Central Washington University

Chemical Hygiene Plan

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1 Introduction

1.1. Purpose

Central Washington University has a commitment to create, maintain, and enhance a safe and healthful environment for all individuals associated with the institution.

1.1.1. Implementation of the Chemical Hygiene Plan (CHP) is a critical element in achieving a safe and healthful environment in CWU laboratories. The purpose of this plan is to establish policies and procedures. In addition, it will provide general and specific guidelines and information to protect employees from health and physical hazards associated with hazardous chemicals and equipment in the laboratory. In fulfilling this purpose, the CHP also satisfies the state requirements for the standard on "Occupational Exposures to Hazardous Chemicals in Laboratories" herein referred to as the Laboratory Safety Standard (WAC 296-62-40001 through 40025). A copy of this standard is provided as **Appendix A**. A list of defined terms from the Laboratory Safety Standard is found in **Appendix B**. Implementation of a chemical hygiene plan in the laboratory will assist in minimizing chemical exposures and physical injury as well as complying with mandated exposure limits.

1.2 Scope and Applicability

1.2.1 This Chemical Hygiene Plan is intended to safely limit laboratory workers' exposure to hazardous chemicals regulated by the Washington Industrial Safety and Health Administration (WISHA). Laboratory workers must not be exposed to hazardous chemicals in excess of the permissible exposure limits listed in WAC 296-62-075 through 296-62-07515 (Air Contaminants). This list of air contaminants and their permissible exposure limits is found in **Appendix C** of this plan.

1.2.2 This standard applies where "laboratory use" of hazardous chemicals occurs. Laboratory use of hazardous chemicals refers to two factors:

- When the handling or use of chemicals occurs on a "laboratory" scale, that is, the work involves containers which can easily and safely be manipulated by one person; and
- When multiple chemical procedures or hazardous chemicals are used.

At a minimum, this definition includes employees who use chemicals in teaching, research, and chemical laboratories at CWU.

2. Implementation of the Chemical Hygiene Plan

2.1. In order to meet the requirements of the Laboratory Safety Standard, a Chemical Hygiene Plan must be written for each CWU laboratory. The CHP must contain:

- Standard operating procedures for use of hazardous chemicals;

- Designated area provisions;
- Descriptions of or provisions for fume hoods and other protective equipment;
- Provisions for employee information, training, and medical monitoring and examination;
- Evaluation criteria the employer will use to reduce exposure;
- Prior approval provisions for special laboratory projects;
- A designation of the Chemical Hygiene Officer, and other person(s) responsible for implementation of the CHP; and
- Any extra protection provisions.

22 The CHP must be readily available to all employees in the laboratory. The term "readily available" means accessible to all laboratory staff at any time, day, or night. It must also be available to Environmental Health & Safety (EH&S) staff and Washington State Department of Labor and Industries (L&I) representatives.

23 The area for which the CHP is written may be adjoining rooms, a single room, or an area within a room as long as the definition of "readily available," as stated above, is met. The spatial definition of a "laboratory" is left to the discretion of the individual who will ultimately take responsibility for the safety of all employees who work within that area. This individual should be a department head, faculty laboratory instructor, laboratory supervisor, or principal investigator.

24 EH&S has provided the basic elements of a "generic" or "core" Chemical Hygiene Plan. Included in this plan are the established policies for CWU and various regulatory agencies.

25 Each laboratory must provide additional information to make this plan relevant to the area.

3. Responsibilities

3.1. Departments

Each department is responsible for supporting and promoting safe and compliant work practices in the laboratory. Department faculty and administration are responsible for facilitating the implementation of the Chemical Hygiene Plan within each department.

3.1.1. Department Chair

3.1.1.1. Has overall responsibility for ensuring that all work performed within their department complies with applicable health, safety, and environmental requirements. The department chair may implement this responsibility through delegation to principal investigators, other faculty, department administration, or other departmental staff deemed appropriate.

3.1.2. Departmental Faculty

3.1.2.1. Collaborating with the administration, Environmental Health & Safety (EH&S) and others to identify effective means to implement the Chemical Hygiene Plan in the laboratory.

3.1.2.2. Providing feedback to administration regarding compliance status.

3.1.2.3. Ensuring that personnel receive required training to implement the Chemical Hygiene Plan effectively.

3.1.2.4. Coordinating and facilitating exchange of information regarding chemical hygiene issues with the research and teaching communities.

