**CHEMICAL HYGIENE PROGRAM**

**Prepared for:**

**(INSERT YOUR AGENCY HERE)**

Reviewed by (print name): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_

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*This program can be developed for a municipality, a utility or housing authority, or a department. NJPEOSH does not specify how the program must be organized. It is the employer’s decision how to best organize the Program: city-wide, for the authority as a whole, or by department.*

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# PURPOSE

The **INSERT AGENCY’S NAME** will implement policies and programs to keep exposures to hazardous chemicals in the laboratory at the lowest practical levels and below the Permissible Exposure Limits (29 CFR 1910.1000 Subpart Z) established by the Occupational Safety and Health Administration (OSHA).

The **INSERT AGENCY’S NAME** Chemical Hygiene Plan (CHP) addresses the requirements of PEOSH/OSHA 29 CFR 1910.1450 Occupational Exposures to Hazardous Chemicals in Laboratories; all laboratories that use chemicals are covered by this Standard. The CHP also addresses the requirements of 29 CFR 1910.1200 Hazard Communication and the New Jersey Worker and Community Right to Know Act Regulations N.J.A.C. 8:59.

The purpose of the **INSERT AGENCY’S NAME** Chemical Hygiene Plan (CHP) is to provide chemical safety information and to establish work practices and procedures that protect workers at the **INSERT AGENCY’S NAME** and provide a safe and healthy environment to protect from health hazards associated with hazardous chemicals. **INSERT AGENCY’S NAME** has **INSERT NUMBER** laboratories. The laboratories are located:

* **INSERT LABORATORY LOCATION #1**
* **INSERT LABORATORY LOCATION #2**
* **INSERT LABORATORY LOCATION #3**
* **INSERT LABORATORY LOCATION #4**
* **INSERT LABORATORY LOCATION #5**

All laboratories and their employees must be familiar with and follow all the requirements in this plan. This guide will be reviewed annually and updated as needed by the Chemical Hygiene Officer (CHO). This guide must be readily available to all laboratory employees.

# RESPONSIBILITIES

**Every person in the laboratory is responsible for chemical hygiene, from the Laboratory Manager to the people who conduct day-to-day operations.**

Chemical Hygiene Officer / Laboratory Manager: *The Laboratory Manager also holds the roles and responsibilities of the Chemical Hygiene Officer (CHO).*

* Responsible for implementing the chemical hygiene plan (CHP).
* Maintain an up-to-date copy of the **INSERT AGENCY’S NAME** *Chemical Hygiene Plan* and ensure that laboratory workers comply with the Plan.
* Continually seek ways to improve the Plan.
* Work with management and other employees to implement appropriate chemical hygiene policies and practices.
* Determine levels of protective apparel and equipment required for the laboratory.
* Ensure that protective and emergency equipment is available and in working order, and that appropriate training has been provided.
* Enforce the use of safety procedures including any necessary personal protective equipment.
* Train or arrange for training of laboratory workers on an annual basis and maintain records documenting the training.
* Gather and maintain manufacturer's Safety Data Sheets (SDSs) for materials used in the laboratories.
* Provide regular, formal chemical hygiene and housekeeping inspections, including routine inspections of emergency and safety equipment (such as fume hoods, eyewash stations, safety showers, chemical containers, etc.).
* Monitor procurement of new chemicals and collection and disposal of chemical wastes.
* Ensure that facilities and training are adequate for use of any material being ordered.
* Ensure that proper signs and labels are provided, used, and legible.
* Conduct health exposure assessments when laboratory operations change.
* Monitor chemical inventory for particularly hazardous chemicals.

Safety Officer:

* Provide technical oversight and support for safety and health programs.
* Provide support for the CHP and laboratory safety including the following:
  + Conduct regular observations of the laboratory operations, identify concerns or areas for improvement, and address any concerns with the CHO and laboratory staff.
  + Assist with technical issues including a selection of personal protective equipment and review of new chemicals or lab processes.

Laboratory Worker(s): *This includes operators that conduct laboratory analyses* ***(pH, chlorine, DO, nitrate, ammonia, etc.)***

* Plan and conduct operations in compliance with this CHP.
* Develop good personal chemical hygiene habits.
* Follow all health and safety procedures.
* Report all hazardous conditions to the laboratory manager/CHO.
* Wear or use prescribed personal protective equipment (PPE).
* Report any job-related injuries or illnesses to the laboratory manager/CHO immediately.
* Request information or training when unsure about how to handle a hazardous chemical.
* Attend CHP training and other laboratory safety training classes.

# training

### Initial Training

All **INSERT AGENCY’S NAME** employees who work with hazardous chemicals must be apprised of the hazards of chemicals present in their work area and the proper use of emergency equipment and procedures. **This training must be provided before the initial assignment and before new exposure situations.** Personal protective equipment (PPE) necessary for the safe handling of hazardous substances must also be provided.

Employees who work with chemicals in the laboratory must be trained on the PEOSH Laboratory Standard. Employees who work with chemicals in places other than the laboratory must be trained under the Hazard Communication (Worker Right-to-Know) program.

The initial training session shall include the following topics:

* Understanding the responsibilities and rights under the PEOSH laboratory standard.
* The location and contents of this CHP.
* The physical and health hazards of chemicals routinely used in the laboratory.
* Chemical Segregation.
* Signs and symptoms associated with those chemicals.
* Methods that may be used to observe releases of those chemicals.
* Measures employees may take to protect themselves from those releases.
* Proper labeling of secondary containers and prepared chemical solutions.
* First Aid and Emergency Procedures.
* PPE that is required for laboratory procedures.
* The location and contents of **INSERT AGENCY’S NAME** Safety Data Sheet (SDS) file.
* Availability to medical consultation and medical examination

### Refresher Training

The frequency for refresher training for employees trained under the PEOSH Laboratory Standard is left to the discretion of the employer; **INSERT AGENCY’S NAME** will conduct CHP refresher training **INSERT FREQUENCY (ANNUAL, EVERY TWO YEARS, EVERY THREE YEARS, ETC.)** . Training sessions will vary, depending on the information that needs to be covered. Such situations include the use of new chemicals, greater quantities of chemicals, prior incidents, new/different procedures, or experiences from laboratory personnel. Additional training is required when new exposure situations arise. The Chemical Hygiene Officer (CHO) will insure that information pertinent to ensuring a safe laboratory operation is updated regularly and is made available to all members of the laboratory staff.

# CHEMICAL SAFETY

### Overview of the Chemical Safety

Priorities of Chemical Safety are as follows:

* Develop chemical safety programs that protect the health and well-being of employees and visitors at the **INSERT AGENCY’S NAME**.
* Develop programs to minimize chemical hazards and chemical wastes.
* Guide the safe handling, storage, and disposal of chemicals.
* Dispose of chemical wastes in an environmentally sound and cost-effective manner.

### Basic chemical safety practices

The following five steps are fundamental to using chemicals safely. More detailed information on these and other safety practices can be found in subsequent chapters of this Chemical Hygiene Plan.

* Develop and follow a written safety plan: If you work in a laboratory, this would be a chemical hygiene plan; in other work areas, this would be a hazard communication plan.
* Know where the Safety Data Sheets (SDSs) and other information sources for the chemicals you work with can be found. Knowing the hazards of the chemicals you work with is fundamental to working with chemicals safely.
* Make sure all your chemical containers are labeled. Each container must be labeled with the chemical name(s) and hazard warning(s). See the SOP below for labeling information and additional requirements.
* Maintain good housekeeping. Good housekeeping is the most important step one can take to improve safety.
* Document training of employees. Train new employees on Hazard Communication or the PEOSH Laboratory Standard, as appropriate. Provide refresher training annually or when new procedures are implemented. Document all training.

# STANDARD OPERATING PROCEDURES

This document represents a minimum set of guidelines for the handling of toxic chemicals at the **INSERT AGENCY’S NAME**. Laboratory workers must know and follow the rules and procedures in this CHP. Workers should always be alert to unsafe conditions and actions and make sure any such conditions are corrected immediately. Any accident can be dangerous. All personnel involved should think, act, and encourage safety so that it becomes a habit.

Unusual conditions may require special rules. The Laboratory Manager/CHO has the responsibility for determining whether work requires increased safety precautions. Everyone must learn to work with and to accept responsibility for the safe and appropriate use of hazardous substances. Workers must be aware of possible hazards and seek information and advice before starting any new or unfamiliar procedure.

### General Procedures

Respect and understand the safety and health hazards associated with the chemicals and equipment you use, and practice the following general safety guidelines at **ALL** times:

**Minimize Exposure to Chemical, Biological, and Physical Hazards**

* Obtain information concerning safe handling practices for chemicals from the SDS and consult with the Chemical Hygiene Officer before handling them.
* Avoid skin contact with chemicals, samples, or other materials that were in contact with chemicals or samples.
* Minimize chemical vapors or dust entering the general laboratory atmosphere.
* Avoid unnecessary exposure to chemicals by any route.
* Do not taste or smell chemicals. Do not use mouth suction to pipette chemicals or to start a siphon. A pipette bulb should be used to create a vacuum.
* Do not perform any unauthorized experiments.
* Wear appropriate PPE at all times, including but not limited to a laboratory coat or uniform, gloves, and safety glasses.
* Inspect gloves before each use for discoloration, punctures, and tears. Glove materials will eventually be permeated by chemicals. Dispose of gloves that become contaminated. Never use damaged gloves. Remove and dispose of gloves when exiting the laboratory.
* Food, drinking, smoking, and the use of tobacco are prohibited in the laboratories and at field sampling locations.
* All chemicals and samples must be stored in cabinets in closed containers. In the event chemicals or samples cannot be capped, they should be stored in ventilated cabinets or under a hood. The hood should never be used for long-term storage unless approved by the Chemical Hygiene Officer.
* Horseplay. Practical jokes or other behavior that might confuse, startle or distract another worker is forbidden.
* Cell Phone Use. Cell phone use in the laboratory is prohibited. This is hazardous as it poses the risk of distraction in laboratory tasks as well as the risk of cross-contamination from the work area.
* Unattended Operations. Except for the drying ovens and incubators, there should be no unattended overnight laboratory operations.
* Working Alone. Working alone in the laboratory is permitted under controlled conditions with the approval of the CHO or the Laboratory Manager. Employees shall not work alone in the laboratory or chemical storage area when performing a task considered “unusually hazardous” by the Laboratory Manager.
* Proper lifting techniques (lifting with the legs, not the back) shall be followed.
* Children and other unauthorized persons should not be in laboratories where hazardous materials or hazardous equipment are being used.
* Equipment. Use proper equipment that is in good condition. For example, never use chipped or cracked glassware. Shield pressurized or vacuum apparatus and safeguard against bumping or overheating.
* Disposal of chemicals. Requests for the collection of chemical waste must be submitted in writing and collected by an outside party.
* Glass tubing. When inserting tubing into stoppers, lubricate tubing and wear cut-resistant gloves to protect hands from being cut in the event of the tubing slipping and breaking.
* Report all injuries, accidents, and incidents.

**Ventilation**

* Ventilation is among the best ways to prevent exposure to airborne substances and to control their escape into the working environment. Laboratory apparatus that may discharge toxic vapors must be vented to a local exhaust system. Refer to Fume Hood section below.

**Glassware**

* Glassware should be used only for its designated purpose and should be handled, stored, and labeled with care to avoid damage or breakage.
* Any damaged glass items (broken, chipped, scratched) should be repaired or discarded.
* Disposable and broken glassware should be segregated from other laboratory trash. Disposable and broken glassware must be disposed of in a sturdy container that is segregated for broken glassware. Broken glassware containers are available in all laboratories.
* Do not handle broken glass with bare hands or improper gloves (nitrile, latex, etc.). Use forceps, tongs, scoops, or other mechanical devices for removing or retrieving broken glass. Cut-resistant gloves are also used when handling broken glassware. Use a dustpan and brush to clean up small pieces of broken glass.
* Use care in making rubber to glass connections. Lubricate tubing with glycerin or water before inserting into rubber stoppers or rubber tubing. Cut-resistant gloves must be worn when making such connections.

**Fire extinguishers**

* All trained laboratory personnel are responsible for knowing the location, operation, and limitations of the fire extinguishers.
* Classes of Fire:
  + **Class A**- Normal combustibles such as wood, cloth, paper, rubber, and plastics.
  + **Class B**- Flammable and combustible liquids, oils, greases, tars, oil-based paints, lacquers, and flammable gases.
  + **Class C**- Energized electrical source.
  + **Class D**- Combustible metals, such as magnesium, titanium, zirconium, and sodium.
* **INSERT AGENCY’S NAME** has the appropriate rated fire extinguisher in all laboratories. These are capable of extinguishing the appropriate class of fire.
* Fire extinguishers shall never be blocked by storage or concealed from view.
* The Laboratory Manager/CHO and Safety Officer must be informed of the use of a fire extinguisher or an extinguisher having a pressure gauge indicating low pressure.
* Fire extinguishers must be available, charged, and hung in a location that is immediately accessible. There should be no obstructions that might inhibit the use of this equipment.
* Make sure that all extinguishers are checked monthly. Each extinguisher should have a tag indicating the date it was last checked.

**Housekeeping**

* Exits, aisles, safety equipment, and utility controls must NOT be obstructed in any way with equipment, furniture, or other items.
* Keep the work area clean and uncluttered. The lab should be cleaned at the end of an operation and/or at the end of each day. This will prevent cross-contamination of what work was done before and what work will be done later.
* Work areas and floors are not to be used for excessive storage. Doors that are not in use but are accessible from a corridor or adjacent room should be appropriately labeled if they are blocked on the interior of the room.
* Reagents and other items should be returned to their proper place after each use.
* Chemicals, especially liquids, should never be stored on the floor, except in closed-door cabinets suitable for the material to be stored.
* Stairways and hallways are not to be used as storage areas.
* Disinfect counter tops and equipment often.
* Make sure that the floors are dry. If any spillage occurs, clean it up immediately and dispose of it properly. Utilize a Caution: Wet Floor sign if necessary. In case of breakage, clean up the break immediately and place the shards in the proper container. Also, notify coworkers that there was a break and to be careful of any glass particles at or around the break-in case, not all the shards were cleaned up.
* All chemicals and equipment must be properly labeled and stored.

