inspections must be maintained by FM.

Laboratory, classroom, and stockrooms, prep rooms, studios and theater inspections

Annual inspections of laboratories, studios and theaters, classrooms, stockrooms and prep rooms will be completed by the CHO. The focus should be on general safety rules.

Safety equipment must never be blocked, and aisles must be free of chemical containers, obstructions, and tripping hazards.

There must be proper storage of chemicals and hazardous waste.

The general area should be free of dirty glassware and unused equipment.

Inventory of chemicals must be up to date.

Copies of the inspections must be maintained by the CHO.

Medical Program

Description

Grinnell College will provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up determined necessary by the examining physician, for the following circumstances:

Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed to in the workplace.

Where exposure monitoring reveals an exposure routinely is above the Permissible Exposure Limit (PEL) and/or the Threshold Limit Value (TLV) for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements. Medical surveillance shall be established for the effected employees as prescribed by the particular OSHA Standard (29 CFR 1910.1001 through 29 CFR 1910.1050)

Whenever an event takes place in the work area that results in the likelihood of a hazardous chemical exposure, such as a spill, leak or explosion, the effected employee(s) shall be

provided an opportunity for a medical consultation.

Medical Examinations and consultations

Medical examinations and consultations are to be performed by or under the direct supervision of a licensed physician, and are to be provided at no cost to the employee without loss of pay, and at a reasonable time and place. (It is important to note that should the effected person be a student, and not an employee, that medical attention will still be provided, but the student will be responsible for the cost of the examination and treatment. Students should be properly insured for their protection.)

The physician shall be provided with the following:

- The identity of hazardous chemical(s) to which the employee may have been exposed to.
- A description of the conditions under which the exposure occurred, including quantitative exposure data, if possible.
- A description of the signs and symptoms of exposure the employee is experiencing, if any.
- A written report from the examining physician for an examination or consultation which is required by the Standard should be obtained by both HR and the employee.

This report shall be forwarded to the Director of Human Resources. It shall include:

- Any recommendation for further medical follow-up.
- The results of the medical examination and any associated tests.
- Any medical condition that may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous chemical found in the workplace.

A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment.

Any findings or diagnoses made during the course of this examination that are not directly related to the incident, or that do not affect the occupational safety of the individual will NOT be included in this written report, in accordance to HIPPA laws that provide for the privacy of patients.

Recordkeeping for the medical program

Records must be kept by Human Resources for the following medically related information:

- employee exposure complaints and suspected exposures
- air concentration monitoring results
- exposure assessments
- medical consultations and examinations.

The records must be maintained for at least the duration of employment plus thirty years, and made available to personnel upon request.

Recordkeeping

Safety Data Sheets (SDS)

The original SDS must be filed by the in a binder designated for that workspace. Grinnell College subscribes to CEMS (Chemical Environmental Management System, by UNH).

This is an electronic database that makes it easy to locate any SDS from the stockroom computer. When a new chemical is ordered, its information needs to be entered into our inventory in this program. This can replace the original paper SDS copies in order to save space, as long as employees in these areas are able to access this online program.

Inventories

Each department and research laboratory should maintain up to date inventories of the chemicals they have on hand. These inventories should be forwarded to the CHO each year.

Accidents and spills

It is the responsibility of the CHO, supervisor or faculty to record the information about accidents and spills. Incident report forms are included in Appendix G and should be readily available in each lab. The Human Resources department will maintain these reports for a minimum of 30 years.

Inspections

The results of inspections for each laboratory, classroom, stockroom, prep room, studio and theater must be maintained by the CHO. The date and name of the person who conducted the inspection must be listed.

Training

Records of safety training and hazardous waste training must be maintained by each department. They must include the date, names of individuals, type of training, and name of person responsible for the training.

Medical records

All medical records of personnel who have needed medical attention as result of exposure to a hazardous substance at Grinnell College must be maintained by Human Resources. These records must be maintained for the duration of employment plus thirty years. The measurements used to monitor personnel exposures must be kept for 30 years.

