

Hackensack Meridian Health Center for Discovery and Innovation Chemical Hygiene Manual

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Introduction

In coordination with the OSHA Occupational Exposure to Hazardous Chemicals in laboratories standard, 29 CFR 1910.1450, the following document represents the chemical hygiene plan for the Center for Discovery and Innovation. In addition to providing the requirements of this plan, this document also entails:

- Training for employees
- Hazard Identification
- Labeling
- Management of Chemical Hazard Information
- Exposure Monitoring
- Occupational Health
- Exposure Control
- Personal Protective Equipment
- Laboratory Safety Equipment
- Chemical Waste Management
- Safety for Particularly Hazardous Substances
- Recordkeeping

The policies and procedures within this plan are applicable to all laboratories and personnel.

Hazardous Chemicals are any chemical or mixture of chemicals, which classify as a physical or health hazard due to the reactionary properties of the material.

When working with these materials, all personnel must perform a comprehensive risk assessment. Before beginning any new procedures, assess all of the potential hazards, ensure proper protective measures are in place (including personal protective equipment and engineering controls), and re-evaluate process and procedures on a routine basis to ensure best practices are being utilized for a safe and effective work environment.

In order to evaluate the implementation status and effectiveness of the chemical hygiene plan, laboratory personnel, and laboratory supervisors, the safety officer will conduct annual inspections to review laboratory safety practices and check safety equipment.

Engineering Controls

Whenever possible, substitution of less hazardous chemicals should be used as a primary method of preventing adverse effects due to chemical exposure. Properly exhausted fume hoods, local exhaust ventilation, glove boxes, and other special purpose hoods must be used when there is a likelihood of excessive exposure to air contaminants generated by laboratory activities. Used in conjunction with good laboratory practices, properly designed and operated exhaust ventilation is effective in minimizing air contaminant exposure.

Administrative Controls

Administrative controls are work procedures such as safety policies, rules, supervision, and training in order to reduce the duration, frequency, and severity of exposure to hazardous chemicals. Some administrative controls include, but are not limited to, utilizing granular materials instead of powders, using low pours, avoiding working alone after hours with particularly hazardous substances or procedures.

Personal Protective Equipment

The use of personal protective equipment (PPE) is necessary to supplement both engineering and administrative

controls. The following are some examples of effective PPE:

- Eye and Face Protection: safety glasses, goggles, and face shields
- Protective Clothing: lab coats, aprons, arm covers, and closed-toe shoes
- Respiratory Protection: Tight-fitting facial respirators, cartridge respirators, and self contained breathing apparatus (SCBA)

Training

Training will be provided to all laboratory personnel to ensure that they are aware of the hazards of the chemical present in their laboratory environment. The purpose of information and training is to ensure that all individuals at risk are adequately informed about the work being performed in the laboratory, associated hazards and actions to be taken to protect themselves during normal operations, as well as emergencies.

Responsibilities of the Safety Officer

The Safety Officer is responsible for promoting and maintaining a safe research environment for all research personnel. The safety officer serves as the Chemical Hygiene Officer.

Responsibilities of the Safety Officer include:

- Ensuring that adequate training and resources are available to conduct safety compliance programs in accordance with federal, state, and local regulations.
- Identifying personnel affected by specific compliance requirements.
- Communication compliance program requirements to administration and faculty. ■ Securing facility and administration input for the development and implementation of compliance programs.
- Periodically updating the chemical hygiene plan to ensure compliance with all up to date regulations.
- Assisting laboratory personnel in performing comprehensive risk assessments for laboratory practices and procedures.
- Perform laboratory inspections and audits.
- Assist in hazardous waste disposal procedures and pick-ups.
- Perform accident investigations.
- Provide support in emergency response situations.

Responsibilities of the Principal Investigator

The responsibilities summarized here are based on the requirements provided by OSHA Laboratory Standard as well as other applicable regulatory agencies.

Principal Investigators (PIs) or the Laboratory Director are responsible for the health and safety of all personnel and compliance with all applicable regulations and the criteria established in this manual in their laboratories.