**Hygiene**

* Do not eat, drink, smoke, chew gum, or apply cosmetics where chemicals and samples are present.
* Wash hands frequently throughout the day. Wash hands before and after doing any laboratory activities, before and after using sanitary facilities, before eating, drinking, smoking, or applying cosmetics, after being in areas where chemicals are used or biological contamination is present, before putting on gloves, after glove removal. Always wash well before leaving the laboratory area. **Washing hands is extremely important when working in the lab. Be sure to wash your hands at the end of the day before going home.**
* If away from the lab and must use gloves, waterless hand sanitizers will suffice.
* Food or beverages may not be stored in laboratory refrigerators, nor should they be handled or eaten in laboratory areas.
* Confine long hair and loose clothing or jewelry to prevent it from contacting chemicals or samples.
* Remove rings and watches as they may be damaged by chemical contact or they may trap chemicals against the skin.

**Electrical**

* Outlet plugs should not be bent or damaged.
* When removing the plug from the electrical outlet, do not pull on the electrical cord. Firmly grasp the end of the plug and pull the plug directly out of the outlet. Do not remove plugs with wet hands.
* Damaged, torn, or cracked cords and electrical failures or evidence of overheating should immediately be reported to your supervisor.
* Locate electrical equipment to minimize the possibility of spills onto the equipment or flammable vapors carried into it. If water or any chemical is spilled on electrical equipment, shut off the power immediately at the main switch or circuit breaker and unplug the apparatus using insulated rubber gloves.
* Access to electrical equipment (e.g. plugs, switches, and electrical panels) should be maintained free from obstructions to allow immediate access in an emergency.
* All circuit breakers, fuses, and electrical panels must be labeled to indicate what appliances, rooms, outlets, switches, and/or power disconnects are served.
* All receptacle outlets in laboratory spaces should be the polarized grounding type. Ground Fault Circuit Interrupters (GFCI's) should be used in those locations involving wet processes or outdoor work, including electrical outlets within six feet of sinks. All electrical hand tools used inside laboratories should be grounded or double insulated.
* All electrical extension cords used should be visible and inspected periodically for damage and/or defects. Cords should not run in aisles or corridors where they might be damaged or create a tripping hazard.
* Cords should not be run through doors, walls, or partitions, under rugs, or above dropped ceilings. They should not be wrapped around fixtures, tied in knots, or draped over pipes, lights, or ventilation ductwork.
* Extension cords should not be used as a substitution for fixed receptacle outlets. Cords used for 110-120 volt service should be UL listed standard heavy-duty three-wire equipped with a polarized three-prong plug. Two-wire type extension cords should not be used.
* Multi-outlet plugs shall not be used unless they have a built-in circuit breaker.
* The most commonly used electrical equipment in the laboratory will be hot plates and or hot plates with magnetic stirring motors. When hot plates with magnetic stirrers are used, remember that the appearance of the ceramic plate does not change, whether it is cold or hot. Always carefully move the plate by grasping the bottom of the apparatus. Before turning the hot plate on, ensure that the cord is not in contact with the ceramic top of the hot plate.
* Hot plates should be used in a hood especially when you are heating organic solvents so that the vapors are removed.
* Be sure to confirm that the hot plate is OFF and unplugged before you leave the laboratory.

**Thermometers**

* All laboratory thermometers are filled with mercury-free liquids such as spirit-filled thermometers and/or alcohol-based thermometers. When these are broken, there are no hazardous material disposal issues.
* A common issue with the spirit or organically filled thermometers is the separation of the liquid column. When this occurs, thermometers may be carefully heated over an open flame to bring the column together. Only the Laboratory Manager is permitted to do so. If separation is observed in a thermometer, inform the Laboratory Manager of the issue.

# Physical and Health Hazards

## Introduction

The hazards of chemicals vary widely and appropriate caution must always be used. Every chemical can be hazardous in certain circumstances. An understanding of the hazards of chemicals and how they enter the body can help those working with chemicals devise procedures to work with them safely.

This chapter presents information on the physical and health hazards associated with chemicals, routes of exposures, factors affecting toxicity, and general measures that can be taken to control chemical exposures.

### Physical Hazards

*The U.S. Occupational Safety and Health Administration (OSHA) defines a chemical presenting a physical hazard as “a chemical that is classified as posing one of the following hazardous effects: explosive; flammable (gases, aerosols, liquids, or solids); oxidizer (liquid, solid, or gas); self-reactive; pyrophoric (gas, liquid, or solid); self-heating; organic peroxide; corrosive to metal; gas under pressure; in contact with water emits flammable gas; or combustible dust.”*

The following terms are frequently used when describing the physical hazards associated with chemicals:

**Combustible liquid:** Any liquid, or mixture with 1% or more of a liquid, with a flashpoint above 140° F. but below 200° F.

**Compressed gas:** A gas or gas mixture with an absolute pressure exceeding 40 p.s.i. at 70° F, or exceeding 104 p.s.i. at 130° F, or a liquid having a vapor pressure exceeding 40 p.s.i. at 100° F as determined by ASTM D-232-72, a standard of the American Society of Testing and Materials.

**Explosive:** A chemical that causes a sudden, almost instantaneous release of gas, pressure, and heat when subjected to sudden shock, high temperature, or pressure.

**Flammable:**

* *Aerosol:* A material that can produce a flame or flashback from a valve opening.
* *Gas:* Any gas at ambient conditions that will cause a flammable mixture with air in concentrations of 13% or less.
* *Liquid:* Any liquid, or mixture with 1% or more of a liquid, with a flash point below 141° F.
* *Solid:* A material that is liable to cause fire through friction, contact with moisture, spontaneous reaction, or retained heat, or which can be readily ignited and burns with enough persistence or violence to cause a serious health hazard.

**Organic peroxides:** An organic compound with a bivalent O-O structure, which may be considered a peroxide derivative with one or both of the hydrogen atoms replaced with an organic molecule. They present dangerous fire and explosion risks; many are strong oxidizers.

**Oxidizer:** A chemical that initiates or supports the combustion of other materials, causing a fire by itself or by the release of oxygen or other gasses.

**Pyrophoric:** A material that will ignite spontaneously in air at or below 130° F.

**Unstable:** Any material that will vigorously decompose, polymerize, condense, or will become self-reactive when exposed to conditions of shock, pressure, or temperature.

**Water-reactive:** A material that can react with water or steam to produce a gas that is either toxic or flammable.

### Health Hazards

*OSHA defines a chemical presenting a health hazard as “a chemical that is classified as posing one of the following hazardous effects: acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenicity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); or aspiration hazard.”*

**Carcinogen:** A material that causes or potentially causes cancer according to the International Research on Cancer or is listed as such in the National Toxicity Program Annual Report on Carcinogens. Carcinogens are chronically toxic substances; they cause damage after repeated or long-duration exposure, and their effects may become evident only after a long latency period.

**Corrosives:** Corrosive substances are those that cause the destruction of living tissue by chemical action at the site of contact and are solids, liquids, or gases. Corrosive effects occur not only on the skin and eyes but also in the respiratory tract and, in the case of ingestion, in the gastrointestinal tract. Corrosive liquids are especially dangerous because their effect on tissue is rapid. Sulfuric acid, nitric acid, hydrochloric acid, aqueous sodium hydroxide solution, and hydrogen peroxide are examples. Corrosive gases are also frequently encountered. Gases such as chlorine and ammonia damage the lining of the lungs. Examples of common corrosive solids include sodium hydroxide and phosphorus. If dust from corrosive solids is inhaled, it causes serious damage to the respiratory tract. *The EPA defines a liquid as corrosive if its pH is less than 2 or greater than 12.5.*

**Irritants:** Chemicals that are not corrosive, but which cause reversible inflammatory effects on living tissue at the site of contact. A wide variety of organic and inorganic chemicals are irritants- skin and eye contact with all reagent chemicals in the laboratory should be minimized.

**Mutagen:** A material that damages chromosomes.

**Sensitizer:** A chemical that will cause an allergic reaction in a substantial number of exposed people.

**Target organ effects:**

* *Cutaneous hazards:* damage the skin
* *Eye hazards:* damage the eye
* *Hematopoietic toxins:* damage the blood and/or blood-forming organs
* *Hepatotoxic:* damage the liver
* *Nephrotoxic:* damage the kidneys
* *Neurotoxins:* damage the nervous system
* *Pulmonary toxins:* damage the lungs
* *Reproductive toxins:* affect the fetus

**Teratogen:** A material that causes birth defects.

**Toxic:** A chemical with an oral lethal dose of 50-500 mg/kg, a cutaneous lethal dose of 200-1000 mg/kg, or a lethal concentration in air of 200-2000 ppm.

**Highly toxic:** A material with an oral lethal dose of < 50 mg/kg, a cutaneous lethal dose of < 200 mg/kg, or lethal concentration in air at < 200 ppm.

### Factors Affecting Toxicity

All chemicals are hazardous under some conditions. An understanding of the factors that affect toxicity helps devise safe procedures to prevent hazardous exposures. Some of these factors are briefly discussed below:

**Dose:** Perhaps the single most significant factor of concern is the amount of exposure to the chemical. Exposure to a large amount of the chemical is usually of more concern than exposure to a small amount. For most chemicals, there is a level of exposure below which no adverse effects are likely to be observed.

**Toxicity:** Chemicals vary widely in how toxic (poisonous) they are. Exposure to small amounts of highly toxic chemicals can be a greater danger than exposure to large amounts of less toxic chemicals. Toxic effects of chemicals occur after single (acute), intermittent (repeated), or long-term repeated (chronic) exposure. An acutely toxic substance causes damage as the result of a single short-duration exposure. A chronically toxic substance causes damage after repeated or long-duration exposure or causes damage that becomes evident only after a long latency period.

**Duration and frequency:** In general, the longer the duration of exposure, the greater the opportunity for toxic effects to occur. The frequency of exposure also has an important influence on the nature and extent of toxicity. The total amount of a chemical required to produce a toxic effect is generally less for a single exposure than for intermittent or repeated exposures because many chemicals are eliminated from the body over time. After all, injuries are often repaired, and because tissues may adapt in response to repeated low-dose exposures.

**Synergistic effects:** Many situations involve exposure to two or more chemicals at the same time. When this happens, the combined exposures may be more hazardous than what one might expect from simply adding the two effects together. While the information on exposures to a single chemical is often available, good information on the possible toxic effects of chemical mixtures is often not available.

**Individual characteristics:** Each person is unique. While there are many similarities in response to chemical exposures, responses may vary dramatically among individuals. Special concern is often given to women who are pregnant. Some individuals are allergic or hypersensitive to certain chemicals.

**Acute vs. chronic effects:** Acute effects are those that show up immediately after a chemical exposure occurs. A good example of an acute effect is the spillage of acid on the skin--a chemical burn will occur immediately. Chronic effects are those that occur after a significant amount of time passes and usually are the result of multiple exposures over some time. Cancer is a typical example of a chronic effect because cancers caused by chemical exposures often do not show up until 20 or more years after the initial exposure.

### Routes of Exposure

There are three major routes of entry for a chemical to enter the body: inhalation, direct contact (to skin and eyes), and ingestion. An injection is a fourth, though much less common, route of entry for chemicals. An understanding of these routes of entry enables one to develop procedures or controls to prevent hazardous exposures to chemicals.

**Inhalation hazards:** Inhalation of chemicals is the most common route of entry a chemical can take to enter the body. Inhalation of the chemical will be absorbed in the blood vessels of the lungs. Always utilize the fume hoods to prevent inhalation of hazardous chemicals. A proper mask or another breathing apparatus can be used to cover the nose and mouth, if needed, to prevent the inhalation of dangerous chemical vapors or dust. Currently, no laboratory procedure warrants a mask. Chemicals that could be inhaled include:

* Gases
* Vapors of volatile liquids
* Mists and sprays of both volatile and nonvolatile liquid substances
* Solid chemicals in the form of particles, fibers, and dust.

**Direct (skin/eye) contact hazards (Absorption):** Many chemicals (ex. corrosives) can injure the skin directly, while others may cause irritation or an allergic reaction. In addition to causing local toxic effects, many chemicals may be absorbed through the skin and/or eyes in sufficient quantity to cause systemic effects. The main avenues by which chemicals enter the body through the skin are hair follicles, sebaceous glands, sweat glands, and cuts or abrasions of the skin. Direct contact effects and absorption of chemicals through the skin depend on several factors including:

* Chemical concentration
* Chemical reactivity
* Solubility of the chemical in fat and water
* Condition of the skin
* Duration of contact

**Ingestion hazards:** Ingestion of chemicals is a less common route of entry into the body. However, persons using chemicals can easily ingest chemicals into the body via contaminated hands if they are not washed before eating, drinking, smoking, applying cosmetics, or sticking part of the hand or a writing tool that has come contaminated into the mouth.

**Injection hazards:** This route is the least likely for chemical exposures. Accidental injection of chemicals through needles is unlikely. However, if needles are contaminated or contaminated glassware breaks, there is the possibility of injecting chemicals into the body. Injections can also occur through high-pressure streams of liquids or gases. Use the proper hand protection to avoid this potential problem.

# PARTICULARLY HAZARDOUS SUBSTANCES

Special provisions for select carcinogens, reproductive toxins, and acutely toxic chemicals

PEOSH requires that certain chemicals be identified as particularly hazardous substances.

In addition to the general safety guidelines mentioned in the plan, special precautions are needed when handling carcinogens, reproductive toxins, and chemicals with a high degree of acute toxicity. The laboratory manager should ensure that these and other precautions designed to minimize the risk of exposure to these substances are taken. The following are minimum guidelines:

* Work with carcinogens, reproductive toxins, hazardous and acutely toxic chemicals should be performed in the presence of a coworker within a functioning fume hood or other system designed to minimize exposure to these substances. In all cases, work with these types of chemicals should be done in such a manner that the Occupational Safety and Health Administration's (OSHA) permissible exposure limits or similar standards are not exceeded.