Hazard Identification

Labels

Grinnell College assures that labels on incoming containers of hazardous chemicals are not removed or defaced, and that SDS that are received with incoming shipments of

hazardous chemicals are maintained and readily accessible to laboratory employees. For label requirements for secondary containers, see part 4, section N of this document.

Development of chemicals

For chemical substances developed in the laboratory, the following procedures shall be followed:

- If a chemical substance is going to be produced exclusively for laboratory use, and it is determined to be hazardous, appropriate training will be provided for that substance before it is produced.
- If a chemical substance of unknown composition will be produced as a by-product, the substance will be assumed to be hazardous, and the appropriate protective equipment and PPE should be used. The correct handling procedures will be determined by an employee's supervisor prior to the development of the substance.
- If a chemical substance is going to be produced for another user outside of Grinnell College, the College complies with the Hazard Communication Standard 29CFR 1910.1200, including the requirements of the preparation of a Safety Data Sheet and appropriate labeling.

Emergency/Contingency planning

Emergency response

For emergencies such as fires, explosions, or spills, personnel should rescue anyone immediately affected by the emergencies, but only if it does not put themselves at risk. If trained, first aid can be administered to the victim(s). If the situation is critical, 911 should be called. Security should be contacted.

All major accidents, fires, explosions, and spills must be reported to Security (ext. 4600) immediately. Security will notify the CHO (ext. 3012).

If an emergency occurs after normal working hours, Security will contact the personnel responsible for the room for notification and consultation. An Emergency Contact List should be posted on each room door. The list includes building name and room numbers, names of personnel responsible for those rooms, and their home (and/or cell) phone numbers. This private information will only be used when an emergency occurs. In addition, there should be a list of names of people (in order of priority – Department Chair, etc.) to be called if the primary person is not available.

Accident reporting and investigation

All accidents (injuries, fires, spills, explosions) no matter how minor shall be reported to the laboratory supervisor and the CHO as soon as possible, and no later than within one working day of the incident. These reports shall be forwarded to Human Resources. They will also be forwarded to Facilities Management if repairs are required. Incident report forms should be in every lab with the first aid kit.

Once the initial report is received, the CHO and laboratory supervisor will review the incident to investigate the reason for the incident, and determine if there are changes that can be made to avoid similar accidents in the future. Potential changes based on these reports will be presented

at the next meeting of the safety committee.

Hazardous material spills cleanup and reporting

If a spilled chemical is highly toxic or hazardous, or if there is a spill that results in injury, the Department Chair and CHO must be sent a report regardless of the amount. All spills should be considered hazards and therefore must be cleaned up promptly regardless of whether the substance is hazardous or harmless. Different chemicals require different clean-up equipment. For example, a corrosive liquid clean-up is different from the clean-up of a spill from a flammable liquid. The CHO can provide technical advice, but is not responsible for spill clean-up. Refer to the specific SDS for more details. If the spill involves radioactive materials, refer to the Radioactive Safety Manual.

Major spill cleanup

A major spill is defined as a spill of material that poses a significant threat to an employee's safety or the environment. Generally it involves a large quantity of a moderately hazardous substance, or any amount of highly toxic or particularly hazardous material, or any material that may present a fire hazard, or if the material cannot be recovered before being released to the environment.

Everyone in the area must be notified, the area evacuated, and Security contacted, ext. 4600.

Security will contact the Fire Department. The Fire Department may call in a HazMat team to deal with the spill.

No attempt should be made to clean up a major spill by employees. These should be cleaned up by people with special training, such as HazMat workers. However, if it is possible to do so safely, stop the source of the spill.

The caller and other people who have knowledge of the event should arrange to meet a Security officer at a safe location in order to answer questions about the incident.

A report must be sent to the CHO within 24 hours of the incident, and that report will be forwarded to Human Resources.

Minor spill cleanup

A minor spill is defined as a spill of material that does not pose an immediate significant threat to an employee's safety or the environment.

If the substance is toxic, poses a significant fire hazard, or cannot be released into the environment, personnel should not attempt to clean the spill up, but should call Security at ext. 4600. Such a spill would be considered a major spill, not a minor spill, and the procedure for a major spill should be followed.

Very small spills (around 100 ml) of low-toxicity chemicals can be absorbed with paper towels and allowed to evaporate under the hood after which the towel may be disposed of in regular trash.