Responsibilities of the Principal Investigator include:

- Ensuring that specific laboratory hazards are effectively communicated to laboratory personnel.
- Ensuring that personnel have received appropriate training and are competent to perform procedures used in the laboratory, including safe laboratory practices, controls and emergency procedures.
- Ensuring laboratory personnel are informed of the signs and symptoms associated with exposures to hazardous chemicals used in their laboratory.
- Developing laboratory-specific standard operating procedures (SOPs) that cover the hazards and activities (both routine activities and unusual events) relevant to the laboratory.
- Ensuring that engineering controls are available, in good working order, and are used appropriately to minimize exposure.
- Ensuring that appropriate personal protective equipment is available and used by laboratory personnel.
- Granting approval, where required, prior to the use of particularly hazardous substances in the laboratory.
- Ensuring that chemical waste is disposed of according to regulations, as outlined in this manual.
- Ensuring that any transportation or shipping of chemical materials are packaged and documented in accordance with regulations.
- Ensuring that laboratory operations are supervised to ensure that the Chemical Hygiene Plan is being followed.
- Ensuring that periodic inspections of the laboratory are conducted with the safety officer and a laboratory representative.
- Maintaining an updated chemical and hazardous material inventory for the laboratory.

Responsibilities of Laboratory Personnel

All laboratory personnel working with chemicals must comply with all applicable regulations and the criteria established in this manual.

Responsibilities of Laboratory Personnel include:

- Reviewing and following relevant laboratory safety manual(s).
- Following oral and written laboratory safety rules, regulations, and standard operating procedures required for the tasks assigned.
- Keeping work areas safe and uncluttered.
- Reviewing and understanding the hazards of materials and processes in their research operations prior to conducting work.
- Using appropriate measures to control identified hazards, including consistent and proper use of engineering controls, personal protective equipment, and administrative controls.
- Understanding the capabilities and limitations of PPE issued to them.
- Obtaining prior approval from the principal investigator for the use of particularly hazardous chemicals.
- Consulting with the principal investigator before using highly hazardous materials or conducting certain higher risk experimental procedures.
- Prompt reporting of spills, accidents, or unsafe conditions to the principal investigator, as well as the safety officer.
- Completing all required health, safety, and environmental training and providing written documentation to their supervisor.
- Participate in applicable Occupational Health programs/medical surveillance, as required.

General Guidelines for Handling Chemicals

The following are general guidelines for handling hazardous chemicals. All personnel handling hazardous chemicals are responsible for knowing and following these general guidelines, as well as any precautions specific to any chemicals with which they are working. Remember, awareness is the most fundamental rule of chemical safety.

- Restrict access to hazardous chemicals to authorized personnel only.
- Store and handle chemicals in accordance with the guidelines contained in this Chemical Hygiene Plan or in accordance with the chemical manufacturer's instructions.
- Prior to use, review the safety and health hazard information of chemicals used in the laboratory.
 - Know the signs and symptoms of overexposure and the physical and sensory characteristics (odor, appearance) of these chemicals.
 - Know what precautions are needed to protect you.
- Know appropriate procedures for emergencies, including the location and operation of all emergency equipment.
- Never use unlabeled chemicals; always label containers even for temporary use.
- Always order the least amount of a chemical; use the smallest amount and lowest concentration needed for the current task.
- Substitute less hazardous chemicals for more hazardous ones, whenever possible.
- Use hazardous chemicals in a chemical fume hood to minimize exposure.
- Wear all recommended PPE when working with hazardous chemicals. Ensure lab coats are buttoned. Ensure gloves selected are appropriate for the chemical.
- When working with hazardous chemicals, have a second person nearby (avoid working alone).
- Avoid leaving experiments unattended, whenever possible.
- Maintain equipment and inspect it regularly for proper function.
- Use a safety shield when there is a possibility for explosion or implosion.
- Store hazardous waste in a closed, labeled container in a designated satellite accumulation center.
- Dispose of hazardous waste as directed in this Chemical Hygiene Plan.
- Do not eat, drink, chew gum, smoke, or apply cosmetics in any laboratory or chemical storage area.
- Do not store food or beverages in the laboratory or in a chemical refrigerator.
- Mouth pipetting is prohibited; mechanical pipetting devices must be used.
- Do not use chipped or cracked glassware.
- Report all accidents, even if they do not result in injury, to the principal investigator and the safety officer immediately.

Chemical Exposure

The hazards of laboratory chemicals can be determined by referring to the labels and SDS information sheets associated with materials handled in the laboratory. In addition to this, the ability to recognize the signs and symptoms of a chemical exposure are vitally important.