Particularly hazardous substances are defined as select carcinogens, reproductive toxins, and substances which have a high degree of acute toxicity. Quantities of these chemicals used and stored in the laboratory should be minimized, as should their concentrations in solution or mixtures.

Emergency response planning for releases or spills is prepared by the Laboratory Manager/CHO and included in the training of the laboratory workers and others who may be affected in the building. Refer to the Emergency Procedures section.

Minimize any release or exposure to carcinogens and reproductive toxins. The exposure potential is very low, with accidental ingestion from hand contact and poor hygiene practices being the primary route of exposure. The use of gloves and hand washing should effectively minimize the potential for ingestion and the use of fume hoods should minimize the potential for inhalation.

***Select Carcinogen:*** A select carcinogen is defined in the OSHA Laboratory Standard as a substance that meets one of the following criteria:

* 1. It is regulated by OSHA as a carcinogen; or
  2. It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP); or
  3. It is listed under Group 1 ("carcinogenic to humans") by the International Agency for Research on Cancer Monographs (IARC); or
  4. It is listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP.

*[Reference: NJ Right-to-Know Hazardous Substance List]*

***Reproductive Toxins:*** Reproductive toxicity includes adverse effects on sexual function and fertility in adult males and females, as well as developmental toxicity in offspring.

*[Reference: NJ Right-to-Know Hazardous Substance List]*

**Highly Toxic:**

* Oral LD50\* (< 50 mg/kg)
* Dermal LD50 (< 200 mg/kg)
* Inhalation LC50\*\* (< 200 ppm) gases, vapors
* Inhalation LC50 (< 2 mg/L) mists, fumes or dust

\*LD50 - A standard measurement of acute toxicity that is stated in milligrams (mg) of chemical per kilogram (kg) of body weight. An LD50 represents the individual dose required to kill 50 percent of a population of test animals.

\*\*LC50 - The concentrations of the chemical in the air that kills 50% of the test animals during the observation period, which is usually 4 hours.

**INSERT AGENCY’S NAME** **Particularly Hazardous Substances**

| **Chemical** | **Hazard Class** | **Routes of Exposure** | **Controls** |
| --- | --- | --- | --- |
| **Nitric Acid** | Acute Toxicity | Inhalation  Ingestion  Skin/Eye Contact | Dilution  Small Quantities  Ventilation  PPE |
| **Sulfuric Acid** | Acute Toxicity  Carcinogen | Inhalation  Ingestion  Skin/Eye Contact | Dilution  Small Quantities  Ventilation  PPE |
| **Cadmium** | Acute Toxicity  Carcinogen | Inhalation (fatal)  Ingestion (toxic)  Eye Contact | Ventilation  Small Quantities  PPE |
| **Chloroform** | Acute Toxicity  Carcinogen | Inhalation (harmful)  Ingestion (harmful)  Skin/Eye Contact | Ventilation  Small Quantities  PPE |

**Wear proper PPE when handling these chemicals. Refer to and continually review the SDSs associated with the above chemicals considered “particularly hazardous substances.”**

Sulfuric Acid (Stored in **LOCATION** laboratory):

* Concentrated sulfuric acid is a very strong dehydrating agent (able to remove water) and all but very dilute solutions can be oxidizing. Sulfuric acid reacts violently with strong alkaline substances and is incompatible with water, strong oxidizers, strong reducers, metals, and cyanides.
* **Hazard Statement**- Sulfuric acid can be corrosive to metals, causes severe skin burns and eye damage, may cause respiratory irritation, may cause cancer if inhaled and is harmful to aquatic life.
* **Symptoms**- Sulfuric acid is corrosive to skin and eyes.
* If exposed to sulfuric acid, get medical advice/attention. Immediately call a poison center/doctor. If swallowed, rinse your mouth; do not induce vomiting. If on the skin, take off immediately all contaminated clothing. Rinse skin with water or use a safety shower and flush for at least 15 minutes. If in the eyes, rinse with water for at least 15 minutes at the eyewash station. Remove contact lenses, if present and easy to do. If inhaled, remove the person to fresh air and keep comfortable breathing.

Nitric Acid (Stored in **LOCATION** laboratory):

* Nitric acid is used in the laboratory for preservation and has a high degree of acute toxicity. Nitric acid fumes are highly toxic.
* **Hazard Statement**- Nitric acid can be corrosive to metals, can cause severe skin burns and eye damage, and can cause respiratory irritation. Nitric acid is also a strong oxidizer and can intensify fire.
* **Symptoms**- Nitric acid causes severe skin burns and eye damage, causes digestive tract burns, and spray mists may cause respiratory tract irritation.
* Nitric Acid generally reacts more rapidly than sulfuric acid does. If dilute nitric acid gets on the skin and is not washed off completely, it causes the exposed skin to become yellowish brown as a protein-denaturing reaction occurs. Using small quantities of nitric acid, ventilation, proper PPE, and adhering to lab procedures should effectively control exposure to nitric acid.
* If exposed to nitric acid, get medical advice/attention. Immediately call a poison center/doctor. If swallowed, rinse your mouth; do not induce vomiting. If on the skin, take off immediately all contaminated clothing. Rinse skin with water or use a safety shower and flush for at least 15 minutes. If in the eyes, rinse with water for at least 15 minutes at the eyewash station. Remove contact lenses, if present and easy to do. If inhaled, remove the person to fresh air and keep comfortable breathing.

Cadmium (Stored in **LOCATION** laboratory):

* **Hazard statement**: Toxic if swallowed. Fatal if inhaled. Suspected of causing genetic defects. May cause cancer. Suspected of damaging fertility or the unborn child. Causes damage to organs through prolonged or repeated exposure. Very toxic to aquatic life. Very toxic to aquatic life with long-lasting effects.
* Avoid moisture. Incompatible materials include acids and strong oxidizing agents.
* If swallowed, immediately call a poison center or doctor. Rinse mouth. Do not induce vomiting without advice from the poison control center. If inhaled, remove the person to fresh air and keep comfortable breathing. If eye or skin contact occurs, rinse with water for at least 15 minutes; utilize the eyewash station or safety shower if needed. Seek medical attention if irritation develops and persists.
* **Symptoms**- Headache, nausea, vomiting, diarrhea, and coughing. Prolonged exposure may cause chronic effects.
* Store cadmium in a well-ventilated place. Keep the container tightly closed.
* Cadmium is stored under the laboratory fume hood and segregated from other chemicals.

Chloroform (Stored in **LOCATION** laboratory):

* **Hazard statement**: Harmful if swallowed. Causes serious eye irritation. Causes skin irritation. Causes damage to organs. Causes damage to organs through prolonged or repeated exposure. Suspected of causing cancer. Suspected of damaging fertility or the unborn child. Harmful to aquatic life with long-lasting effects.
* Avoid heat, sparks, flames, and contact with incompatible materials. Incompatible materials include strong oxidizing agents, strong bases, caustics, aluminum, and chemically active metals.
* If swallowed, immediately call a poison center or doctor. Rinse mouth. If on the skin, take off immediately all contaminated clothing. Rinse skin with water or shower for at least 15 minutes. If skin irritation occurs, get medical advice/attention. If in the eyes, rinse with water for at least 15 minutes at the eyewash station. Remove contact lenses, if present and easy to do. If inhaled, remove the person to fresh air and keep comfortable breathing.
* **Symptoms**- Harmful if swallowed. Irritating to eyes, respiratory system, and skin. Narcotic effect. May cause reproductive effects.

Hydrochloric Acid and Phosphoric Acid (Stored in **LOCATION** laboratory):

* **Hazard statements**: May be corrosive to metals. Harmful if swallowed. Causes severe skin burns and eye damage. May cause respiratory irritation.
* Store locked up. Store in a well-ventilated place. Keep the container tightly closed.
* If swallowed, immediately call a poison center or doctor. Do not induce vomiting. If vomiting occurs, keep your head low so that stomach content doesn't get into the lungs. If on the skin, take off immediately all contaminated clothing. Rinse skin with water or shower for at least 15 minutes Call a physician or poison control center immediately. If in the eyes, rinse with water for at least 15 minutes at the eyewash station. Remove contact lenses, if present and easy to do. If inhaled, remove the person to fresh air. Call a physician or poison control center immediately.
* **Symptoms**- Causes severe skin and eye burns. Harmful if swallowed.

Acetic Acid (Stored in **LOCATION** laboratory):

* **Hazard statement**: Flammable liquid and vapor. Harmful in contact with skin or if inhaled. Causes severe skin burns and eye damage. May cause respiratory irritation. Harmful to aquatic life with long-lasting effects.
* Keep away from heat, hot surfaces, sparks, open flames, and other ignition sources. Wear protective gloves/protective clothing/eye protection/face protection. Do not breathe dust or mists. Wash thoroughly after handling. Avoid release to the environment.
* Store locked up. Store in a well-ventilated place. Keep cool. Keep the container tightly closed.
* If swallowed, immediately call a poison center or doctor. Do not induce vomiting. If vomiting occurs, keep your head low so that stomach content doesn't get into the lungs. If on the skin, take off immediately all contaminated clothing. Rinse skin with water or shower for at least 15 minutes Call a physician or poison control center immediately. If in the eyes, rinse with water for at least 15 minutes at the eyewash station. Remove contact lenses, if present and easy to do. If inhaled, remove the person to fresh air. Call a physician or poison control center immediately.
* **Symptoms**- Irritating to eyes, respiratory system, and skin.

# EXPOSURE DETERMINATION, CONTROL MEASURES & ppe

## Exposure Determination

* The Chemical Hygiene Officer will coordinate exposure determinations to determine if any laboratory employees may be exposed to chemicals above PEOSH/OSHA permissible exposure limits or action levels.
  + **Currently, no tasks in the laboratory result in exposures exceeding PEOSH/OSHA permissible exposure limits or action levels.**
* The Chemical Hygiene Officer will review new or modified laboratory processes if they have the potential for exposures higher than current procedures. If there is a potential for increased exposure, an exposure determination will be conducted.
* If any employee believes that the air in the laboratory threatens his or her health, that employee shall leave the area and ask the Chemical Hygiene Officer to make an exposure assessment.

### Controlling Chemical Exposures

Using the information presented in the Chemical Hygiene Plan and knowing the specific hazards of the chemicals to be used one can design procedures to minimize hazards. At no time should any employee be exposed to any chemical above the OSHA Permissible Exposure Limit (PEL) or Short-Term Exposure Limit (STEL). OSHA has established these limits as protective of virtually all workers.

Control techniques fall into three broad classes: engineering controls, administrative controls, and personal protective equipment.

1. **Engineering controls:** Options for engineering controls are those that eliminate the hazard through methods such as changing the procedures or substituting less hazardous materials for more hazardous materials.

**Exhaust Ventilation**

Fume Hoods are used for the following operations to contain and exhaust toxic, offensive, or flammable materials:

* Phosphorus digestion
* Total Solids evaporation
* Total Dissolved Solids evaporation
* Mixing and pouring chemicals

## **Hood Use**

* Keep the hood's horizontal sashes closed unless actively working in the hood.
* Hoods must always be used when work involves hazards and noxious materials which are toxic, odoriferous, volatile, or harmful.
* Always check to assure the fan is on before initiating any work.
* Only items necessary to perform the present work should be in the hood as the more equipment in the hood, the greater the air turbulence and the chance for gaseous escape into the lab.
* Partially closing the hood improves its overall performance.
* The maximum sash height, where the minimum face velocity maintains 80 fpm, should be noted and marked on the hood. The maximum sash height will be checked and verified or changed on an annual basis by an outside company.
* Results of all fume hood measurements are available to laboratory staff upon request.
* Additional monitoring of hood performance may be conducted, with approval of the Laboratory Manager/CHO, if a staff member requests it.
* Hoods may not be used for storing or disposing of chemicals.

### Hood Evaluation

The lab hood will be evaluated, and face velocity readings taken on an annual basis by an independent company or whenever there is a change in any aspect of the ventilation system. The company will mark the maximum sash heights where minimum face velocity maintains at least 80 fpm.

***INSERT AGENCY NAME*** *has Constant Air Volume (CAV) fume hoods. CAV fume hoods exhaust the same amount of air, regardless of the sash height. Therefore, face velocity is inversely proportional to the sash height. All measurements should be collected with the sash in the design height position. The hood’s opening should be divided into a grid of equally spaced imaginary cells, approximately 1.0 ft2 cells. The airflow face velocities should be measured and recorded at the center of each grid location. These readings should be collected to base an average, minimum, and maximum face velocity. If any hood is found to be operating insufficiently, a warning notice is to be posted on the hood and corrective maintenance is to be enacted. The hood should be re-tested before removing the warning notification.*

The **INSERT AGENCY NAME**lab hoods must have an average face velocity of at least 100 fpm and a minimum face velocity of 80 fpm.

**Emergency eye wash/safety showers.** Be certain safety showers/emergency eyewashes are properly located and maintained. Employees must be familiar with the location and operation of safety showers and eyewashes. These units must be located in areas that will be immediately accessible. There should be no obstructions that might inhibit the use of this equipment. Conduct weekly and annual safety tests on the safety shower and eyewash station as described below.

Emergency eyewash stations, as well as shower equipment, are addressed by ANSI/ISEA Z358.1-2014: American National Standard for Emergency Eyewash and Shower Equipment. This standard covers emergency showers, eyewashes, eye/face washes, and combination units. It is intended to provide uniform minimum guidelines for their performance, use, installation, test procedures, maintenance, and training.

* 1. Weekly Performance Requirements:
* Eye washes and safety showers must be flushed weekly to verify that the units are working and to clear the lines of any sediment build-up or debris and minimize microbial contamination due to stagnant water.
* Activation shall ensure the flow of water to the head of the device.
* Duration of the activation shall be sufficient to ensure all stagnant water is flushed from the unit itself and all sections of piping that do not form part of a constant circulation system, also known as "dead leg" portions. (The duration is determined by the length of piping where stagnant water could be sitting before it reaches the head of the unit).
  1. Annual Performance Requirements:
* All shower units shall be inspected annually to assure conformance with ANSI Z358.1.
* Safety station shall be accessible within 10 seconds of hazard, approximately 55 ft.
* The station shall be located on the same level as the hazard and the path of travel shall be free of obstructions.
* Emergency equipment location shall be well lit and identified with a highly visible sign.
* All employees subject to exposure to hazardous material should be instructed on the location and proper use of emergency equipment.
* Deliver tepid flushing fluid. Temperature range – above 60 F (16 C) and below 100 F (38 C).