3.1.3. Principal Investigators (PIs)

3.1.3.1. Each Principal Investigator plays a critical role in the implementation of the Chemical Hygiene Plan. The PI has primary responsibility for chemical hygiene and EH&S compliance in his or her laboratory. These responsibilities include ensuring that:

- Laboratory personnel have adequate knowledge and information to recognize and control chemical hazards in the laboratory.
- Hazardous operations are defined and safe practices and protective equipment are designated and provided.
- Safe work practices, personal protective equipment and engineering control are used to reduce the potential for exposure to hazardous chemicals and equipment.
- Laboratory personnel are informed of the potential hazards of the chemicals and equipment they use and are trained in safe laboratory practices, controls, and emergency procedures.
- Laboratory personnel are informed of the signs and symptoms associated with exposures to hazardous chemicals used in their laboratory.
- Chemical waste is managed properly.
- Action is taken to correct work practices and conditions that may result in release of hazardous chemicals.
- The PI grants approval, where required, prior to the use of particularly hazardous substances in the laboratory.
- Laboratory operations are supervised to ensure that the Chemical Hygiene Plan is being followed.
- Compliance with the CHP is maintained and documented.

3.1.4. Chemical Hygiene Officer (CHO) – May be Incorporated into the Duties of the PI

3.1.4.1. The Chemical Hygiene Office (CHO) (e.g., Principal Investigator, Lab Supervisor, or Safety Coordinator/Officer) is critical to the effective implementation of the Chemical Hygiene Plan. The CHO is responsible for the adaption and implementation of the Chemical Hygiene Plan in his or her laboratory, thus maintaining a safe work environment and ensuring compliance with regulatory requirements. The duties of the CHO include the following:

- Appropriate training is provided to new and current laboratory personnel and is properly documented.
- Workers know and follow established safe work practices and emergency procedures.
- Safety equipment and engineering controls are utilized.
- Appropriate personal protective equipment is utilized.
- Laboratory practices and safety and control equipment inspections are routinely conducted and properly documented.
- Copies of the up-to-date Chemical Hygiene Plane and chemical hazard reference material (e.g., MSDS/SDS) are available to laboratory personnel.
- Procedures developed for new or particularly hazardous substances or operations are coordinated with input from Environmental Health & Safety Office.
- Accidents and other potential exposure conditions are reported to the Chemical Hygiene Officer and the Environmental Health & Safety Office for further investigation, exposure monitoring, or input regarding appropriate corrective actions.
- Recommended actions are taken to correct any unsafe condition.

3.1.5. Laboratory Personnel

3.1.5.1. Laboratory personnel and principal investigators share responsibility for chemical and physical safety in their laboratory, as well as informing visitors entering their laboratory of the potential hazards and safety precautions to be taken. Laboratory personnel are responsible for:

- Participating in laboratory safety training sessions.
- Being aware of the hazards of the chemicals and equipment they are working around or with, and safe storage, handling, and disposal procedures.
- Planning and conducting each operation or experiment in accordance with established chemical hygiene procedures.

- Using appropriate safe work practices, personal protective equipment, and engineering controls at all times.

3.1.6. Non-Laboratory Personnel / Support Staff Responsibilities

3.1.6.1. Custodians and maintenance staff (support staff) often must enter laboratories to perform routine tasks such as cleaning and equipment maintenance. Support staff members are expected to follow the posted safety rules of each laboratory. Minimum PPE requirements for support staff working in a laboratory are safety glasses, long pants, and closed-toe shoes. If additional PPE is required or if other unique safety requirements must be followed, it is the lab personnel's responsibility to notify support staff.

3.1.7. Environmental Health & Safety Office (EH&S)

3.1.7.1. The primary responsibility of the Environmental Health and Safety Office is to provide technical support and guidance to laboratory personnel for the development and management of environmental, health, and safety programs. EH&S is responsible for reviewing and updating the common (non-lab specific) portions of this Chemical Hygiene Plan on an annual basis and distributing any required changes to appropriate University personnel. The EH&S Office offers the following services relating to chemical hygiene:

- Development and evaluation of safety procedures.
- Laboratory inspection and audits.
- Fume Hood validation and inspection.
- Training and information dissemination.
- Hazardous waste disposal.
- Hazard and exposure assessments.
- Accident investigation.
- Emergency assistance.

4. General Chemical Hygiene and Safety Requirements

4.1. It is prudent to minimize all chemical exposures. State Occupational Health Standards have established Permissible Exposure Limits (PELs) for over 600 chemical agents. Exposure to these agents must be controlled in such a manner that the workers' exposure shall not exceed the applicable limits (WAC 296-62-07515).