In the event of an exposure, seek medical attention immediately:

- Wash skin with soap and water for at least 15 minutes and mucus membranes or eyes with plain water for at least 15 minutes.
 - For Exposures that occur Mon. to Fri 7:30 am – 3:00 pm: Employees from Hackensack Meridian Health campuses go to the Employee Health Center located at 20 Prospect Avenue, Suite 715, Hackensack, NJ (551-996-8663).
 - For after-hours exposure, go immediately to the Hackensack University Medical Center Emergency Room (ER), 30 Prospect Avenue, Hackensack, NJ. Inform staff you are a researcher with biohazard exposure emergency and must be evaluated immediately.
 - For life-threatening emergencies, dial 911.

Signs and symptoms of exposure can include but are not limited to:

- Chemical odors may be present at safe concentrations, but odors may indicate a release. 🚨 Skin displaying unusual signs of distress including drying, whitening, reddening, swelling, blistering, or inflammatory responses.
- Tearing or burning in the area in and around the eyes.
- Headache, dizziness, or coughing.

Laboratory personnel must review the SDS information associated with the chemicals they are using to become familiar with the signs and symptoms of exposure.

Medical attention from employee health should be sought whenever:

- Personnel develop signs or symptoms associated with a hazardous chemical used in the laboratory.
- Exposure monitoring reveals consistent personnel exposure greater than the action level or applicable OSHA exposure limit for a chemical.
- When the use of respiratory equipment is required.
- When medical surveillance requirements for OSHA regulated substances must be met.
- At the discretion of the principal investigator or the safety officer.

When seeking medical attention, exposed or potentially exposed workers must provide the following information:

- Name of chemical compound and the relevant SDS.
- The conditions surrounding the exposure.
- The Signs and symptoms currently being experienced.

Exposure Monitoring

Regular environmental or personnel exposure monitoring of airborne contaminants is not usually warranted or practical in laboratories, since chemicals are typically used for a relatively short period of time and in small or minute quantities. Air monitoring will be conducted if:

- There is reason to believe that exposure levels for a substance routinely exceed either the action level (AL) or the permissible exposure level (PEL) set by OSHA.
- Personnel suspect or report that they have been overexposed to a chemical in the laboratory.
- A particularly hazardous substance is used on a regular basis (several times per week), for an extended period of time (three to four hours at a time) in large quantities. Use of particularly hazardous substances in this manner should be reviewed with the principal investigator and the safety officer before proceeding.

Monitoring will be conducted in accordance with established sample collection and analytical methodology for the chemical exposure being evaluated. If initial monitoring indicates that the worker exposure is above the AL or PEL, the periodic monitoring provisions of the relevant OSHA standard will be met.

Upon receipt, results of personal monitoring will be made available to workers, in writing within 15 days, either individually or by posting in an appropriate location accessible to the affected personnel.

Recordkeeping

Comprehensive records will be maintained pertaining to:

- Medical examination and consultation records will be maintained in an appropriate confidential manner by employee health. These records are to be kept, transferred, and made available for at least the duration of the employee's employment plus 30 years. These records are maintained in accordance with 29 CFR 1910.1020 "Access to Employee Exposure and Medical Records".
- Exposure monitoring records, including any sampling results, SDS, or other chemical –specific information, are to be maintained in the laboratory's files. These records are to be kept, transferred and made available for at least 30 years. These records are also maintained in accordance with 29 CFR 1910.1020. Any exposure monitoring records generated by the safety officer will also be maintained there.
- Training records are maintained by the laboratory, as well as, by the safety officer.
- Laboratory Inspection records are maintained by the laboratory. These records are maintained until the next inspection event occurs. The safety officer also maintains all inspection records.

Chemical Storage and Handling

Laboratory chemicals present many potential hazards. Understanding the properties of the chemicals and taking these properties into account for safe handling practices may minimize hazards. Simply storing chemicals alphabetically is not acceptable and may lead to hazardous conditions. Chemicals that are flammable, corrosive, explosive, or peroxide forming agents require special precautions. Storing incompatible chemicals together may have disastrous results.

The following are general guidelines storage and handling of all chemicals:

Chemical handling:

- Handle chemical containers with care.
- Close caps securely.
- Use bottle carriers to transport liquid chemicals.
- Pour liquid chemicals or scoop solid chemicals carefully.
- Carefully add acid to water, **NOT** water to acid.