Safety Shower

* The showerhead must be 82 - 96 inches above the surface floor of the user.
* The shower must deliver a minimum of 20 gallons for 15 minutes and provide a column of water 20 inches wide at 60 inches above the surface floor of the user and be 16” from any obstruction.
* Shall be designed so that the flushing flow remains on without the use of the operator’s hands. The valve shall be simple to operate and go from “off” to “on” in one second or less.
* The actuator cannot be more than 69 inches from the surface floor of the user.

Eyewash

* Must provide a means of controlled flow to both eyes simultaneously at a velocity low enough to be non-injurious.
* Eyewash must deliver a minimum of 0.4 gallons per minute of water for 15 minutes.
* Outlets shall be protected from airborne contaminants.
* Flushing fluid flow pattern should be 33 - 53 inches from the surface floor of the user and a minimum of 6 inches from any obstruction.
* Shall be designed so that the flushing flow remains on without the use of the operator’s hands. The valve shall be simple to operate and go from “off” to “on” in one second or less.

**Whenever these emergency units are checked for proper functioning, written documentation showing the date and the person's initials performing the check should be maintained. See** **Appendix A for Emergency Eye Wash/Shower Station Weekly Check List**

### Other Engineering Controls

Other engineering controls include special containers and storage equipment for substances with specific hazards and providing secondary containment in the event of spills.

1. **Administrative controls:** Whereas engineering controls are controls that work passively once they are established, administrative controls require that workers take active steps. Examples of administrative controls are posting hazard signs on laboratory doors, minimizing exposure time when working with hazardous chemicals, wearing the appropriate PPE, restricting access to areas where hazardous chemicals are used, and adopting standard operating procedures.
2. **Personal protective equipment:** Personal protective equipment and personal hygiene are basic aspects of laboratory safety. Wearing appropriate personal protective equipment and practicing good personal hygiene as described below will minimize exposures to hazardous chemicals during routine use and in the event of an accident. Personal protective equipment includes items such as gloves, eye protection, foot protection, suitable clothing, and respirators. Note that selection of appropriate personal protective equipment is not always straightforward. In the case of gloves, there are a wide variety of types depending on the specific application. Although some types of personal protective equipment may be suitable for a wide range of applications, each operation should be assessed individually.

### Eye and Face Protection

* Safety glasses are required when working in the **INSERT AGENCY NAME**laboratory, and for visitors or other staff entering areas where work is being performed.
* Safety glasses should be of strong plastic without any cracks in them. The glasses should fit snug on the user. If the person wears prescription glasses, he or she must have safety glasses that fit over the top of the glasses or must have prescription safety glasses with side shields on them.
* Goggles and/or face shields shall be worn if there is a need for protection of the entire face and throat from splashes or corrosive liquids or flying particles. Whenever a face shield is used, side shield eye protection and/or goggles should be worn under the face shield.
* Visitors shall follow the same eye protection requirements as the employees. It is the responsibility of the Laboratory Manager or designee interacting with the visitors to ensure compliance and that visitors are issued eye protection.
* Contact lenses may be worn in the laboratory; however, they do not provide any protection of the eyes. Persons who wear contacts must use the same eye protective equipment as persons who do not wear contacts. Contact lens wearers are requested to notify the Laboratory Manager/Chemical Hygiene Officer.
  + If a corrosive liquid splashes in the eye, the natural reflex is to clamp the eyelids shut, making it very difficult to remove the contact lens before damage is done.
  + The plastic used in contact lenses is permeable to some of the vapors found in the laboratory. These vapors can be trapped behind the contact lenses and cause extensive damage.
  + The lenses can prevent tears from removing the irritant. If goggles are worn by contact wearers, they should fit loosely around the eyes and have no vents for access by vapors.
  + If chemical vapors or an accidental splash contact the eyes while wearing contact lenses, these steps should be followed:
    - Immediately remove the lenses.
    - Proceed to the nearest eyewash fountain.
    - Continuously flush the eyes for at least 15 to 30 minutes.
    - Have someone immediately report the incident to the Laboratory Manager, Safety Officer, direct Supervisor, and/or plant office so that medical attention can be provided.
* Full-face shields must be worn when conducting a procedure that may result in a violent reaction. Operations presently conducted in the laboratory do not warrant the use of face shields. A face shield may be found in the cabinet under the hood with the spill kits.
* Laboratory staff should consult the Laboratory Manager or Chemical Hygiene Officer if they have questions regarding appropriate protection or to request goggles or a face shield
  + 1. **Foot Protection**
* Safety shoes or boots are required for all personnel while working in the **INSERT AGENCY NAME**laboratory.

### Body Protection

* Proper attire must be worn at all times. Wear a lab coat or uniform when working in the laboratory and when handling samples or chemicals. Cover legs (no shorts), arms, and feet (safety shoes must be worn-no sandals or open-toed shoes or sneakers).
* Confine loose clothing and long hair.
* Do not wear laboratory attire outside of the laboratory.
* Wash laboratory uniform or lab coat frequently.

### Respiratory Protection

* Operations presently conducted in the laboratory **DO/ DO NOT (CHOOSE ONE)** warrant the use of respirators. If the Chemical Hygiene Officer determines that a task requires respiratory equipment, that task will be deferred until a respirator program can be implemented. However, no employee will be allowed to use a respirator until he or she has completed the medical, fit-test, and training elements of the respirator program.
* Work in a fume hood or provide adequate ventilation when working with materials that produce hazardous vapors or fumes.

### Hand Protection

* Use gloves that are appropriate to the degree and type of hazard. At all times pay special attention to the hands and any skin that is likely to be exposed to hazardous chemicals. Wear proper protective gloves when handling hazardous chemicals, toxic materials, materials of unknown toxicity, corrosive materials, rough or sharp-edged objects, very hot or very cold objects, or whenever protection is needed against accidental chemical, physical, or biological exposure. The proper gloves will prevent skin absorption, infection, or burns.
* Nitrile gloves are used for tasks that do not involve direct chemical contact. They will protect from incidental contacts such as minor drips or splashes. Nitrile gloves have limited chemical resistance and should be removed after any chemical contact and replaced with new gloves.
* Gloves should be inspected for discoloration or damage. Gloves with even a small pinhole or thin tear will not give adequate protection. Glove materials are eventually permeated by chemicals and should be discarded when contaminated.
* Disposable gloves are not to be saved after removal from hands.
* Do not leave the laboratory with gloves that have been used.
* Cut-resistant gloves are appropriate for handling broken glassware and handling sharp-edged objects. These may also be worn under nitrile gloves when dealing with sharp objects and glassware.
* Heat-resistant gloves are available for handling hot equipment and samples, such as phosphorus glassware and solids crucibles, and weighing dishes. Heat-resistant gloves are also used for ovens and high-temperature materials.
* Gloves should also be worn when washing and handling wet glassware. It is advised that cut-resistant gloves be worn under nitrile gloves when washing wet glassware in case of broken glass.

Protective equipment should be checked periodically by the Laboratory Manager to ensure that the equipment is functioning properly. Please inform the Laboratory Manager/CHO if you need additional PPE.

# CHEMICAL HANDLING, LABELING, AND STORAGE

Hazards associated with various chemicals and gases vary widely. Understanding the hazards associated with a compound and minimizing the quantity used and stored in the lab will decrease the chance of injury. Always assume that the chemical being used is hazardous. Familiarize yourself with the SDS of the chemical before working with it.

## Chemical Procurement

The Laboratory Manager/Chemical Hygiene Officer is informed of the procurement of all chemicals so that the chemicals can be properly logged into the laboratory. The Laboratory Manager/Chemical Hygiene Officer is also responsible for ordering all chemicals utilized in the laboratories.

All chemicals get delivered to one central location, **LOCATION**, and later dispersed. Transportation of chemicals within the facility must be done safely and suitable carriers utilized. Containers being transported are remained sealed.

Shipments of chemicals and reagents received are immediately unpacked/opened, inspected to ensure the container is intact and labeled, and are marked with the date of receipt and initialed. Do not remove or deface any labels on incoming containers of chemicals and other materials. The chemical is then stored safely and appropriately. The packing slip is signed and dated and given to the Laboratory Manager.

Personnel receiving new or unfamiliar materials must consider the potential hazards involved in their use, determine if there are adequate facilities and trained personnel available, and obtain proper information concerning the handling, storage, and disposal before delivery.

Safety Data Sheets (SDSs) are kept in an accessible location or file and new SDSs are obtained with the procurement of new chemicals. Each operations laboratory has its own SDS binders located in its laboratories. **INSERT AGENCY NAME** main laboratory keeps all SDSs in an accessible file location. The Laboratory Manager is responsible for obtaining SDSs and maintaining SDS files for all laboratories.

Consider the hazards of the chemical when specifying order quantities. It is preferred to minimize the storage quantities and container sizes of the more hazardous chemicals.

**Globally Harmonized System of Classification and Labelling of Chemicals (GHS)**

The GHS is all about communicating hazards to users. Using the GHS for hazard recognition requires that you have a basic understanding of the elements of the system. In the GHS, there are 17 physical hazard classes, 10 health hazard classes, and 2 environmental hazards classes. Within each class, the hazard is placed into a category based on various criteria specific to that classification. Each category is assigned a number or a letter, for example, 1 to 5 or A to E. In the GHS, the lower the category value is within each classification for a chemical, the more severe the hazard. The hazard categories are communicated to the user through pictograms, hazard statements, precautionary statements, and signal words. Hazard categories are especially helpful in assessing the relative risks of hazards. Remember that category 1 or A is the most hazardous rating for that class.

**Elements of the GHS**

1. **Pictograms** are pictures that represent a concept. The GHS uses nine pictograms to visually alert users to the chemical hazard class. See Appendix B for the GHS Pictograms and Hazard classes they cover. The degree of each hazard for each chemical within each class must be evaluated by the manufacturer. If the degree of hazard is great enough within a class, then that pictogram is required on the label and in the SDS. There is no minimum or a maximum number of pictograms that a substance may warrant.
2. **Hazard statements** are short statements that describe each physical, health, and/or environmental hazard. There are quite a few hazard statements, and each one is assigned an H code as an alphanumeric identifier.
3. **Precautionary statements** are short statements that indicate how to handle, store, prevent exposure to, and dispose of a substance. There are even more precautionary statements than hazard statements. Each of these is assigned a P-code as an alphanumeric identifier.
4. **Signal words** provide the user with an immediate indication of the hazard severity in each class. There are two signal words: “Danger” and “Warning”. Within a specific hazard class, “Danger” is used for the more severe hazards, and “Warning” is used for the less severe hazards.

### Safety Data Sheets (SDSs)

The Hazard Communication Standard (HCS) (29 CFR 1910.1200(g)), revised in 2012, requires that the chemical manufacturer, distributor, or importer provide Safety Data Sheets (SDSs) (formerly MSDSs or Material Safety Data Sheets) for each hazardous chemical to downstream users to communicate information on these hazards. The SDSs are required to be presented in a consistent user-friendly, 16-section format. SDSs should be the first source of information about the hazards associated with a chemical.

Appendix D to 29 CFR 1910.1200 indicates the required (and suggested) information to include in the SDS and the format. Sections 1-11 and 16 below are required, sections 12-15 below may be included but are not required.

* **Section 1—Identification**: Product identifier, manufacturer or distributor name, address, phone number, emergency phone number, recommended use, and restrictions on use.
* **Section 2—Hazard(s) identification:** All hazards regarding the chemical and required label elements.
* **Section 3—Composition/Information on ingredients:** Information on chemical ingredients and trade secret claims.
* **Section 4—First-aid measures:** Required first aid treatment for exposure to a chemical and the symptoms (immediate or delayed) of exposure.
* **Section 5—Fire-fighting measures**: The techniques and equipment recommended for extinguishing a fire involving the chemical and hazards that may be created during combustion.
* **Section 6—Accidental release measures:** Steps to take in the event of a spill or release involving the chemical. Includes emergency procedures, protective equipment, and proper methods of containment and cleanup.
* **Section 7—Handling and storage:** Precautions for safe handling and storage, including incompatibilities.
* **Section 8—Exposure controls/Personal protection: OSHA’s** permissible exposure limits (PELs), threshold limit values (TLVs), appropriate engineering controls, and personal protective equipment (PPE).
* **Section 9—Physical and chemical properties**
* **Section 10—Stability and reactivity:** Chemical stability and possible hazardous reactions.
* **Section 11—Toxicological information:** Routes of exposure (inhalation, ingestion, or absorption contact), symptoms, acute and chronic effects, and numerical measures of toxicity.
* **Section 12—Ecological information:** How the chemical might affect the environment and the duration of the effect.
* **Section 13—Disposal considerations—**describes safe handling of wastes and methods of disposal, including the disposal of any contaminated packaging.
* **Section 14—Transportation information**—includes packing, marking, and labeling requirements for hazardous chemical shipments.
* **Section 15—Regulatory information**—indicates regulations that apply to the chemical.
* **Section 16—Other information—**includes the date of preparation or last revision.

The Laboratory Manager is responsible for obtaining and maintaining all SDSs in all laboratories. SDSs must be readily available to employees.

## Chemical Labeling

All purchased chemicals must be labeled per PEOSH Hazard Communication and NJ Right-to-Know labeling requirements. This includes the identity of the chemical, signal word, hazardous statement, precautionary statement, all pictograms, and the name, address, and the number of the chemical manufacturer. See GHS information above.

**INSERT AGENCY NAME** is responsible for maintaining the labels so that labels continue to be legible and the pertinent information (such as the hazards and directions for use) does not get defaced (i.e., fade, get washed off) or removed in any way. The **INSERT AGENCY NAME** must relabel items if the labels are removed or defaced.