4.2. Information that must be provided or made available to laboratory personnel includes:

4.2.1. How to obtain copies of the OSHA Lab Standard and Appendix A and Appendix B.

4.2.2. The location and availability of the Chemical Hygiene Plan.

4.2.3. How to obtain Permissible Exposure Limits (PELs) for OSHA-regulated substances https://www.osha.gov/dsg/topics/pel/ and the ACGIH Threshold Limit Values (TLVs) (e.g., by contacting EH&S) for hazardous substances not given OSHA PELs.

4.2.4. Resources and reference sources for signs and symptoms associated with exposure to hazardous substances used in the laboratory.

4.2.5. The location and availability of known reference materials on hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory.

4.3. Environmental Monitoring

4.3.1. The employer shall measure the employee's exposure to any regulated hazardous chemical if there is reason to believe that exposure levels for that chemical routinely exceed the action level or in the absence of an action level, the PEL (WAC 296-62-40007).

4.3.2. Representative air monitoring is mandatory for the following chemicals because they are regulated by substance-specific health standards:

- Acrylonitrile
- 1,2-Dibromo-3-chloropropane
- Inorganic Arsenic
- Asbestos
- Ethylene oxide
- Lead
- Benzene
- Formaldehyde
- Vinyl chloride

4.3.3. Additional air monitoring may be needed when there is a change in lab procedure or design, which may cause overexposure to hazardous substances.

4.3.4. Events or circumstances that might reasonably constitute overexposure include:

4.3.4.1. A hazardous chemical leaked, spilled, or otherwise was released in an uncontrolled manner.

4.3.4.2. A laboratory employee had direct skin or eye contact with a hazardous chemical.

4.3.4.3. A laboratory employee manifests symptoms such as headache, rash, nausea, coughing, tearing, irritation, or redness of eyes, irritation of throat, dizziness, loss of motor dexterity or judgment, and:

- Some or all of the symptoms disappear when the person is taken away from the exposure area and breathes fresh air.
- The symptoms reappear soon after the employee returns to work with the same hazardous chemicals.

4.3.4.4. Two or more persons in the same laboratory work area have similar complaints.

4.3.5. If you suspect that chemical exposures may exceed permissible limits, contact EH&S (963-2252) for assistance with environmental monitoring.

4.4. Medical Surveillance

4.4.1. Laboratory employees who suspect they have been overexposed, or are having symptoms consistent with overexposure to a hazardous chemical, will be provided, at a reasonable time and place without cost to the employee, medical examinations and consultations conducted by or under direct supervision of a licensed physician (WAC 296-62-40001 through 40025).

4.4.2. Medical consultation, exams and surveillance, which may be required under the standard, will be coordinated through EH&S.

4.4.3. Staff involved in any emergency situation should go directly to the nearest emergency room or call 911 for assistance.

4.5. Research Area Inspections

4.5.1. Laboratories and other research areas are regulated by WISHA/OSHA laboratory safety standards and general industry regulations, DOE and EPA hazardous waste regulations, DOH regulations, NFPA life and fire safety standards, and building codes. To assist researchers to be in compliance with these regulations and standards, EH&S will conduct required inspections of all campus research areas on an annual basis.

4.5.2. The purpose of the inspections is to assist responsible faculty and staff members in identifying and correcting potential regulatory compliance issues or other issues that could affect granting activities, and identify potential health and safety hazards that could pose an unreasonable risk to laboratory personnel, students, and the campus community. To facilitate the correction of deficient items, a corrective action process has been implemented and will be tracked. EH&S will schedule inspections by working with college-level contacts, Department Safety Representatives, Building Monitors and staff throughout the colleges, departments, and buildings.

4.5.3. Research areas are strongly encouraged to conduct their own self inspections prior to EH&S conducting an inspection of their research area to address any potential issues before the EH&S inspection and to provide a training opportunity for research staff. To facilitate the self-inspection process, EH&S is providing research areas with the following self-inspection checklist and explanation key which identify the same topics covered during an EH&S inspection (see **Appendix D**).

4.6. Self-Inspections

4.6.1. An important part of any research safety program is implementation of self-inspections. Self-inspections provide a number of useful benefits and further help to create a culture of safety within the lab. Benefits of self-inspections include:

- Raising the level of awareness of laboratory personnel and determining the level of compliance with state and federal regulations.

- Identifying and addressing any potential issues before an inspection by a state or federal regulatory agency.
- Providing an opportunity for lab specific training by identifying potential issues within the lab and then training lab personnel to look for these issues.
- Serving as a regular health and safety check of laboratory facilities.
- Serving as an outlet for faculty, staff, and student concerns.