Labels:

- Keep chemicals in their original containers as much as possible.
- Label all secondary containers for proper identification.
- Date chemicals upon receipt, especially those that may become unstable over time or develop peroxides.

Storage:

- Storage units and shelves should be made of chemically resistant materials.
- Do not store chemicals on hard to reach shelves.
- Place chemicals so that their labels can be easily read.
- Do not store chemicals under sinks
- Do not store chemicals in hallways

Incompatible chemicals:

- Many chemicals are incompatible and must not be stored together.

Excessive storage:

- Order the smallest amount of needed chemicals.
- Avoid stockpiling unused chemicals.
- Check inventory regularly and dispose of unneeded or outdated chemicals.

Chemical fume hoods:

- Except for chemicals in use, do not store chemicals or solvents in the fume hood.
- Volatile or odiferous compounds need to be stored in a properly ventilated cabinet.

Flammable Liquids

A flammable liquid gives off enough vapors to form an ignitable mixture with air in the presence of an ignition source. The temperature at which this happens is the Flash Point. Flammable liquids have flash points below 100°F per NFPA (National Fire Protection Association), while combustible liquids have flash points below 200°F. OSHA (Occupational Safety and Health Administration) makes no distinction, classifying all liquids with flashpoints under 199.4°F (93°C) as flammable. The Flash Point of a chemical can be found in the SDS.

Storage containers:

- Whenever possible, glass containers should not be used for storing flammable liquids. If a glass container is used, the maximum allowable size is one gallon.
- The maximum allowable capacity of any plastic or regular metal container is 5 gallons.
- Safety cans are the preferred storage container for storage outside a flammable liquid storage cabinet. Safety cans have spring-loaded spout covers that close automatically when released to prevent leakage if tipped over, but can open to relieve internal pressure when subjected to fire. The spout is fitted with a flame arrestor screen to prevent flame propagation into the can—**DO NOT** remove the screen. The maximum allowable size of a safety can is 5 gallons.

Refrigerators/freezers:

- Refrigerators or freezers used for storage of flammable materials must be rated for flammable storage.

Flammable liquid storage cabinets:

- Store flammable liquids in a flammable storage cabinet. A variety of commercially manufactured cabinets are available. All are constructed with features to minimize the risk of fire.

Handling:

- Do not use or store flammable materials in areas that could block exits in the event of a spill or fire.
- Avoid sources of ignition
- During transfer of flammable materials from one container to another, the containers must be properly grounded and bonded to avoid ignition from static electricity.

Incompatibles:

- Store flammable liquids separate from oxidizers, compressed gases, highly toxic materials, corrosives, and water-reactive chemicals.

Oxidizing Agents

An oxidizing agent stimulates the combustion of other materials by readily giving up oxygen. Oxidizers can react violently with reducing agents, metals, and some ordinary combustibles.

Storage:

- Store in well-ventilated areas on fire-resistant shelves
- Store in inert, unbreakable containers
- Do not use rubber or cork stoppers as they are potentially oxidizable substances

Incompatibles:

- Oxidizing agents can initiate combustion and therefore should not be stored in the same area with flammable liquids, organic chemicals, dehydrating agents, or reducing agents.

Peroxidizable Materials

Many organic chemicals including ethers, liquid paraffin, and olefins can form peroxides on exposure to air or light. This may occur even before the container has been opened. Some common laboratory chemicals that may form peroxides upon aging include isopropyl ether, diethyl ether, dioxane, tetrahydrofuran, glyme (ethylene glycol dimethyl ether), and diglyme (diethylene glycol dimethyl ether).

Storage time limit:

- Opened containers should be used up or discarded within 6 months after they are first opened.
- Unopened containers should be stored no more than one year.
- Containers should be dated upon receipt and upon opening the bottle.

Container inspection:

- Containers should be inspected for peroxide formation before opening or moving the containers. If crystals are present around the lip of the container or the liquid appears cloudy, **DO NOT** move or open the container.
- Colorimetric tests are available to test for peroxide formation, including commercially available peroxide test strips.
- Although some ethers contain a peroxide inhibitor, they should still be inspected before opening.

Incompatibilities:

- Store away from oxidizers, reducing agents, and organic substances.

Perchloric Acid

Anhydrous perchloric acid is unstable at room temperature and will ultimately decompose spontaneously with violent explosion. At concentrations above 72% or at elevated temperatures (above 160°C), perchloric acid becomes an exceedingly strong and active oxidizer and dehydrating agent. Below 72% and at ordinary temperatures, perchloric acid behaves as a strong non oxidizing acid.