Inadequate labels on older containers should be updated to meet current standards.

Information on whether a chemical poses a health hazard may be found on the Safety Data Sheet (SDS).

No purchased chemicals will be accepted without appropriate labeling.

New chemicals and supplies should be received and dated. Be sure to make the open date when opened.

Make sure all labels are legible.

**NFPA 704 Signs and Labels**

For labeling of secondary containers into which chemicals are transferred from the original labeled containers, the **INSERT AGENCY NAME** laboratory uses labeling based on the NFPA 704 Standard System for the Identification of the Hazards of Materials for Emergency Response.

When labeling secondary containers, be sure the container is labeled by chemical name, all chemicals included in the solution and their CAS#s, the preparation date, expiration date (if applicable), and initials of the preparer. Also, be sure to affix the NFPA 704 label onto the container.

The NFPA 704 provides a simple, readily recognized system for identifying the specific hazards of a material and the severity of the hazard that would occur during an emergency response. The system addresses the health, flammability, instability, and special hazards.

IMPORTANT NOTE: Chemical hazard ratings under the NFPA system go from Class 0 to Class 4 with a rating of Class 4 indicating the most severe hazard. Remember, the new Globally Harmonized System (GHS) rates chemical hazards from Category 1 to Category 4 with a rating of Category 1 indicating the most severe hazard. Since the numbering scheme used in both systems is different, it is important to make sure that the NFPA class system is used when completing the NFPA diamond. New Safety Data Sheets (SDS) will always contain the GHS ratings for a chemical. NFPA ratings are also often listed toward the end of the document.

When transferring or adding materials to a secondary container, the responsibility of ensuring proper labeling rests with the person who filled or created the container and who has been trained accordingly.

Where materials with varying degrees of hazard are used or stored together place one sign with an estimated rating for the combined storage based on the hazards and quantities of the chemicals.

Make sure all containers are of good integrity- if deteriorated containers are found, dispose of the chemical or transfer it to a new container. Make sure that the container is appropriate for the chemical(s) stored.

If labels are no longer legible, be sure to affix a new, legible label with all necessary information onto the bottle.

Labeling is not required of secondary containers which are intended only for the immediate use of the person who mixes the material or performs the transfer from the original labeled container; however, it is recommended that such containers be labeled with at least the name of the substance. Immediate use is defined as use in which the material is not left unattended and is discarded immediately following use. If the chemical transfers hands to another worker, it must then be labeled as described above.

Hazardous material storage areas/cabinets will also be labeled with a diamond-shaped, four-quadrant, hazard signal system described in NFPA Standard 704 based on the combined hazards related to the storage area.

Wash bottles, waste bottles, and waste must be labeled.

See Appendix C for additional information regarding the NFPA 704 system and hazard ratings.

## Laboratory Storage

Storage of chemicals should be to the manufacturer's instructions.

All chemical compounds should be considered toxic unless known to be otherwise.

Stored chemicals should be checked frequently for expiration, deterioration, and container integrity.

To minimize quantities of chemicals and reduce waste, no more than a year’s supply of a chemical should be stored in the laboratory.

Chemicals in the laboratory have defined storage locations and must be returned to that location after each use.

Flammable liquids, oxidizers, and corrosive chemicals may not be stored on bench tops or in hoods.

Storage trays or secondary containers should be used to minimize the distribution of material should a container break or leak.

Concentrated acids are segregated and stored in the acid cabinet. Diluted, prepared acids are segregated and stored beneath the hood and labeled accordingly.

Flammable liquids are stored in a flammable storage cabinet located under the hood. Do not store paper, rags, or other combustible materials in the cabinet.

Do not expose stored chemicals to heat or direct sunlight.

Avoid storing chemical containers in hard-to-reach areas.

Avoid storing materials and equipment on top of cabinets. To make chemicals readily accessible and to reduce accidents, do not store materials on shelves higher than 5 feet. Use a step stool when necessary.

Store heavy materials on lower shelves. Large bottles of corrosive liquids must be stored below head level.

Maintain a clearance of at least 18 inches from the sprinkler heads to allow proper functioning of the sprinkler system.

Maintain inventory checks on oxidizers, nitrate and nitrite compounds, and acids such as nitric acid and sulfuric acid.

Chemicals should be segregated by hazard classification to prevent the potential for a reactive mixture. Once segregated by hazard class, chemicals may be stored alphabetically. Basic segregations should keep:

* Oxidizers away from organics
* Air/water reactivates away from air and water
* Caustics away from acids

Make sure all containers are of good integrity- if deteriorated containers are found, dispose of the chemical or transfer it to a new container. Make sure that the container is appropriate for the chemical stored. Flammable materials, if removed from their original containers, should be stored in appropriate containers, such as safety cans or other Department of Transportation (DOT) approved containers.

Store chemicals are known to be highly toxic in ventilated storage. Keep quantities at a minimum working level. **INSERT AGENCY NAME** **has a separate cabinet labeled “Health Hazards” for the storage of cadmium.**

## Chemical Handling and Transportation (On-Site)

Encourage the use of poly-coated bottles.

When flammable, corrosive or other hazardous chemicals are hand-carried, the container should be placed in an outside container or acid-carrying bucket to protect against breakage and spillage. If a wheeled cart is used, it should be stable under the load and have wheels that are large enough to handle uneven surfaces without tipping over or stopping suddenly.

Close caps securely.

Pour chemicals carefully.

Never add water to an acid; prepare to dilute solutions by adding acid to water under the fume hood.

Containers holding more than five gallons should be grounded when transferring flammable liquids.

# waste handling & disposal

### Pollution Prevention/Waste Minimization

If waste is regulated as hazardous waste, it must be handled and disposed of in specific ways. EPA defines chemical hazardous waste under the Resource Conservation and Recovery Act of 1978 (RCRA 40 CFR Parts 260-272). EPA and RCRA establish federal standards for chemical hazardous waste.

Waste minimization strategies usually have the dual benefits of improving safety and reducing chemical purchase and disposal costs. It is recommended that procedures are evaluated periodically to consider the possible usage of less hazardous chemicals and/or smaller quantities of chemicals.

**All mercury thermometers have been replaced and disposed of or put out of service to eliminate the possible exposure to mercury and health hazards associated with mercury. Thermometers are filled with mercury-free liquids such as spirit-filled thermometers and/or alcohol-based thermometers. When these are broken, there are no hazardous material disposal issues.**

It is the responsibility of each laboratory worker to be sure that chemical waste generated from their activities is disposed of properly. Some materials can be safely let into the sanitary sewer and others can cause damage to health, the environment, or the functioning of the wastewater plant.

*\*****INSERT AGENCY NAME*** *sinks, drains, and associated pipes send water/wastewater to the head of the treatment plant where it is biologically and chemically treated before discharge into the environment.*

Consult with the Laboratory Manager or Chemical Hygiene Officer about requirements for waste disposal. Any waste stream generated in the laboratory that is not described in this section must be characterized for disposal by the Laboratory Manager/CHO. Disposal considerations of new analytical procedures should also be discussed with the Laboratory Manager/CHO.

**Collection, Storage, and Handling of Waste:**

* + The accumulation and temporary storage of waste in the laboratory is called *satellite accumulation.*
  + Chemical waste should be accumulated at or near the point of generation, under the control of laboratory workers.
  + Store acids and bases separately. Acids should never be put into steel containers.
  + Hazardous waste must be transferred from laboratories to a designated hazardous waste storage area.
  + Each waste type should be stored in a compatible container pending transfer or disposal.
  + Waste containers should be clearly labeled and kept sealed when not in use. Labels should include the material’s identity, accumulation start date, and hazard warnings (flammable, corrosive), as appropriate. When compatible wastes are collected in a common container, keep a list of all components to aid in later disposal decisions.
  + Incompatible waste types should be kept separate to ensure that heat generation, gas evolution, or another reaction does not occur.
  + Waste containers should be segregated by how they will be managed. Waste containers should be stored in a designated location that does not interfere with normal laboratory operations.
  + Ventilated storage and secondary containment may be appropriate for certain waste types.
  + There should be at least 2 in. of headspace in the liquid waste container to avoid a buildup of gas.
  + Never put chemicals into a sink or down the drain unless instructed to do so.
  + When necessary, an outside company will be contacted for the pick-up and disposal of hazardous chemical wastes.
    - A list of hazardous waste and the quantities are recorded.
    - A copy of the manifests is kept.
  + All other waste disposal practices required by the CHP must be followed.

## Liquid Waste

Understand the hazards and toxicity of the materials you work with by consulting safety data sheets (SDSs). Work slowly to avoid splashes and wear the proper protective equipment (lab coat, glasses, face shield, gloves) during drain disposal.

Waste approved for drain disposal should be disposed of only in drains that flow to a POTW. Most samples and test solutions can be safely disposed of down the laboratory sinks, which flow back to the head of the treatment plant.

Liquid wastes suitable for direct disposal include:

* Laboratory wash water
* All aqueous samples
* Influent and Effluent Samples
* Analysis media for the following test parameters:
  + BOD
  + Microbiological liquid waste (after being autoclaved)
  + TSS filtrates
  + Residual Chlorine

Chemicals that may be permissible for sewer disposal include aqueous solutions that readily biodegrade and low-toxicity solutions of inorganic substances. Also, spent buffer solutions neutralized mineral acids and caustics, and very dilute aqueous solutions of water-soluble organic solvents (e.g., methanol, ethanol) may be discarded down the laboratory sink. Water-immiscible chemicals should never go down the drain.

Certain liquid waste is prohibited from sink disposal. Take care to collect and store each waste type in a compatibly labeled container and keep it sealed when not in use. Incompatible waste types must be kept separate.

Wastes that contain any element or compound that cannot be adequately treated or removed by the wastewater treatment plant (biological activated sludge treatment) and that is known to be an environmental hazard must not be discarded down the drain.

Noxious smelling or offensive, toxic, or irritating chemicals should also not be discarded down the drain. Interconnected drains may create an uncontrolled vapor release from another drain. Substances poured down different drains may inadvertently react with a resultant evolution of toxic gases and/or heat. Contact the Laboratory Manager/CHO with any questions.

**Drain disposal of dilute acids and alkalis**

Strong acids and bases should be neutralized to the pH 6-9 range before being discharged into the drain. Proper care must be taken to adjust solutions to the proper pH range. Perform neutralizations in a fume hood behind the shield, as fumes and heat may be generated. Neutralization should be done in small quantities (i.e. no larger than 1 liter). If the acid or base is highly concentrated, it is prudent to first dilute it with cold water (adding the acid or base to the water) to a concentration below 10%. Then add 1N acid solution to the basic solution and/or 1N basic solution to the acidic solution. Keep containers cool during the process and work slowly- additional water may be slowly added when necessary to cool and dilute the neutralized product. Ensure a pH of 6-9 is achieved with either pH strips or a pH meter. The concentration of neutral solutions disposed of in the sanitary sewer should generally be below 1%. Drain disposal is properly done in the following manner:

* Protective equipment (gloves, laboratory coat/uniform, long sleeves, pants, safety shoes, and safety glasses) must be worn.
* Before pouring the solution, turn on the tap to get a good flow of water to wash it down. Make sure that the sink and drain lines are washed free of any substances that could generate noxious gases when mixed with the solutions.
* Pour the solution down the drain slowly, making sure that before, during, and after pouring, the tap is turned on to provide a strong flow of water that aids in washing it down the drain.

**How Much**

Quantities of chemical waste for drain disposal should be limited generally to a few hundred grams or milliliters or less per day. *Because risks tend to increase exponentially with scale, larger quantities should be treated only in small batches.* Larger amounts should have prior approval from the Chemical Hygiene Officer or Safety Officer. Disposal should be followed by flushing with at least 100‐ fold excess water at the sink. (that means for 100 ml of chemical, run the water for approx. two minutes at maximum flow.)

*Note: Acids and bases may be discharged in larger quantities since they must be neutralized to a pH of between 6 and 9 before they can be drained disposed to the sanitary sewer.*

**Solid Chemical Waste**

Solid chemical wastes should be placed in properly labeled containers. Incompatible materials should be segregated. A waste determination is required to determine if the material is hazardous waste. If bottles are used, they should be placed in buckets (e.g., lab packs) and await disposal. When necessary, contact outside companies for pick up and disposal of chemical wastes.

## Non-Hazardous Solid Waste

Most of the solid waste media generated in the laboratory can be disposed of as non-hazardous waste that goes in laboratory trash containers or directly to the facility dumpster for contracted pick-up. Non-hazardous solid wastes include:

* Laboratory gloves and disposable laboratory supplies
* Non-reusable sample containers
* Paper towels
* Coliform plates (after being autoclaved)
* Filtered solids (e.g., TSS filters)

Materials that are contaminated with chemicals, such as paper towels used to clean up a spill, may need to be placed into a special container marked as chemical/hazardous waste. The Chemical Hygiene Officer can inform you whether cleanup materials need to be collected for hazardous waste.

**Broken Glassware**

Broken glassware is segregated from other solid waste in a puncture-resistant container. These broken glassware containers are labeled accordingly. If the broken glass is contaminated with chemicals, ask the Chemical Hygiene Officer where to dispose of the glass.

## Hazardous and Other Segregated Waste

Some materials used or generated in the laboratory may not safely be disposed of either wastewater treatment by the plant or with routine solid waste. These materials include hazardous waste and other components that may not be safe to directly dispose of.

Waste solvents that are free of solids and corrosive or reactive substances may be collected in a common safety can. It is essential to determine what substances are compatible. Compatibility must be confirmed, and waste disposal practices are followed exactly.

**Recycling Containers**

Laboratory materials other than chemicals, such as containers or packaging materials, can be recycled. Examples include certain clean glass and plastic containers, cardboard, office paper, lightbulbs. Ensure chemical bottles and containers are thoroughly cleaned and DI rinsed before recycling. Labels must be removed, and pertinent information crossed out.

Empty containers that are being rinsed should be triple rinsed with a minimal amount of liquid. If the container held hazardous waste, the rinsate must be collected and managed as hazardous waste and disposed of properly.