If the spilled chemical is not a highly toxic material, is not spilled in large quantity (a liter or more), does not pose a significant fire hazard, and can be recovered before released to the

environment it can be cleaned by personnel.

Custodians are not permitted to clean up hazardous materials from a spill, whether it is a minor spill or a major spill, unless it is one of their own cleaning materials that was spilled in a laboratory.

When cleaning a minor spill, use the appropriate clean-up procedures below.

- Minor spill cleanup with no injury during normal working hours
 - The employee will determine if they can clean the spill or contact Security to request professional assistance.
 - Appropriate PPE must be worn.
 - After the spill is cleaned, the clean-up items and gloves must be disposed of in a way that is appropriate for the substance that was spilled.
- Minor spill cleanup with injury during normal working hours
 - If any person has been contaminated by the spill, especially the eyes and skin, the person should be taken to an eyewash or shower, and then Security, ext. 4600 should be contacted.
 - Security will arrange for transportation of the injured person if necessary.
 - Personnel can determine who will clean the spill or contact Security to request professional assistance.
 - Appropriate PPE must be worn.
 - After the spill is cleaned, the clean-up items and gloves must be disposed of in a way that is appropriate for the substance that was spilled.
- Spill cleanup after normal working hours
 - If the spill occurs after normal working hours when no personnel are available, Security (ext. 4600) should be notified.
 - Officers will contact the appropriate person from the Emergency Contact List.
 - The caller and other people who have knowledge of the event should arrange to meet a Security officer at a safe location in order to answer questions about the incident.
 - Personnel can clean up the spill or contact Security to request professional assistance.
 - Appropriate PPE must be worn.
 - Avoid breathing in vapors from the spill.
 - After the spill is cleaned, the clean-up items and gloves must be disposed of in a way that is appropriate for the substance that was spilled.
- Cleanup equipment for hazardous substances
 - Each department should have a spill kit tailored to deal with the potential hazards of the materials being used.

- Gloves and goggles must be worn during any clean-up of hazardous substances.
- The used clean up items and gloves must be of in a way that is appropriate for the substance that was spilled. For example, some toxic materials would require that the clean up items and gloves be placed in sealed plastic bags in the SAA, to be disposed of with other hazardous waste. Other substances are less hazardous and the gloves and potentially other clean up materials could be placed in the trash. If you are uncertain, place the materials in a plastic bag and place it in the SAA. Be sure to completely label the bag with the name of the substance that was spilled and the date.
- Be sure to notify the CHO when a spill kit component has been used up, so it can be replaced.
- The following cleanup materials can be included in the spill kits:
 - Acidic materials of low flammability which are not volatile or which have low toxicity (sulfuric, nitric, and hydrochloric acid) can be neutralized with baking soda and the residue swept up. Appropriate PPE must be worn. The spent baking soda and gloves must be placed in a labeled hazardous waste container in the SAA.
 - Basic materials of low flammability which are not volatile or which have low toxicity (sodium and potassium hydroxide) can be neutralized with citric acid and the residue swept up. Appropriate PPE must be worn. The spent citric acid and gloves must be placed in a labeled hazardous waste container in the SAA.
 - Flammable solvents (petroleum ether, hexane, pentane, diethyl ether, dimethoxy ethane and tetrahydrofuran) can be absorbed with spill control pillows or pads. All occupants should be immediately notified, all flames extinguished, and any spark producing equipment should be turned off if possible. Appropriate PPE must be worn. The clean-up items and gloves must be placed in a labeled plastic bag and placed in a fume hood in the SAA.
 - Broken glass should be picked up with tongs, dust pan, or some other mechanical device. It should then be placed in a designated glass-only container.

Accident response

Eye contact

The eyes must be flushed with water for at least 15 minutes.

Both hands should be used to hold the eyelids open so that the entire surface of the eye is rinsed. This should be done at an eyewash station.

Medical attention should be sought if necessary, and Security (ext. 4600) notified.

The SDS should be read to determine if there is the possibility of any delayed effects.

An incident report must be filed out by the supervisor and submitted to Human Resources, with

a copy going to the CHO, within 24 hours of the incident, no matter how minor.