4.6.2. EH&S recommends the following frequency for self-inspections:

- On a daily basis lab personnel should maintain good housekeeping within their lab.
- Informal weekly lab walkthroughs or "Friday afternoon cleanups".
- Ideally, self-inspections should occur once per month. These could include participation of research staff, DSRs, and/or safety committee members, and use of an inspection checklist.
- At least once per semester research personnel should perform a formal self-inspection utilizing the EH&S self-inspection checklist and explanation key.

4.6.3. The benefits of conducting inspections of laboratories on a regular basis cannot be overstated. In addition to providing for a healthier and safer work environment, lab inspections can reduce legal liability by identifying potential issues, and training lab personnel to look for and correct potential issues.

4.7. Chemical Procurement, Distribution, and Storage

4.7.1. Procurement

4.7.1.1. Laboratory personnel should obtain prior approval to proceed with a laboratory procedure from the Principal Investigator.

- No container will be accepted without an adequate identifying label (identity of chemical, hazard warnings, manufacturer's name and address).
- □ Before a chemical is received, information on proper handling, storage, and disposal should be known.

4.7.2. Peroxide Forming Chemicals

4.7.2.1. Peroxidizable chemicals must be dated when opened and used or disposed of within the period specified for specific chemical.

4.7.3. Distribution

4.7.3.1. When chemicals are hand carried, the container should be placed in an outside container or acid-carrying bucket to protect against breakage and spillage. Freight-only elevators should be used, if possible.

4.7.4. Housekeeping/Hygiene

4.7.4.1. The following housekeeping and hygiene practices should be implemented at all times to reduce the likelihood of accident or chemical exposure:

- □ Work area should be kept clean and free from obstructions.

- □ Hands should be washed after every experiment, before touching any non-contaminated area or object, and before leaving the laboratory area.
- □ Access to exits, emergency exits, aisles, hallways, stairways, stairwells and controls must never be blocked.
- □ Emergency exits must be kept unlocked from the inside.
- □ Hallways should not be used as storage areas.
- □ Work areas should be cleaned at the end of the experiment and at the end of the day.

5. Laboratory Storage

5.1. Many potential hazards are associated with the storage and handling of laboratory chemicals. Understanding the properties of the chemicals and planning procedures by which they may be handled safely may minimize these hazards. Simply storing chemicals alphabetically is not prudent. Flammable, corrosive, explosive, and peroxide forming agents require special precautions. Storing incompatible chemicals together may have disastrous results. The following guidelines are prudent for all chemical storage and handling:

5.1.1. **Chemical Handling:** Use battle carriers to transport chemicals. Close caps securely. Pour all chemicals carefully. Add acid to water, not water to acid.

5.1.2. **Labels:** Be sure all labels are securely attached and legible. Keep chemicals in their original container if possible. Label all secondary containers to avoid unknown chemicals and/or inadvertent reaction. Date all chemicals which may become unstable over time or are peroxidizable.

5.1.3. **Shelves:** Avoid storing hazardous liquid chemicals on hard-to-reach shelves. Labels on stored chemicals should be able to read easily (facing outward). Shelves should be made of a chemically resistant material.

5.1.4. **Incompatible Chemicals:** Incompatible chemicals must not be stored together. For each chemical, the hazardous nature must be considered individually and in relation to other chemicals in the area. Refer to the chemical MSDS/SDS, or see **Appendix E** for a table of common incompatible chemicals.

5.1.5. **Excessive Storage:** Avoid stockpiling chemicals. Purchase only what is needed. Use older stock first. Discard chemicals which are no longer needed or that have expired.

5.1.6. **Hallway Storage:** Hallways should not be used as storage areas for chemicals.

5.1.7. **Chemical Fume Hoods:** In general, fume hoods should not be used for storage of chemicals, unless they are part of the experiment being conducted in the fume hood at that time. The exception is storage in a fume hood, which is specifically designed for that storage, and where experimental procedures are not carried out.

5.2. Flammable Liquids

5.2.1. **Glass containers:** Whenever practical, glass containers should not be used for storing flammable liquids. If a glass container must be used, the maximum allowable container size is 4L (1-gallon).

5.2.2. **Metal (non-DOT) or plastic containers:** No more than 20L (5-gallons) of flammable liquid should be stored in regular metal or plastic containers.

5.2.3. **Safety cans:** Safety cans are the preferred containers for storage outside a flammable liquid storage cabinet. Safety cans are available in several sizes. They have spring-loaded spout covers that can open to relieve internal pressure when subjected to fire, and will prevent leakage if tipped over. Flame arresters are present in the spout to prevent flame propagation into the can. The maximum size of the container should be 20L (5-gallons).