**Disposal of Ammonia TNT & Nitrate TNT** *(***ENTER LOCATION OF STORAGE***):*

*Ammonia TNT-* Working in small batches, dilute to 3 to 5 times the volume with cold water. Adjust to a pH between 6 and 9 with an acid, such as sulfuric. Open cold water tap completely, slowly pour the reacted material to the drain. Allow cold water to run for 5 minutes to completely flush the system.

*Nitrate TNT-* Dilute to 3 to 5 times the volume with cold water. Adjust to a pH between 6 and 9 with an acid, such as sulfuric. Open cold water tap completely, slowly pour the reacted material to the drain. Allow cold water to run for 5 minutes to completely flush the system.

### EMERGENCY PROCEDURES AND MEDICAL CONSULTATION

### Medical Surveillance

**Under the collective bargaining agreement between the INSERT AGENCY’S NAME and ENTER UNION NAME, each employee must have an annual physical. The medical examinations and tests are provided without cost to the employee.**

### Medical Emergencies

In **INSERT AGENCY’S NAME** laboratories, the most common emergencies that you may need to respond to involve spills, fires, cuts and/or burns, and chemical exposure.

If emergency medical assistance is needed, call 911.

**Incident Reporting and Investigation**

**INSERT AGENCY’S NAME** anticipates that emergency communications in the laboratories will be conducted by direct vocal communication. The telephone system is used as the site-wide communication and alarm system to alert and communicate with people in all parts of the facility including the laboratory. A list of employees and their contact numbers, as well as emergency contact numbers, may be found posted in the laboratories.

Any incident that involves the medical treatment, fire, significant damage, or a significant chemical spill or release must be reported to the Laboratory Manager/Chemical Hygiene Officer, your immediate Supervisor, or Safety Officer and an investigation will be coordinated. Even if consultation with a medical professional is not deemed necessary after a laboratory illness or injury, it must still be reported to one of the above-mentioned personnel.

Supervisors must ensure that an Employee's Injury Report is completed for all work-related injuries or illnesses. Reports must be completed at the earliest convenience of both parties, ideally the day of the incident, otherwise first thing the following day.

Medical consultations are available for laboratory staff who experience signs and symptoms associated with a hazardous chemical they have been exposed to, are exposed above PEOSH/OSHA exposure limits (PEL or AL), or in the event of exposure due to spill, leak, or fire. Contact the Chemical Hygiene Officer / Laboratory Manager or Safety Officer to request a medical consultation.

The employer shall provide the following information to the physician (1910.1450(g)(3):

* The identity of the hazardous chemical(s) to which the employee may have been exposed;
* A description of the conditions under which the exposure occurred including quantitative exposure data, if available; and
* A description of the signs and symptoms of exposure that the employee is experiencing if any.

**Emergency Assistance**

Be familiar with the location of all safety equipment, signs, fire alarms, and exits. Some of the items you can locate include a fire extinguisher, safety shower, eyewash station, exit signs, and first aid kits. While preparing to respond to an emergency, remember that the primary goal is to protect human life and minimize injury. Never put yourself in danger. The second goal is to minimize damage to structures and equipment.

Call 911 for assistance in the following kinds of emergencies:

* Medical assistance for injuries
* Fires
* Explosions
* Chemical spills for which assistance is required

Post numbers to call in emergencies clearly at all telephones in hazard areas. If an emergency occurs:

* Determine the safety of the situation. Do not enter or reenter an unsafe area.
* Without endangering yourself, assist the personnel involved and remove them from exposure to further injury if possible. Remember you cannot help another person if you injure yourself in the process.
* Summon medical help immediately.
* Warn personnel in adjacent areas of any potential risks to their safety.
* Provide emergency personnel with as much information as possible about the nature of the hazard, including pertinent information in the safety data sheet (SDS).
* Do not move an injured person unless he or she is in danger of further harm. Unnecessary movement can complicate certain injuries.
* If feasible, designate one person to remain with the injured person. The injured person should be within sight, sound, or physical contact with that person at all times.
* See below sections for emergency response procedures and information relating to chemical spills and fires.

**Spill Preparedness**

It is best to proceed in an organized manner for spill response. Establishing protocols and evaluating potential hazards in advance will be well worth the initial effort. Before working with chemicals, you should familiarize yourself with the chemical’s SDS, determine what could go wrong and how you might respond to a spill. As a result of this evaluation, written protocols should be prepared for use in the event of a spill and make sure that you have all the necessary personal protective devices, safety equipment, and containment/clean-up material readily available. See below for procedures for acid and caustic chemical spills. These protocols need to be communicated to all persons who might be affected by a spill.

All laboratory staff is informed of the location of emergency equipment (eyewash stations, safety showers, spill cleanup equipment, fire extinguishers, first aid supplies, etc.). Each individual who may be involved in spill response or clean-up must know the location, purpose, and limitations of all personal protective equipment, safety equipment, and clean-up materials. This emergency equipment should always be available, and their locations should be clearly marked and highly visible.

Those who spilled the material can safely clean up most laboratory spills and many small spills outside the laboratory. If handled properly, these small spills are little more than minor nuisances. Some spills should not be cleaned up, except by specially trained emergency response personnel.

Since spills can greatly disrupt your activities and cause bodily harm or property damage, it is prudent to make preparations before spills occur. This section provides basic emergency preparedness information and gives general guidance on how you should respond to chemical spills.

**Preventing spills**: Listed below are some basic spill prevention steps that apply to the storage, transportation, and transfer of chemicals.

* General precautions
  + Reduce clutter and unnecessary materials in your work areas.
  + Eliminate tripping hazards and other obstructions.
  + Have all necessary equipment readily available before starting work.
* Storage precautions
  + Use sturdy shelves.
  + Larger containers should be stored closer to the floor.
  + Containers on shelves should be stored back from the edge to reduce the danger of falling.
  + Chemicals should be stored first by compatibility, then alphabetically.
  + Inspect the storage area regularly for leaking or defective containers.
  + Use appropriate storage containers.
  + Do not store unprotected glass containers on the floor.
* Transportation precautions
  + Use carts, where appropriate.
  + Use safety containers, where appropriate.
  + Use bottle carriers for 2.5- and 4.0-liter bottles (bottles >1 L).
  + Use straps to secure containers, where appropriate.
  + Think about potential hazards before transporting chemicals.
  + Consider purchasing plastic coated “shatter resistant” bottles.
* Precautions in transferring chemicals
* Pay careful attention to the size of the container to avoid overfilling.
* Provide containment to capture leaks and spills.

**Defining and classifying a spill**

The basic type of spill is a chemical spill. *All mercury thermometers have been replaced and/or disposed of, so mercury spills are not of concern to any of* **INSERT AGENCY’S NAME** *laboratories.*

Chemical spills can be broken down into two basic subtypes: simple spills, which you can clean up yourself, and complicated spills that require outside assistance.

* + 1. Simple spills: A spill that can be managed by one person, does not spread rapidly other than by direct contact, and does not pose an immediate danger to the environment.
    2. **If your spill meets ANY of the following conditions of a complicated spill, call 911 immediately.** A spill is complicated if:
* A person is injured; or
* Identity of the chemical is unknown; or
* Multiple chemicals are involved; or
* The chemical is highly toxic, flammable or reactive; or
* The spill occurs in a “public space” such as corridors; or
* The spill has the potential to spread to other parts of the building such as through the ventilation system; or
* The cleanup procedures are not known or appropriate materials are not readily available; or
* The spill may endanger the environment such as reaching waterways or outside ground; or
* If there is an acid or caustic spill that exceeds 1 Liter, the spill kits available are suitable for spills up to 1 Liter.

**Chemical Spills and Releases**

* When a chemical spill occurs, first ensure that any person who contacted or was overexposed to the chemical is treated and decontaminated.
* Contain the spilled material immediately, if this may be done safely with the training and experience of personnel and equipment available.
* Handle all chemicals according to the manufacturer's recommendations and always wear appropriate personal protective equipment.
* Use the exhaust/fume hoods when working with any volatile, toxic, or flammable material.
* If a spill occurs in a fume hood, close the sash to allow the vapors to be removed.
* If a small spill of a solid material occurs, use a dustpan and brush to clean up the material and dispose of it accordingly.
* Secure the area to prevent accidental exposure to other staff either entering or working in the area.
* Notify the Chemical Hygiene Officer / Laboratory Manager, who is to record the incident.
* If chemical fumes are excessive, evacuation of the area or building may be necessary. In the event of an evacuation, no one should re-enter the laboratory until directed by the Chemical Hygiene Officer.
* The Chemical Hygiene Officer must approve decontamination before work resumes in the area of the spill.

### Acid Spills

* Minor spills of strong acids may be cleaned up when they can be done safely. Spill kits are utilized for spills up to 1 Liter.
* Nitric acid and hydrochloric acid produce a significant amount of vapors/fumes and ventilation is a priority in the event of a spill. These acids have “good warning properties” in that the vapors/fumes produced to cause a strong odor and irritation at low levels. If vapors/fumes produce strong irritation (eye tearing, throat burning, etc.) increase ventilation if feasible or leave the area. Seek medical attention if necessary.
* Sulfuric acid has a very low vapor pressure and will not produce significant vapor/fumes unless a reaction occurs with another material.
* Wear safety glasses, a lab coat/uniform, safety shoes, and chemical-resistant gloves (heavyweight nitrile) when cleaning up a spill.

*Note: Consult the chemical’s SDS to see if additional PPE is required.*

* In the case of a small spill in an area with adequate ventilation, neutralize the spill. Obtain the acid spill kit under the fume hood. Surround the spill with the absorbent/neutralizer mixture provided in the acid spill kit, then fill the circle with the remaining mixture.
  + Using a mildly alkaline material will minimize the heat-producing reaction that will occur.
* After the mixture turns blue, put it into a waste bag using the dustpan and brush. Seal the bag tightly and place it in the kit along with kit contents. Close kit securely and dispose of appropriately.
* Do not return the used/partial kit to storage. Inform Laboratory Manager/CHO of the spill and use of the kit. A new kit will need to be ordered.
* After the spill has been absorbed, wash the contaminated area and any other items used for clean-up with soap and water.

### Caustic Spills

* Minor spills of strong caustics may be cleaned up when they can be done safely. Spill kits are utilized for spills up to 1 Liter.
* Wear safety glasses, a lab coat/uniform, safety shoes, and chemical-resistant gloves (heavyweight nitrile) when cleaning up a spill.

*Note: Consult the chemical’s SDS to see if additional PPE is required.*

* In the case of a small spill in an area with adequate ventilation, neutralize the spill. Surround and cover the spill with the neutralizer mixture provided in the caustic spill kit. Absorb the neutralized caustic with the absorbent mixture provided in the spill kit.
* After the mixture turns pink, put it into a waste bag using the dustpan and brush. Seal the bag tightly and place it in the kit along with kit contents. Close the kit securely and dispose of it properly.
* Do not return the used/partial kit to storage. Inform Laboratory Manager/CHO of the spill and use of the kit. A new kit will need to be ordered.
* After the spill has been absorbed, wash the contaminated area and any other items used for clean-up with soap and water.

**Fires**

**Fire Prevention**

* The best way to fight a fire is to prevent it. Ask yourself the following questions to prevent a fire:
  + Are you working with any source of heat, flame, or spark? Are you working with flammable liquids or vapors? Are there any damaged wires on the electrical equipment? Are bottles or glassware (containing flammable solvents) too close to the edge of the laboratory bench? Is the workspace cluttered?
* When you are using a flammable liquid, minimize the quantity in your workspace by dispensing only the quantity required and returning the bottle to its proper storage location immediately.
* Excess flammable material in the immediate work area will act as an additional fuel source in a fire. You should keep combustible materials, such as paper, away from areas where procedures are being performed with flammable chemicals. In the event of a fire, combustible materials will act as fuel to keep the fire burning. NEVER store combustible materials on top of a flammable cabinet.

**Fire Response**

* Fire extinguishers are available and may be used when a fire can be quickly and safely extinguished.
  + **INSERT AGENCY’S NAME** has ABC fire extinguishers available in all laboratories. These are capable of extinguishing three classes of fire; Class A for trash, wood, and paper, Class B for liquids and gases, and Class C for energized electrical sources.
* Immediately **Call 911**. Report fires even if they are or may be extinguished, as re-ignition can occur, and fire will spread rapidly.
* If there is any doubt the flame can be easily extinguished, all employees must immediately leave the laboratory.
* Every employee will be responsible to observe and report fires and conditions that could lead to fires. The Laboratory Manager will stop any activity that increases the risk of fire until appropriate controls are in place.

If you have been trained in the use of a fire extinguisher and feel confident using one, position yourself between the fire and an escape route (e.g., a door), and fight the fire from this position to be sure that you can escape.

* Remember **PASS**- **Pull** the pin, **Aim** at the base of the fire, **Squeeze** the lever, and **Sweep** from side to side. Slowly move toward the fire aiming low at its base.

Small fires often can be extinguished, but not always. If not extinguished, a fire can quickly threaten your life. If the fire is burning over an area too large for the fire to be extinguished quickly and simply, everyone should evacuate the area. Pull the fire alarm and follow the evacuation procedures. Once you are safe, make sure that you or someone else calls **911**. Locate your immediate Supervisor to let them know you are safe. Aid others if able.

**Evacuation**

In the event of a major chemical spill or fire, it may be necessary to evacuate the laboratory space or building. Staff members should notify each other of the situation. Evacuate to the nearest exit.

**Chemical Contact or Exposure**

In most cases of chemical contact flushing with water at a sink, eyewash or shower is the immediate course of action.

Provide a private location for the person to remove wet and contaminated clothing if needed.

*Eye Contact* – If contaminated solid or liquid gets into the eyes, wash them immediately at an emergency eyewash station using large amounts of water. Lift the lower and upper eyelids and flush with water; move your eye continuously up and down and sideways to flush the area behind the eyelid as well. Flush the eyes with water for at least 15 minutes. If wearing contact lenses, remove them if possible. After flushing your eye, seek medical attention.