Inhalation or ingestion

Medical attention should be sought immediately.

If the situation warrants it, call 911 immediately.

Security, ext. 4600, must be contacted.

The name of the substance and the SDS should be readily available for proper treatment.

An incident report must be filed out by the supervisor and submitted to Human Resources, with a copy going to the CHO, within 24 hours of the incident, no matter how minor.

Skin contact

For most spills covering small amounts of skin, the affected area should be flushed with water for at least 15 minutes. (There are exceptions, such as with phenol, when PEG 300 should be used instead of water. The SDS should be read before using the chemical in order to be aware of these exceptions.)

Jewelry should be removed if necessary to aid in the removal of residual materials.

If there is no visible burn after the 15 minutes, the area should be washed with warm water and soap.

Check the SDS to see if any delayed effects should be expected.

It is advisable to seek medical attention for even minor chemical burns.

For spills on clothes, no attempt should be made to wipe the clothes. They should be quickly removed while using the safety shower.

Security (ext. 4600) should be notified as soon as possible.

Seek medical attention after 15 minutes under the shower.

An incident report must be filed out by the supervisor and submitted to Human Resources, with a copy going to the CHO, within 24 hours of the incident, no matter how minor.

Physical injury

If there is an injury (such as a cut from broken glass or electric shock from a shorted out piece of equipment), assess the severity of the situation. If the injury is major, call 911.

If further exposure is life threatening, move the injured from the area.

An employee may offer initial treatment if trained in first aid or CPR.

If chemicals are involved, wash the person under the safety shower.

Once the immediate needs of the injured person are attended to, notify Security at ext. 4600.

If the injury is minor, use the first aid kit located in every lab. The injured person should then go to Health Services for further treatment.

In all cases of physical injury, be sure to follow protocol for blood borne pathogens. Wear gloves to avoid contacting the blood of another person.

All cleanup materials that contain blood or bodily fluids should be placed in a sealed bag and labeled as Biohazard Waste, and disposed of accordingly.

An incident report must be filed out by the supervisor and submitted to Human Resources, with a copy going to the CHO, within 24 hours of the incident, no matter how minor.

Fires and explosions

In the event of a fire:

- Activate the nearest fire alarm first, even if you may attempt to extinguish it. If a fire breaks out, everyone should be alerted.
- If a person's clothing or hair catches on fire, immediately attempt to get the person to stop, drop, and roll.
- If it is a small fire (no larger than a chair) or contained (such as in a wastebasket) and if trained to use fire extinguishers, an employee can attempt to extinguish the fire.
- No untrained person should attempt to use extinguishers.
- Small fires can often be extinguished by suffocation by covering the container with a nonflammable material or item.
- If the fire can't be quickly controlled, evacuate the area.
- Close doors to confine fire as you are leaving.
- Do not use elevators.
- Once you are outside the area, call 911.
- Security, ext. 4600, must be notified.
- The caller and other people who have knowledge of the event should arrange to meet a Security officer at a safe location in order to answer questions about the incident.
- Reentry into the area will not be allowed without authorization from Security and the City of Grinnell Fire Department.

In the event of an explosion:

- The nearest emergency alarm should be pulled and the building evacuated.
- Once in a safe location, Security, ext. 4600, must be contacted.
- The caller and other people who have knowledge of the event should arrange to meet a Security officer at a safe location in order to answer questions about the incident.
- Reentry into the area will not be allowed without authorization from Security and the City

of Grinnell Fire Department.

Biohazard spills

Details on handling biohazards can be found in the [Biohazard Safety Plan](#).

Chemical stockrooms

General requirements

Stockrooms are areas in which large quantities of chemicals are stored for use.

Chemicals must be stored in such a way that incompatible chemicals are not near each other.

Access must be limited to authorized personnel.

Stockrooms must be locked and secured when personnel are not present.

A mechanical exhaust ventilation system must be operational.

Emergency equipment must not be obstructed.

The exits must be clearly marked and unobstructed.

The rooms must be well-lit so that container labels can be easily read.

Containers should be facing forward so labels can be read without moving the container.

Shelves should not be over crowded.