5.2.4. **Flammable liquid storage cabinets:** Use of flammable liquid storage cabinets is the method of choice for storage of small quantities of flammable liquids. Flammable storage cabinets are made of double-walled steel, and are equipped with flame arresters. Some models have doors that close automatically and some have sprinkler systems. The cabinets must bear a label assuring that it is approved by Factory Mutual or Underwriters Laboratories.

5.2.5. **Refrigerators/freezers:** Refrigerators and freezers used for storage of flammable materials must be rated for flammable storage and labeled accordingly.

5.2.6. **Maximum quantities:** In general, no more than 10-gallons of flammable liquids per 100 square feet of laboratory space should be stored outside a flammable liquid storage cabinet or safety can.

5.2.7. **Handling:** Transfer and storage of flammable materials should not be in an area where a spill of the liquid could block an exit from the room, hallway, or building in the event of a fire, and where there is a source of ignition.

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

5.3. Oxidizing Agents

5.3.1. **Storage:** Oxidizers should be stored on fire-resistant shelving, in a well-ventilated area.

5.3.2. **Incompatibles:** Oxidizing agents can initiate combustion and therefore should not be stored in the same area with fuel, such as flammable, organic chemicals, dehydrating agents, or reducing agents.

5.4. Perchloric Acid

5.4.1. At ordinary temperatures at concentrations of 72% and weaker, perchloric acid reacts as a strong, non-oxidizing acid. But at concentrations above 72% or at elevated temperatures (usually above 160^0 C), it is an exceedingly strong and active oxidizer and dehydrating agent. Anhydrous perchloric acid is unstable at

room temperature and will ultimately decompose spontaneously with violent explosion.

5.4.2. **Handling:** Perchloric acid should be handled in a fume hood designed for perchloric acid use (must have a wash down system to prevent accumulation of crystals on the ductwork and the ductwork must be specially coated).

5.4.3. **Incompatibles:** Perchloric acid must be stored away from oxidizers and organic materials, including wood, paper, and cloth.

5.5. Peroxidizable Materials

5.5.1. Ethers, liquid paraffins, and olefins form peroxides on exposure to air or light. Since these chemicals are packaged in an air atmosphere, peroxides can form even if the containers have not been opened (e.g., isopropyl ether, diethyl ether, dioxane, tetrahydrofuran, glyme, and diglyme). A representative list of common peroxidizable and other unstable materials is provided in **Appendix F**.

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

5.5.3. **Container inspection:** Containers should be inspected for peroxide formation before opening or moving the containers. If crystals are present around the lip of the container or the liquid appears cloudy, do not move or open it. Colorimetric tests are available to test for peroxide formation. Although some Ethers contain a peroxide inhibitor, they should still be inspected before opening.

5.5.4. **Dating of containers:** To ensure storage time limits are not exceeded, containers of peroxidizable materials should be dated when received, when opened, and when tested for peroxide formation.

5.6. Corrosive Materials

5.6.1. Corrosive substances are some of the most hazardous substances commonly encountered in the laboratory. In general, corrosive substances cause destruction of living tissue very rapidly at the site of contact (skin, eyes, respiratory tract and gastrointestinal tract). For this reason, proper selection and use of personal protective equipment is critical, when working with corrosives.

5.6.2. **Containers:** Whenever practical, corrosive materials should be purchased and stored in break-proof or break-resistant containers.

5.6.3. **Storage:** many acids and alkalis are corrosive to their containers and other materials in a storage area. In general, they should be stored in a cool, dry area, equipped with corrosion-resistant shelving and plumbing, preferably in a corrosive storage cabinet.

5.6.4. Acids react with many metals to form hydrogen gas, and alkalis may forms hydrogen gas when in contact with aluminum. Since hydrogen gas form an

explosive mixture with air, accumulation of hydrogen in storage areas must be prevented.

5.7. Toxic Materials

5.7.1. Toxic materials include carcinogens, reproductive toxins (teratogens, mutagens, etc.) and acutely hazardous materials. Toxic materials which are simultaneously hazardous because of another attribute (i.e., flammable, corrosive) should be evaluated to determine which is the most significant hazard (primary) and stored accordingly.

5.7.2. Access to these materials should be restricted to the people involved in the experiment and people who have been informed of the hazardous properties of the chemical. These chemicals should not be stored in a hallway, stairway, or any other emergency egress path regardless of whether they are contained in a storage can or cabinet. Lists of carcinogens are referenced in **Appendix G**.

5.7.3. If the toxicity of the chemical is the primary hazard, the chemical should be stored in one of the following ways:

- In a continuously operating chemical storage fume hood.
- In a volatile storage cabinet with restricted access, such as a locked cabinet.
- In a hermetically sealed container at a temperature low enough to significantly reduce its volatility (i.e., a deep freeze).