*Skin Exposure* –For small liquid spills or splashes that affect only a small area of skin, immediately flush with flowing water for at least 15 minutes. After initial rinse, wash the entire area with warm water and soap. If you spill solid chemicals on your skin, brush them off in the appropriate waste container if hazardous and flush your skin for at least 15 minutes as described above. If necessary, remove contaminated clothing and wash the contaminated skin promptly using soap or mild detergent and water. If your skin or clothing is contaminated with larger spills of a liquid, go to the nearest safety shower immediately, turn on the water and stand under the water. While you are under the flowing water, remove all contaminated clothing and shoes. Flush the affected body area with water for at least 15 minutes but resume flushing for longer if the pain returns. After thoroughly flushing, seek medical attention.

*The Laboratory Manager must be notified as soon as possible if an employee required the use of a safety shower or eyewash so that appropriate medical assistance can be rendered and an incident form completed.*

*Breathing* – If a person inhales high levels of gas or vapor, move them to fresh air at once. If symptoms do not improve, get medical attention. You should warn other people in the area of the potential for harm and seek medical assistance immediately. If you suspect that someone has inhaled hazardous chemicals, call 911.

*Ingestion* – If a person swallows chemicals, contact the Poison Control Center (800-222-1222).

If the injured person is not breathing and has no pulse, you should provide cardiopulmonary resuscitation (CPR) if you are trained to do so. You should call 911 immediately or tell someone else to do so while you are tending to the victim.

Always refer to the SDS for additional information about chemicals.

In all cases, follow-up with medical treatment if symptoms persist.

**First Aid and Medical Treatment**

A first aid kit is kept in all laboratories.

If you or someone else is bleeding severely, try to control the bleeding by placing a cloth on the wound and applying firm pressure. If possible, elevate the injury above the level of the heart. You should take precautions to avoid contact with someone else’s blood. There are gloves available in all laboratories.

If an employee is injured or exposed:

* Move the employee to a clean area, if possible.
* Evacuate other persons threatened by the condition, if applicable.
* Administer whatever first aid the injured party needs if you are qualified.
* Report the injury to the Laboratory Manager and Safety Officer.

**First aid treatment may be administered only by trained persons.**

If emergency medical treatment is needed, call 911. **INSERT AGENCY’S NAME** employees who suffer a work-related injury or illness during normal working hours should seek treatment at **ENTER NAME OF MEDICAL TREATMENT LOCATION WITH ADDRESS AND PHONE NUMBER.**

If non-emergency medical treatment is needed, the Laboratory Manager and Safety Officer will determine the course of action and medical facility. Medical treatment will usually be through **INSERT AGENCY’S NAME** designated medical provider.

Treatment is typically sought at **ENTER NAME OF MEDICAL TREATMENT LOCATION WITH ADDRESS AND PHONE NUMBER.**

Supervisors must ensure that an Employee's Injury Report is completed for all work-related injuries or illnesses.

Medical consultations will be performed per 29CFR1910.145(g).

Medical records will be available to employees per 29CFR1910.1020.

Medical records must be maintained on file for employment plus thirty (30) years. Medical records of all active employees are held and maintained by the Director of Personnel.

# SPECIAL HEALTH AND SAFETY PRECAUTIONS

The following procedures are performed in the **INSERT AGENCY’S NAME** laboratories:

**ENTER NAME 1** Laboratory:

* **Ammonia (Non-compliance spectrophotometry).**
* **Biochemical Oxygen Demand (BOD)/CBOD (meter and incubation),**
* **Dissolved Oxygen (Winkler & meter),**
* **Fecal coliform, E. Coli, Total Coliform (incubation),**
* **Nitrate (Non-compliance spectrophotometry),**
* **Nitrate and Nitrite (cadmium reduction and spectrophotometry),**
* **pH (meter),**
* **Residual Chlorine (spectrophotometry),**
* **Temperature (meter and glass thermometer),**
* **Total Phosphorus (digestion and spectrophotometry),**
* **Total solids content: total solids (TS), Residue non-filterable (TSS), Total Dissolved Solids (TDS) (oven and gravimetric),**
* **Total volatile solids (TVS) and total suspended volatile solids (TVSS) (oven and muffle furnace).**

**ENTER NAME** **2** Laboratory:

* **Ammonia (Non-compliance spectrophotometry).**
* **Biochemical Oxygen Demand (BOD)/CBOD (meter and incubation),**
* **Dissolved Oxygen (Winkler & meter),**
* **Fecal coliform, E. Coli, Total Coliform (incubation),**
* **Nitrate (Non-compliance spectrophotometry),**
* **Nitrate and Nitrite (cadmium reduction and spectrophotometry),**
* **pH (meter),**
* **Residual Chlorine (spectrophotometry),**
* **Temperature (meter and glass thermometer),**
* **Total Phosphorus (digestion and spectrophotometry),**
* **Total solids content: total solids (TS), Residue non-filterable (TSS), Total Dissolved Solids (TDS) (oven and gravimetric),**
* **Total volatile solids (TVS) and total suspended volatile solids (TVSS) (oven and muffle furnace).**

**ENTER NAME** **3** Laboratory:

* **Ammonia (Non-compliance spectrophotometry).**
* **Biochemical Oxygen Demand (BOD)/CBOD (meter and incubation),**
* **Dissolved Oxygen (Winkler & meter),**
* **Fecal coliform, E. Coli, Total Coliform (incubation),**
* **Nitrate (Non-compliance spectrophotometry),**
* **Nitrate and Nitrite (cadmium reduction and spectrophotometry),**
* **pH (meter),**
* **Residual Chlorine (spectrophotometry),**
* **Temperature (meter and glass thermometer),**
* **Total Phosphorus (digestion and spectrophotometry),**
* **Total solids content: total solids (TS), Residue non-filterable (TSS), Total Dissolved Solids (TDS) (oven and gravimetric),**
* **Total volatile solids (TVS) and total suspended volatile solids (TVSS) (oven and muffle furnace).**

**ENTER NAME** **4** Laboratory:

* **Ammonia (Non-compliance spectrophotometry).**
* **Biochemical Oxygen Demand (BOD)/CBOD (meter and incubation),**
* **Dissolved Oxygen (Winkler & meter),**
* **Fecal coliform, E. Coli, Total Coliform (incubation),**
* **Nitrate (Non-compliance spectrophotometry),**
* **Nitrate and Nitrite (cadmium reduction and spectrophotometry),**
* **pH (meter),**
* **Residual Chlorine (spectrophotometry),**
* **Temperature (meter and glass thermometer),**
* **Total Phosphorus (digestion and spectrophotometry),**
* **Total solids content: total solids (TS), Residue non-filterable (TSS), Total Dissolved Solids (TDS) (oven and gravimetric),**
* **Total volatile solids (TVS) and total suspended volatile solids (TVSS) (oven and muffle furnace).**

**ENTER NAME** **5** Laboratory:

* **Ammonia (Non-compliance spectrophotometry).**
* **Biochemical Oxygen Demand (BOD)/CBOD (meter and incubation),**
* **Dissolved Oxygen (Winkler & meter),**
* **Fecal coliform, E. Coli, Total Coliform (incubation),**
* **Nitrate (Non-compliance spectrophotometry),**
* **Nitrate and Nitrite (cadmium reduction and spectrophotometry),**
* **pH (meter),**
* **Residual Chlorine (spectrophotometry),**
* **Temperature (meter and glass thermometer),**
* **Total Phosphorus (digestion and spectrophotometry),**
* **Total solids content: total solids (TS), Residue non-filterable (TSS), Total Dissolved Solids (TDS) (oven and gravimetric),**
* **Total volatile solids (TVS) and total suspended volatile solids (TVSS) (oven and muffle furnace).**

Most analyses performed in the laboratories involve the measurement of wastewater constituents by colorimetry, meter, and gravimetric analysis. Several preparatory techniques require digestion or reduction of samples in **ENTER NAME** laboratory. Analyses performed in **ENTER NAME** laboratory also include BOD/CBOD analysis, microbiological culture, and cell counts. The **ENTER NAME** laboratory also utilizes acids and reagents to prepare and preserve samples for contracted work and some in-house analysis.

## Analytical Reagent Preparation

Some of the analyses that the **INSERT AGENCY’S NAME** laboratories conduct use strong chemicals (e.g., sulfuric acid, nitric acid, and sodium hydroxide) generally in low volumes.

The potential for exposure can also occur during the preparation of reagents and standard solutions. In addition to the general rules and PPE established in this procedure, when preparing solutions remember to:

* Place stronger solutions in weaker ones, to dissipate the heat of neutralization.
* Mix materials (e.g., sulfuric acid, nitric acid, sodium hydroxide, hydrochloric acid) that have significant vapor pressures or heat of reaction in a laboratory hood.
* Prepare to dilute solutions of acid by adding acid to water under the fume hood. Never add water to acid!

## Microbial Analysis

Measurement of fecal coliform, handling wastewater samples, and the BOD test constitute a potential biological hazard. These tests present a lesser potential for chemical exposure, but some potential for contact with infectious agents.

Follow the general rules and PPE established in this procedure. There are no additional task-specific requirements.

### Titration Analysis

Measurement of dissolved oxygen by the Winkler method constitutes simple titrations. These tests use reactive chemicals, such as sulfuric, but involve little physical manipulation. Follow the general rules and PPE established in this procedure. There are no additional task-specific requirements.

### Analysis with Digestion

Measurement of total phosphorus constitutes instrumental methods with chemical digestion. This test uses reactive chemicals, such as sulfuric acid, and involves physical manipulation. In addition to the general rules and PPE established in this procedure:

* Handle hot surfaces only with insulating gloves.
* Perform open digestions that release airborne acids in a laboratory hood.

### Evaporation Analyses

Measurement of total solids, total dissolved solids, and suspended solids constitute gravimetric analysis preceded by evaporation. These tests involve physical manipulation. In addition to the general rules and PPE established in this procedure:

* Perform vacuum extraction only with glassware designed for work with the level of vacuum provided
* Handle hot surfaces only with insulating gloves or tongs.
* Stay aware of the condition of heating blocks, ovens, and the muffle furnace during use; allow them to cool at the end of their use.
* When analyzing samples that may generate noxious fumes, dry or ash, do so under a fume hood.

### Specific Information Regarding Nitrate and Ammonia TNT chemicals

* + - 1. **Nitrate TNT:**

**Hazard statements:** Flammable liquid and vapor**.** Causes serious eye irritation**.** May cause drowsiness or dizziness

**Precautionary statements**

* Avoid breathing dust/fume/gas/mist/vapors/spray
* Store in a well-ventilated place. Keep the container tightly closed. Keep cool.
* Keep away from heat/sparks/open flames/hot surfaces.
* Take precautionary measures against static discharge
* Wear protective gloves/protective clothing/eye protection/face protection

**Symptoms**- Burning sensation. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea, and vomiting.

**First Aid:**

* Call a Poison Center or doctor if you feel unwell after exposure.
* **Inhalation** Remove to fresh air. If exposed or concerned, get medical advice/attention.
* **Eye contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Keep eye wide open while rinsing. Do not rub the affected area. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists.
* **Skin contact** Wash off immediately with soap and plenty of water (Use shower if necessary) while removing all contaminated clothes and shoes.
* **Ingestion** Do NOT induce vomiting. Clean mouth with water and drink afterward plenty of water. Never give anything by mouth to an unconscious person. Call a physician.
* **Self-protection of the first aider** Ensure that medical personnel is aware of the material(s) involved, take precautions to protect themselves, and prevent the spread of contamination. Avoid contact with skin, eyes, or clothing.
  + - 1. **Ammonia TNT:**

**Hazard statements:** Causes severe skin burns and eye damage

**Precautionary statements:**

* Do not breathe dust or mists
* Wash face, hands, and any exposed skin thoroughly after handling
* Wear protective gloves/protective clothing/eye protection/face protection
* Wash contaminated clothing before reuse

**First Aid:**

* **General advice** No hazards which require special first aid measures. Use first aid treatment according to the general guidelines in this CHP and based on the nature of the injury.
* Call a Poison Center or doctor if you are exposed.
* **Inhalation** Remove to fresh air and keep at rest in a position comfortable for breathing
* **Eye contact** Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Keep eye wide open while rinsing. Do not rub the affected area. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention.
* **Skin contact** Wash off immediately with soap and plenty of water (Use shower if necessary) while removing all contaminated clothes and shoes.
* **Ingestion** Do NOT induce vomiting. Clean mouth with water and drink afterward plenty of water. Call a physician.

# New or modified laboratory procedures

The following laboratory operations require prior approval of the Chemical Hygiene Officer / Laboratory Manager and Safety Officer before they can be carried out:

* When a new procedure or test is used involving chemicals.
* Change or substitution of a chemical used in a procedure.
* When particularly hazardous substances ("Select Carcinogens," reproductive toxins and substances that have a high degree of acute toxicity) are used.
* A substantial change in the quantity of a chemical used or stored in the lab (a quantity increase of 50 percent or more is considered substantial).

Re-evaluation of laboratory procedures is required under the following circumstances:

* When a procedure provides an unexpected reaction or hazard.
* When there is a failure of any equipment used in a procedure, especially safety equipment (fume hoods).
* When members of the laboratory staff suspect exposure.

The Laboratory Manager shall consider and evaluate any potential hazards associated with the procedure and ensure that safe practices are used. Safe practices include utilizing appropriate safety equipment (e.g., fume hoods, gloves) and ensuring that personnel involved in the operations are properly trained and prepared to follow the safety guidelines as established by this plan.

Routine SOPs prepared for standard laboratory analysis will include a safety summary providing potential areas for concern during analysis and proper PPE.

*Supervisors and the* ***INSERT AGENCY’S NAME*** *Safety Committee are responsible for conducting hazard assessments on new procedures. These assessments should not be limited to chemical hazards, but should also include such issues, when applicable, as biological hazards, heat and cold hazards, and physical hazards.*

### Non-Laboratory Staff Working in Laboratory

Approval is required when non-laboratory staff conducts or participates in any laboratory operation. Requests for approval are submitted to the Chemical Hygiene Officer. Authorization of the Chemical Hygiene Officer or the Laboratory Manager is required before work may begin.