Handling:

- Perchloric acid should be handled in a fume hood designed for perchloric acid use. **DO NOT** use perchloric acid in a standard chemical fume hood.

Incompatibles:

- Perchloric acid must be stored away from oxidizers and organic materials, including wood, paper, and cloth.

Corrosive Materials

Corrosives are substances that cause rapid destruction of human tissue at the site of contact (skin, eyes, respiratory tract, gastrointestinal tract). Corrosive chemicals typically have a pH >12 or < 2. Common corrosives are acids and bases. Precautions are designed primarily to prevent exposure via inhalation, ingestion and skin contact.

Precautions:

- Work inside of a chemical fume hood
- Practice proper hand washing
- Wear appropriate PPE (personal protective equipment). PPE may include gloves, goggles or splash guard, or protective apron.

Containers:

- Whenever practical, corrosive materials should be purchased and stored in break-proof or break-resistant containers.
- Transport containers of corrosives using a bottle carrier

Storage:

- Store in a cool, dry area, equipped with corrosion-resistant shelves.
- Use of a separate corrosive storage cabinet is preferred.
- Store acids and bases (alkalis) separately.

Toxic Materials

Toxic materials can cause severe illness, poisoning, disease, or death when ingested, inhaled, or absorbed. The category includes carcinogens and reproductive toxins (teratogens, mutagens, etc.) as well as acutely hazardous materials. Toxic materials which are simultaneously hazardous because of another attribute (i.e., flammable, corrosive) should be evaluated to determine which is the most significant hazard and stored accordingly.

Access to these materials should be restricted only to laboratory personnel involved in the experiment. Personnel using toxic materials must be informed of the hazardous properties of the chemical before handling or using the chemical.

Precautions:

- Work inside of a chemical fume hood
- Practice proper hand washing
- Wear appropriate PPE (personal protective equipment). PPE may include gloves, goggles or splash guard, or respirator.

Compressed Gas Cylinders

Compressed gas cylinders present the potential for both mechanical and chemical hazards. The danger of fire or explosion is acute with a high rate of diffusion from open or leaking cylinders of flammable gases. The gas itself may be reactive or toxic. Asphyxiation can be caused by high concentrations of even “harmless” gases such as nitrogen. Finally, the large amount of potential energy resulting from the compression of the gas makes a compressed gas cylinder a potential rocket.

Identification:

- The contents of the cylinder should be clearly marked.
- Gas lines from the cylinder should be labeled as to the gas and the laboratory served.
- A tag should be attached to the cylinder to indicate whether the cylinder is full, in use, or empty.

Handling:

- During transport cylinders should be secured to appropriate handcarts.
- Highly toxic gases should not be moved through corridors in areas where occupants not knowledgeable in the hazards of the gases may be present.
- Cylinder valves should be opened slowly, using a hand wheel or wrench while standing away from the valve opening.
- Compressed Gas Association (CGA) approved valves, fittings, and other connections of the proper configuration for the gas being used, should be employed at all times.

Storage:

- All cylinders, regardless of whether they are full or empty, must be firmly secured at all times, using a clamp and belt or chain.
- Cylinders should be stored in a cool, dry, well-ventilated area free from sources of ignition.
- Chemical oxidizers should be stored at least 20 feet away from flammable gas cylinders.
- A cylinder cap or regulator valve should **always** be in place.

Empty cylinders:

- Cylinder caps should always be used.
- Cylinders should be clearly marked “empty.”
- Empty cylinders should be kept secured as noted above.

Safety Procedures for Particularly Hazardous Substances

Additional protection is required for work with particularly hazardous substances such as carcinogens, reproductive toxins, biological toxins, and substances with a high degree of acute toxicity. Consultation of what materials may fall into this category should be part of a comprehensive risk assessment with the safety officer. When working with these particularly hazardous materials, the following general procedures must be followed:

- Obtain permission from the principal investigator prior to any use of these materials.
- Order the smallest quantity of the chemical necessary to perform the desired procedure.
- Wear appropriate personal protective equipment, paying close attention to permeation resistance of the protective clothing being used.
- Work only in a properly functioning, uncluttered chemical fume hood or other approved ventilation device. This area should be posted or labeled as a “Designated Area” for the use of particularly hazardous materials. Permit only authorized personnel to utilize that designated area.
- Determine, in consultation with the principal investigator and the safety officer to determine whether the exhaust air should be filtered prior to discharge.
- Consult the SDS for exposure and emergency information before beginning work with these materials.
- Label all containers with the contents, date, manufacturer’s name, and the hazardous properties of the container.
- Transfer particularly hazardous chemicals in tightly closed containers placed within a durable outer container.
- Limit all traffic through the immediate area.
- Decontaminate the work surface immediately after working with these materials. To facilitate decontamination, work surfaces may be covered with stainless steel, plastic trays, absorbent material, or other impervious material which may be easily cleaned or disposed of as hazardous material following the procedure.
- Securely store these materials immediately after use.
- Label all waste materials with the corresponding chemical classification prior to disposal transportation.

Personal Protective Equipment

Personal protective equipment (PPE) is used to directly protect personnel from contact with chemicals. Supervisors are responsible for conducting laboratory PPE assessments, providing PPE, and training personnel in the proper use. PPE must not be taken home or worn outside the laboratory.

Appropriate Laboratory PPE should be determined following a thorough risk assessment of the work being performed. For assistance in selecting PPE for work with hazardous chemicals, contact sean.fitzgerald@hackensackmeridian.org.

Recommended Laboratory PPE

- Laboratory outer garments
 - Dedicated long sleeved outer garments, such as lab coats, are used to prevent contamination of the skin and street clothes.
 - A rubber apron may be needed when working with corrosives.
- Gloves
 - Gloves must be worn when working with hazardous chemicals.
 - Double gloving adds further protection when applied appropriately.
 - Nitrile or rubber gloves may be required when working with corrosives.
- Face protection
 - Safety glasses are recommended for all laboratory procedures.
 - Goggles, face shields, or other splatter guards should be used for anticipated splashes or sprays of hazardous chemicals.
 - Face shields must be used when working with liquid nitrogen; goggles are insufficient protection.
- Respiratory protection
 - May be necessary in some cases depending on the materials being used or procedures performed.
 - Personnel who are required to wear respiratory protection must be evaluated by a physician, and trained in respirator selection and usage.

PPE should be provided for visitors, maintenance, and custodial personnel if needed.

Fume Hoods

The laboratory fume hood is one of the most important safety devices in the laboratory.

Use:

- The ventilation system in the laboratory has been carefully balanced to ensure proper airflow and comfortable working conditions.
- To prevent cross drafts, laboratory doors should be kept closed, whenever possible.
- For proper fume exhaust, the hood should not be operated with the sash opened greater than 18”.
- Do not use a fume hood as a chemical storage location.
- Keep hoods clear of clutter for optimum performance.

Maintenance:

- Each fume hood must be certified prior to use and on at least an annual basis.
- An approved certification vendor evaluates laboratory fume hoods.
- During these evaluations, average face velocity of the hood is measured, and the hood containment is evaluated using flow visualization.
 - Hoods passing evaluation are labeled at an 18" sash height with a fume hood inspection sticker indicating the date of evaluation.
 - Hoods failing evaluation are posted with a failure notification form, and the hood operator(s) is informed of the failure. Failed hoods are reported to facilities for service and are reevaluated after service has been completed.

Eyewash Stations

Eyewash stations are required in any lab where there is the potential for eye injury from exposure to hazardous chemicals.

Requirements:

- The eyewash station must be capable of providing a continuous, soft stream of tepid water for at least 15 minutes.

Location:

- Eyewash stations should be located no more than 10 seconds travel time from the hazard (about 55 feet). The location should be marked with a highly visible sign.

Maintenance:

- Eyewash stations should be flushed weekly for 1 minute to assure function and avoid build-up of bacteria. The path to the eyewash station must be free from obstructions.

Use:

- After any eye contact with a chemical, activate the eyewash station and flush eyes for at least 15 minutes.
- If the chemical is alkaline, flush for at least 30 minutes.
- Avoid rinsing the chemical into the uninjured eye.
- If contact lenses are in place, flush for one minute, remove the lenses, and continue flushing.
- After flushing for the appropriate amount of time, seek medical attention at employee health or the nearest emergency room.

Safety Showers

Safety showers are provided where chemicals are handled. The showers provide first aid for chemical splashes.

Requirements:

- Safety showers should provide at least 30 gallons of water per minute.
- The valve should be simple to activate and should remain activated until intentionally shut off. The valve should be within reach, not more than 69 inches above the floor.