5.8. Compressed Gas Cylinders

5.8.1. Compressed gas cylinders present an important hazard because they have the potential for both mechanical and chemical hazards. The danger of fire or explosion is acute with a high rate of diffusion. Additional hazards arise from the reactivity and toxicity of the gas. Asphyxiation can be caused by high concentrations of even “harmless” gases such as Nitrogen. Finally, the large amount of potential energy resulting from the compression of the gas makes a compressed gas cylinder a potential rocket.

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

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

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

5.8.5. **Empty cylinders:** Cylinder caps should always be secured and cylinders should be clearly marked "empty." Empty cylinders should be kept secured as noted above.

5.9. General Safety Procedures

5.9.1. Basic Precautions

5.9.1.1. Awareness is the most fundamental rule of chemical safety. Take time to understand the safety and health hazards of the chemicals in the workplace. Every laboratory worker should take the following precautions:

- Prior to use, review the safety and health hazard data of the chemical used in the laboratory.
- Know the signs and symptoms of overexposure and the physical and sensory characteristics (odor, appearance) of these chemicals.
- Know appropriate procedures for emergencies, including the location and operation of all emergency equipment.
- When working with hazardous materials, have a second person nearby.
- Avoid leaving experiments unattended, whenever possible.
- Never use unlabeled chemicals.
- Always order the least amount of chemical.
- Use hazardous chemicals in a chemical fume hood.
- Maintain equipment and inspect it regularly for proper function.
- Use guards and shields where possible. All mechanical equipment should have adequate guarding.
- Use safety shields when there is a possibility for explosion or implosion.
- Store and handle chemicals in accordance with the guidelines contained in this Chemical Hygiene Plan or in accordance with the chemical manufacturer's guidelines.
- Store hazardous waste in a closed, labeled container in a designated satellite accumulation area (SAA).
- Do not eat, drink, chew gum, apply cosmetics while near or within chemical use or storage areas.
- Do not store food/drink containers in the laboratory or in a chemical refrigerator.
- Use mechanical pipettes or aspirators.

- Do not use chipped or cracked glassware.
- Report all accidents, even if they do not result in injury, to the principal investigator, chemical hygiene officer, safety officer and/or EH&S immediately.

6. Personal Protective Equipment

6.1. Central Washington University requires each PI or designee assess PPE needs annually. In addition, the PI must ensure that all required PPE is readily available to researchers and that all PPE is properly used in the laboratory.

6.2. Body and Foot Protection

6.2.1. When working with chemicals, a lab coat or apron and closed-toe shoes should be worn at all times. Hair and loose clothing should be confined.

6.3. Hand Protection

6.3.1. Hands are the most likely part of the body to come into contact with chemicals. Skin contact with chemicals may result in irritation, burns, or absorption of the chemical into the blood stream. Glove materials must be compatible with the chemical(s) used. Consult chemical information sources on the EH&S website, the glove manufacturer's literature or EH&S for chemical protective clothing references when choosing gloves for a specific application.

6.4. Eye Protection

6.4.1. Safety glasses, goggles, or face shields should always be worn when eye hazards are possible. Students and visitors should be provided with eye protection before entering a laboratory.

6.4.1.1. **Safety Glasses** must be used when working with solid materials. Safety glasses should comply with the ANSI Occupational and Educational Eye and face Protection Standard (Z87.1). Standard eyeglasses with side shields are generally not sufficient. Safety glasses should not be used when a significant splash potential exist.

6.4.1.2. **Chemical Splash Goggles** must be used when a splash hazard exists. These generally can be worn over regular eyeglasses. Goggles equipped with vents should be used to prevent fogging.

6.4.1.3. **Face Shields** must be worn when maximum protection from flying particles and harmful liquids is needed. These may be used in conjunction with goggles for maximum protection from corrosives and hot chemicals.

6.5. Respirators

6.5.1. When chemical substitution and effective engineering controls are not possible, respirators should be used. The WISHA Respiratory Protection Standard (WAC 296-842) and the OSHA Respiratory Protection Standard (29 CFR 1910.134) must be complied with for all personnel who are required or volunteer to wear a respirator. This standard specifies a medical valuation, training, fit testing,

selection, and guidelines for proper use. EH&S must be contacted before purchasing or using respiratory protection.

6.5.2. EH&S offers training and fit testing services for those workers who may require respirators. In addition, EH&S is available to assist laboratories in establishing a WISHA/OSHA-compliant Respiratory Protection Program.