# iNSPECTIONS AND PROGRAM REVIEW

**Inspections:**

The following safety inspections are conducted in the **INSERT AGENCY’S NAME** laboratories:

* Test eyewash and safety shower – WEEKLY
* Visually inspect fire extinguishers - MONTHLY
* Visually inspect electrical equipment and cords - MONTHLY
* Inspect passageways to make sure they are clean - CONTINUOUSLY
* Confirm that housekeeping rules are followed - MONTHLY
* Inspect and measure face velocities of all hoods – ANNUALLY
* Check for incompatible storage of chemicals- MONTHLY

The Laboratory Manager coordinates inspections and will observe lab operations periodically to evaluate safety and compliance with this plan. Monthly safety inspections are conducted by the Chemical Hygiene Officer / Laboratory Manager on **INSERT AGENCY’S NAME** main laboratory. Inspections of operator’s laboratories are conducted by the Laboratory Manager or Laboratory Technician less frequently. This is due to limited analyses and less hazardous analyses being conducted, small quantities of chemicals being used, and less hazardous chemicals being used. See Appendix D for the inspection checklist. The report must include any problems noted during the inspection along with how to correct them. Follow-up of corrective action must be done.

**CHP Review**

Review this plan annually and update as needed. The Chemical Hygiene Officer will conduct this review.

**Documentation**

Monthly and annual inspections will be documented and retained by the Chemical Hygiene Officer.

Initial and Refresher training documentation will be retained by the Chemical Hygiene Officer.

Safety Data Sheets will be maintained at inaccessible locations by the Laboratory Manager.

**Signs:** Prominent signs of the following types should be posted:

* A telephone list of all employee’s contact numbers is posted in the laboratories and throughout the building.
* Telephone numbers of emergency personnel and facilities and **INSERT AGENCY’S NAME** managers are also posted in the main laboratory. Refer to Appendix E for the emergency telephone number list posted.
* Identity labels, showing contents of containers (including waste containers) and associated hazards.
* Location signs for exits, safety showers, eyewash stations, fire extinguishers, spill kits, and any other safety and first aid equipment.
* Warnings at areas or equipment where special or unusual hazards exist.

# rECORDKEEPING

All records must be kept, transferred, and made available per 29 CFR 1910.1020.

All accident, fatality, illness, injury, and medical records and exposure monitoring records must be retained by the Authority per the requirements of state and federal regulations (see 29 CFR part 1904 and §1910.1450(j)).

Medical records shall be maintained for each employee with occupational exposure per 29 CFR 1910.20. The required medical records will be maintained by the Authority- all active employee records are maintained in the Director of Personnel’s office.

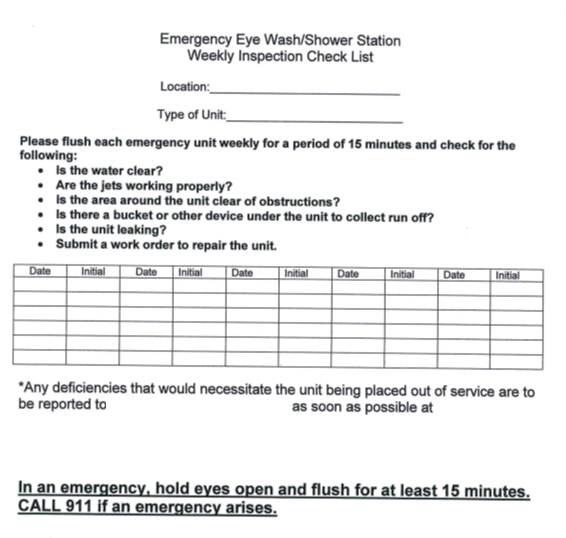
Any exposure monitoring results must be provided to affected laboratory staff within 15 working days after receipt of the results (29 CFR 1910.1450(d)(4)).

Medical records shall be maintained for the duration of the employee’s employment, plus 30 years per 29 CFR 1910.20.

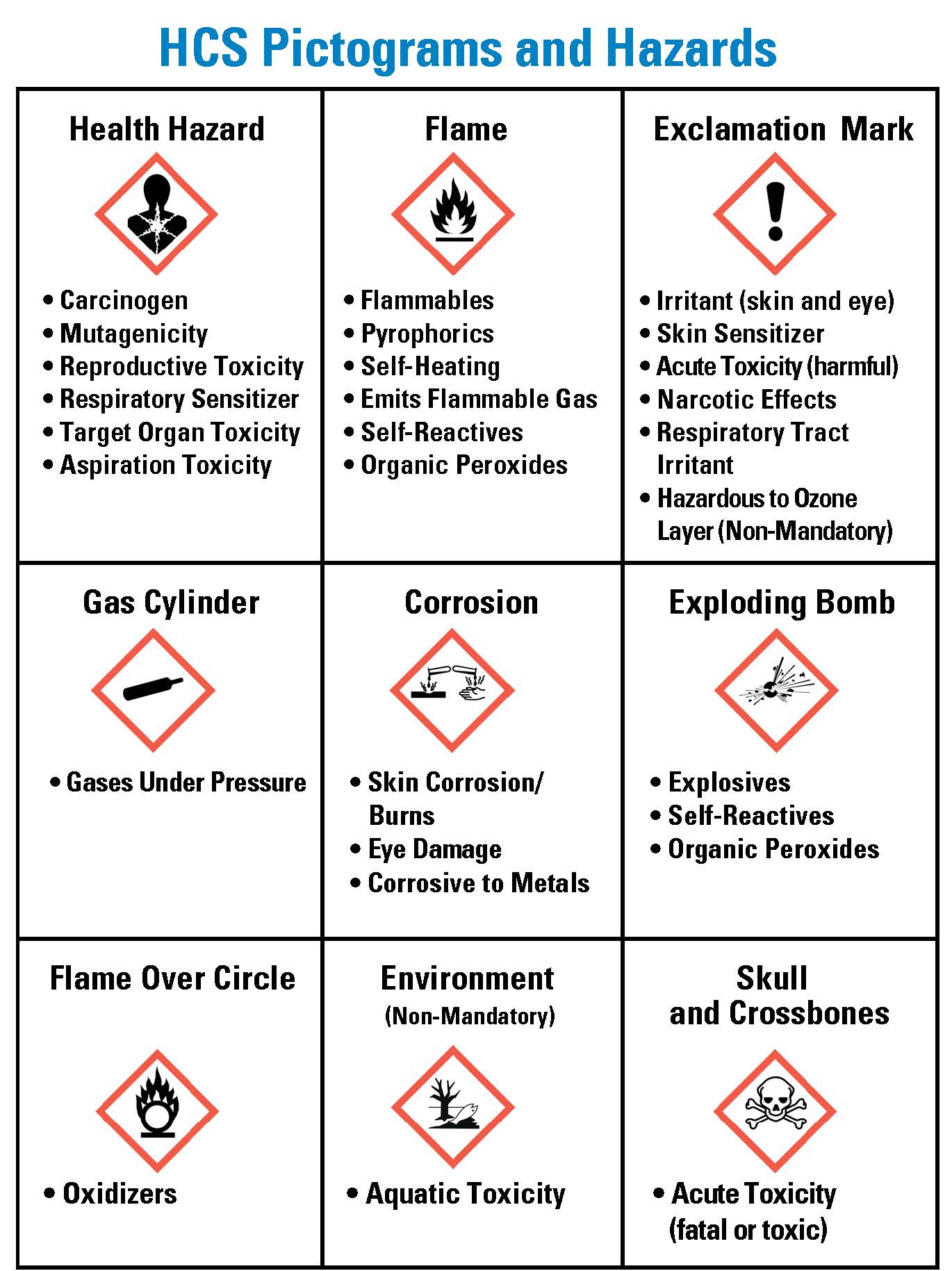
# REFERENCES

* PEOSH/OSHA 29CFR1910.1450 Occupational Exposure to Hazardous Chemicals in Laboratories
  + <https://www.osha.gov/law-regs.html>
* Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards; National Research Council; 2011
  + <http://www.ncbi.nlm.nih.gov/books/NBK55878/>
* New Jersey Right-to-Know Hazardous Substance List; NJ Department of Health and Senior Services
  + <http://web.doh.state.nj.us/rtkhsfs/rtkhsl.aspx>
* NFPA 704 Standard System for the Identification of Hazards of Materials for Emergency Response.
  + <http://www.nfpa.org/codes-and-standards/document-information-pages?mode=code&code=704>
* American Chemical Society, Safety in Academic Chemistry Laboratories, 8th Edition, 2017.
  + <https://www.acs.org/content/dam/acsorg/about/governance/committees/chemicalsafety/publications/safety-in-academic-chemistry-laboratories-students.pdf>

**Appendix A. Emergency Eye Wash/Shower Station Weekly Check List**



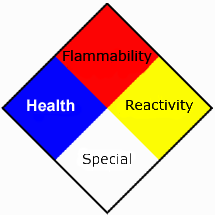
**Appendix B. The Hazard Communication Standard (HCS) Pictograms and Hazards**



# Appendix C. NFPA 704 System for the Identification of Hazards of Materials

**NFPA 704**

The National Fire Protection Association (NFPA) 704 Standard details an identification system developed to alert emergency personnel of the type and degree of chemical hazards within an area. The Fire Prevention Code requires the use of this system to identify the contents of stationary containers and above-ground storage tanks and to identify locations where quantities of hazardous materials exceed thresholds established in the Fire Code.

The four quadrants of the diamond have specific meanings as follows:

* Blue quadrant indicates health hazard
* Red quadrant indicates fire hazard
* Yellow quadrant indicates reactivity hazard
* The lower quadrant contains symbols indicating special hazards, such as OXY for oxidizers, radioactive, and W for water-reactive materials

Each of the colored quadrants contains a number from 0 to 4 indicating the relative degree of hazard of the material stored in the container or area.

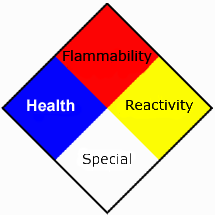
**Hazard Rating Examples**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Material** | **Health** | **Flammability** | **Reactivity** | **Special** |
| Acetone | 1 | 3 | 0 | - |
| Ethyl Alcohol | 3 | 3 | 0 | - |
| Nitric Acid | 3 | 0 | 1 | Oxidizer |
| Phosphoric Acid | 3 | 0 | 1 | - |
| Sodium Hydroxide | 3 | 0 | 1 | - |
| Ammonium Hydroxide | 3 | 1 | 0 | - |
| Sulfuric Acid | 3 | 0 | 1 | Water-reactive |
| Chloroform | 2 | 0 | 0 | - |
| Potassium Nitrate | 1 | 1 | 2 | Oxidizer |
| Potassium Nitrite | 2 | 0 | 3 | Oxidizer |

Note: Ratings may vary slightly by supplier or manufacturer.

**Multiple Materials**

When multiple materials are stored together place one sign with an estimated rating for the combined storage based on relative hazards and volume. NFPA labels are located on the outside of storage cabinets containing numerous chemicals.

**NFPA 704 Hazard Ratings**

|  |  |  |
| --- | --- | --- |
| **HEALTH:** The health hazard rating is based on the greatest hazard that could exist under fire or other emergency conditions in the event of a single exposure which may vary from a few seconds up to an hour. The common health hazards from the burning of ordinary combustible materials (i.e. heat) are not included. | | |
| **Rating** | **Description** | **Example** |
| 0 | Material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible material. | Peanut oil |
| 1 | Material that on exposure would irritate but only minor residual injury. | Turpentine |
| 2 | Material that on intense or continued but not chronic exposure could cause temporary incapacitation or possible residual injury. | Ammonia gas |
| 3 | Material that on short exposure could cause serious temporary or residual injury. | Sulfuric acid |
| 4 | Material that on very short exposure could cause death or major residual injury. | Nitric acid |

|  |  |  |
| --- | --- | --- |
| **FLAMMABILITY:**  The flammability rating indicates the conditions under which the material will burn. | | |
| **Rating** | **Description** | **Example** |
| 0 | The material will not burn. | Water |
| 1 | The material must be preheated before ignition can occur. | Corn oil |
| 2 | The material must be moderately heated or exposed to a relatively high ambient temperature before ignition can occur. | Diesel, Kerosene |
| 3 | Liquids and solids can be ignited under almost all ambient temperature conditions. | Gasoline, Acetone |
| 4 | Materials that will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature, or that are readily dispersed in air and that will burn readily. | Acetylene, LPG |

|  |  |  |
| --- | --- | --- |
| **REACTIVITY:** This hazard rating deals with the degree of susceptibility of materials to release energy by themselves or in combination with other materials. | | |
| **Rating** | **Description** | **Example** |
| 0 | Material that in itself is normally stable, even under fire exposure conditions, and is not reactive with water. | Nitrogen |
| 1 | Material that in itself is normally stable, but can become unstable at elevated temperatures and pressures. | Phosphorus |
| 2 | Material that readily undergoes a violent chemical change at elevated temperatures and pressures or which reacts violently with water or which may form explosive mixtures with water. | Methyl Ethyl Ketone Peroxide |
| 3 | Material that in itself is capable of detonation or explosive decomposition or reaction but requires a strong initiating source or which must be heated under confinement before initiation or which reacts explosively with water. | Fluorine gas |
| 4 | Material that in itself is readily capable of detonation or explosive decomposition or reaction at normal temperatures and pressures. | Picric acid |

# Appendix D. Laboratory Safety Inspection Form



# Appendix E. Telephone list of emergency personnel and facilities and INSERT AGENCY’S NAME managers

|  |  |  |
| --- | --- | --- |
| **Laboratory Emergency Contacts** | | |
| **Emergency Service** | **Name/Provider** | **Phone Number** |
| Executive Director |  |  |
| Director of Operations |  |  |
| Chemical Hygiene Officer/Lab Manager |  |  |
| Safety Officer |  |  |
| Lab Technician |  |  |
| Fire Department |  |  |
| Police Department |  |  |
| 24 Hour Ambulance |  |  |
| Poison Control Center |  |  |
| Company Health Services |  |  |
| Hospital |  |  |

\*A telephone list of all employee’s contact numbers is also posted in the laboratories.