Flammable liquids storage cabinets

Flammable materials must be stored in cabinets that meet OSHA and National Fire Protection Association (NFPA) specifications.

The cabinets should be in good condition, and not rusted.

Quantities of flammables stored shall not exceed the manufacturer's specification for the cabinet. OSHA and NFPA limit the size of the container for classes of flammable and combustible materials. These limits must be followed. The more fire-resistant container the larger it can be.

Compressed gasses

The names of compressed gases must be prominently posted.

Flammable gas cylinders must be stored in a separate area from other types of compressed gases.

Cylinders of incompatible gases must be segregated by distance.

Cylinders must be grouped by the type of gas (toxic, corrosive, etc.)

All compressed gases must be stored away from direct or localized heat in well-ventilated and dry areas and away from areas where heavy items may strike them.

All compressed gases, including empty cylinders, must be secured in an upright position with chains, straps or special stands.

The tanks must have the protective cap secured when the tanks are stored or moved.

A hand truck must be used when transporting gas cylinders to and from storage areas.

Empty cylinders should be separated from nonempty cylinders and labeled as empty.

The valves should be closed when not in use.

Lecture bottle purchases should be discouraged unless disposal arrangements have been made in advance.

Oxidizers and peroxides

An oxidizer is a chemical which may cause the ignition of combustible substances without the aid of an external source of ignition. Also, when substances are ignited oxidizers increase the rate of burning of the materials.

Some common oxidizers are: Nitric acid, sulfuric acid, and perchloric acid.

Oxidizers must be stored away from incompatible materials such as:

- flammables and combustible materials,
- greases,
- finely divided metals,
- and organic liquids.

Strong oxidizing agents must be stored and used in glass or other inert containers.

Corks and rubber stoppers must not be used.

High energy oxidizers must be segregated. Peroxides and chemicals that tend to form peroxides must be stored in airtight containers in a dark, cool and dry place.

To minimize the rate of decomposition, peroxides and peroxidizable materials should be stored at the lowest possible temperature consistent with their solubility and freezing point.

Liquid peroxide or solutions must not be stored at or below the temperature at which the peroxide freezes or precipitates, because peroxides in these forms are extremely sensitive to shock and heat.

The date of receipt and date of opening must be added to each container of peroxide forming chemicals.

Peroxide forming chemicals must be disposed of according to NFPA requirements or at first

sign of peroxide formation.

Ether, dioxane, and tetrahydrofuran are three common peroxide forming chemicals. Refer to specific SDSs for more information.

Toxic chemicals

Extremely toxic substances must be stored in a locked cabinet in unbreakable chemically-resistant secondary containers.

Adequate ventilation must be provided in storage areas especially for toxic chemicals that have a high vapor pressure.

Extremely toxic chemicals must be dispensed in a fume hood.

Water reactive chemicals

Water reactive chemicals should be stored in a cool and dry location.

They must be segregated from all other chemicals.

The quantities of water sensitive chemicals stored should be minimized.

These chemicals should be stored under oil at room temperature.

Storage containers should be checked frequently.

All water sensitive chemicals should be disposed of whenever they are no longer required for current work.

Standard operating procedures (SOP)

Definition

Standard Operating Procedures (SOP) describe a procedure or set of procedures to perform a certain operation. They are intended to provide guidance on how to safely work with chemicals or equipment. The OSHA Laboratory Standard requires that the CHP include specific information to help protect personnel. This is especially important if operations include the use of select carcinogens, reproductive toxins and substances of acute toxicity.

SOP details

At a minimum, SOP should include the following information:

- The name of the chemical or process
- It's hazards and special hazards
- Use of engineering controls (such as fume hoods)
- Required PPE
- Spill response measures

- Cleaning instructions
- Waste disposal procedures.

The OSHA Laboratory Standard specifies the requirement for SOP for work involving hazardous chemicals, but SOP should also be developed with equipment or operations that may cause any physical hazards.

SOP do not need to be too detailed. It is acceptable to point personnel to other sources of information. For example, it is sufficient to direct personnel to the location of the SDS binder for information about a certain chemical's hazards or the Operator's manual for information about a piece of equipment.