Location:

- Safety showers should be in an accessible location no more than 10 seconds travel time or 50 feet from the hazard.
- The location should be marked with a clearly visible sign and, if possible, a large yellow circle should be painted on the floor under the shower.

Maintenance:

- Safety showers should be flushed at least annually, preferably every six months.
- The path to the safety shower must be kept free from obstructions.

Use:

- In case of skin contact with a hazardous chemical, immediately activate the shower and flush the affected area for at least 15 minutes.
- For contact with dry solids, brush the contaminant gently off the skin before using the shower.
- While under the shower, remove clothing and jewelry from the affected area.
- After flushing, seek medical attention immediately at employee health or the nearest emergency room.

Fire Extinguishers

Portable fire extinguishers are necessary to rapidly suppress small fires. Only people trained to use a fire extinguisher should operate one. Never try to fight a fire that is larger than you are.

Types of fires: There are four types of fires, depending on the material that is burning:

- *Class A Fires:* Fires in ordinary combustible materials, such as wood, cloth, paper, and many plastics.
- *Class B Fires:* Fires involving flammable liquids, gases, and greases.
- *Class C Fires:* Fires in energized electrical equipment. When the electrical equipment is de-energized, the fire may continue to burn as a Class A or B fire.
- *Class D Fires:* Fires in combustible metals, such as magnesium, titanium, sodium, zirconium, and potassium.

Types of extinguishers:

- There are several types of fire extinguishers, rated as to the type of fire it can put out. The type of fire the extinguisher is designed to extinguish is printed on the cylinder.
 - Triangle with an “A” denotes Class A
 - Square with a “B” denotes Class B
 - Circle with a “C” denotes Class C
 - Star with a “D” denotes Class D
- Some extinguisher types are rated for multiple types of fires.

Location:

- Fire extinguishers are generally mounted either near an exit or at the back of the laboratory.
- There should be at least one extinguisher in each laboratory.

Maintenance:

- All extinguishers must be inspected annually.
- An inspection tag must be attached to each extinguisher and must indicate the date of the last inspection.

Use:

- Before using a fire extinguisher, **PULL THE ALARM**.
- If the fire is small and you are trained to use a fire extinguisher, choose the correct fire extinguisher by checking the label. Point the nozzle at the base of the flame with a side-to-side motion.
- If the fire becomes larger than you, or the contents of the extinguisher have been discharged and the fire is still burning, evacuate the building closing doors behind you (but do not lock them).

Chemical Waste Management

Hazardous waste regulations require that hazardous waste be accurately identified. Common laboratory chemical waste includes:

- Spent solvents, acids, bases, and oxidizers.
- Unused reagents and other chemicals that are no longer needed, do not meet specifications, are contaminated, have exceeded their storage life, or are unusable in the laboratory.
- Waste oils.
- Other miscellaneous items including broken thermometers, poisons, etc.

Regulations require that hazardous waste be accumulated and stored in properly managed containers on sufficiently impervious surfaces.

Hazardous waste in laboratories is stored in satellite accumulation areas.

Once a satellite accumulation area container is filled, it must be dated and transferred to a main accumulation area or shipped off-site within three days. Disposal of hazardous wastes and chemicals in laboratory sinks is prohibited by regulation.

Containers that accumulate and store hazardous waste must be labeled with the following information:

- The words “Hazardous Waste”
- The waste type in words (waste oils, spent solvents, etc.)
- The associated hazard in words (toxic, flammable, acid, etc.)
- The date upon which the container became filled
- The safety department may be able to provide labels or a proper vendor to procure them.

Containers must be:

- Labeled and situated so that labels are clearly visible.
- Closed at all times, unless waste is being added or removed. Open-top funnels may not be left in open containers.
- In good condition. There may not be severe rusting, dents, or other conditions that could cause leaks or other potentially hazardous issues.
- Compatible with hazardous waste stored within them. When in doubt, use the original shipping container.
- Inspected weekly by laboratory personnel to ensure that they are properly labeled, in good condition, and meet all of the criteria listed above.

Waste Minimization

Laboratory waste minimization must include:

- Process and equipment adjustment or modification
- Toxic material substitution
- Waste segregation and separation
- Recycling

The process of waste minimization will ensure that excess chemicals do not become subject to disposal as hazardous waste.