7. Other Safety Equipment

7.1. Chemical Fume Hoods/Ventilation

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

7.1.2. **Use:** The ventilation system in the laboratory has been carefully balance to ensure proper airflow and comfortable working conditions. To prevent cross drafts, laboratory doors should be kept closed whenever possible. A complete guide to proper use of a laboratory fume hood is contained in **Appendix H**. **Maintenance:** laboratory fume hoods are evaluated by EH&S at least annually. During these evaluations, average face velocity of the hood is measured, and the hood containment is evaluated using flow visualization.

7.1.2.1. Hoods passing evaluation are labeled at an 18-inch sash height with a fume hood validation sticker indicating the date of evaluation. Hoods failing evaluation are posted with a failure notification form, and the hood operator(s) is informed of the failure. Failed hoods are reported to Facilities Management (FMD) for service and are reevaluated after service has been completed.

7.2. Laminar Flow Clean Benches

7.2.1. **Use:** A laminar flow clean bench is an enclosed bench designed to prevent contamination of samples or any particle sensitive device. Air is drawn through a filter and blown in a very smooth, laminar flow towards the user.

7.2.1.1. It is critical that absolutely no hazardous chemicals, infectious and/or radioactive materials ever be used in a laminar flow clean bench, as vapors are blown directly towards the user. Application that involves the use of chemicals should be conducted in chemical fume hoods.

7.2.2. **Maintenance:** Laminar flow clean benches are certified every two years by an outside certified vendor.

7.3. Biological Safety Cabinets

7.3.1. **Use:** A biological (or biosafety) safety cabinets is an enclosed, ventilated laboratory workspace for safely working with materials contaminated with (or potentially contaminated with) infectious materials. The primary purpose of a biosafety cabinet is to serve as a means to protect the laboratory worker and the surrounding environment from pathogens. All exhaust air is filtered as it exits the biosafety cabinet, removing harmful particles.

7.3.1.1. Biological safety cabinets are not designed to be used with chemical applications so the use of chemicals should be kept to a minimum. Applications that involve the use of chemicals should be conducted in chemical fume hoods.

732. **Maintenance:** Biosafety cabinets are certified every two years by an outside certified vendor.

7.4. Eyewash Stations

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

7.4.2. **Requirements:** The eyewash station must be capable of providing a continuous, soft stream of tepid water for at least 15 minutes. Drench hoses may support eyewash stations, but do not replace them unless meeting ANSI standards for a combination drench hose eyewash unit.

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

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

7.4.5. **Use:** After any eye contact with a chemical, activate the eyewash station and flush eyes for at least 15 minutes. If the chemical is alkaline, flush for at least 30 minutes. Avoid rinsing the chemical into the uninjured eye. If contact lenses are in place, flush for one minute, remove the lenses, and continue flushing. If appropriate, call 911 for emergency medical services. After flushing for the appropriate amount of time, seek medical attention at the University Health Center (if student) or the nearest emergency room.

7.5. Safety Showers

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

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

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

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

7.5.5. **Use:** In case of skin contact with a hazardous chemical, immediately activate the shower and flush the affected area for at least 15 minutes. For contact with dry solids, brush the contaminant gently off the skin before using the shower. While under the shower, remove clothing and jewelry from the affected area. After flushing, seek medical attention immediately at the University Health Center (if student) or the nearest emergency room. If appropriate, contact 911 for emergency medical services.

7.6. Fire Extinguishers

7.6.1. Portable fire extinguishers are necessary for a rapid suppression of small fires. Only people trained in the use of a fire extinguisher should operate one. Never try to fight a fire that is larger than you are.

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

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

7.6.3. **Types of Extinguishers:** There are several types of fire extinguishers. An extinguisher is rated as to the type of fire it can put out. The type of fire extinguisher is designed to extinguish is printed on the cylinder. A triangle with an “A” denotes Class A; a square with a “B” denotes Class B; a circle with a “C” denotes Class C; and a star with a “D” denotes Class D.

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

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

7.6.6. **Use:** Before using a fire extinguisher, SOUND THE ALARM or call 911 to report the fire. If the fire is small and you are trained to use a fire extinguisher, choose the correct fire extinguisher by checking the label. Pull the pin, aim the nozzle at the base of the flame and press the handle, sweeping with a side-to-side motion. If the fire becomes larger than you, or the contents of the extinguisher have been

discharged and the fire is still burning, evacuate the building closing doors behind you (but do not lock them).

8. Information and Training

8.1. The Principal Investigator (PI) or laboratory supervisor must provide employees with information and training to ensure that they understand the hazards of the chemicals and equipment present in their work area. EH&S has a variety of resources to assist in this process.

8.2. Chemical and equipment hazard information must be provided at the time of an employee's initial assignment to a work area where hazardous chemicals or equipment are present and prior to assignments involving new exposure situations. The employing department must provide this information.

8.3. Employee shall be informed of the following:

8.3.1. The contents of the Laboratory Safety Standard: **Appendix A**.

8.3.2. Location and availability of the Chemical Hygiene Plan.

8.3.3. Permissible exposure Limits (PELs)

8.3.4. Signs and symptoms of overexposure; information from Material Safety Data Sheets and/or Safety Data Sheets, or other references.

8.3.5. Laboratory safety references.

8.3.6. Labeling requirements.

8.4. Employee training shall include:

8.4.1. Methods and observations that may be used to detect the presence or release of hazardous chemicals.

8.4.2. The physical and health hazards of chemicals and equipment in the work area.

8.4.3. The measures that employees can take to protect themselves from those hazards, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.

8.4.4. The applicable details of the laboratory's Chemical Hygiene Plan.

9. Chemical Classification Systems

9.1. Chemical classification systems are designed to communicate hazards. The four (4) most widely used classification systems are the OSHA Globally Harmonized System (**GHS**) for Classifying and labeling Chemicals (adopted and implemented under the Hazard Communication Standard), the National Fire Protection Association (**NFPA**) system of classifying the severity of hazards, the Hazardous Materials Identification System (**HMIS**) is a numerical hazard rating that incorporates the use of labels with color-coded bars as well as training materials, and the Department of Transportation (**DOT**) hazard classes. These classification systems are used by chemical manufacturers when creating safety data sheets and chemical labels, therefore it is important that CWU lab employees understand the basic elements of each classification system.

9.2 Globally Harmonized System for Classifying Chemicals

9.2.1 The Globally Harmonized System (GHS) is a world-wide system adopted by OSHA for standardizing and harmonizing the classification and labeling of chemicals. The objectives of the GHS are to:

- Define health, physical, and environmental hazards of chemicals.
- Create classification processes that use available data on chemicals for comparison with the defined hazard criteria (numerical hazard classification is based on a 1-5 scale, 1 being the most hazardous and 5 being the least hazardous).
- Communicate hazard information, as well as protective measures, on labels and Safety Data Sheets (SDS), formally known as Material Safety Data Sheets (MSDS).

9.2.2 Safety Data Sheets (SDS)

9221 Safety Data Sheets under the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) offer similar information that MSDSs provide. They provide a clear description of the data used to identify the hazards of a chemical. The major difference is that the SDS is in a globally standardized format (United Nations) for the purpose of easier training and notification of hazards.

1.	Identification of the substance or mixture and the supplier	**9.**	Physical and chemical properties
2.	Hazard(s) identification	**10.**	Stability and reactivity
3.	Composition/information on ingredients	**11.**	Toxicological information
4.	First aid measures	**12.**	Ecological information
5.	Firefighting measures	**13.**	Disposal considerations
6.	Accidental release measures	**14.**	Transport information
7.	Handling and storage	**15.**	Regulatory information

8.	Exposure controls/personal protection	**16.**	Other information

9.2.2.2 A SDS must be kept for each hazardous chemical used and must be readily available to employees. All employees should review SDS documents prior to using hazardous chemicals.

9.2.2.3 The supervisor or designee is responsible for obtaining SDS documents for the department when new chemicals are procured. This designee also reviews incoming SDS documents for safety and health information to convey pertinent information and training to affected employees.

9.2.2.4 SDS documents can be managed electronically if:

- A back-up system is in place in case of emergency causing electronic documents to be unavailable.
- Employees have hard-copy access if requested.

9.2.3 Chemical Labeling

9.2.3.1 The GHS standardized label elements, which are not subject to variation and must appear on the chemical label, contain the following elements:

- Labels should identify the product name, GHS pictograms, signal words, hazard statements, precautionary statements, supplier information, and supplementary information (definitions in **Appendix I**).
- Examples of the GHS pictograms can be seen in **Appendix J**.
- An example of a GHS label can be seen in **Appendix K**.
- GHS Hazardous Industrial Chemicals – Precautionary Labeling uses a word hierarchy, or **signal word** to convey levels of hazard. The three signal words are DANGER, WARNING, and CAUTION the meaning of each are provided below.
  - **DANGER**: If this product gets in or on you, immediate harm will be caused.
  - **WARNING:** If this product gets in or on you, in sufficient quantity, you will suffer harm.
  - **CAUTION:** If this product gets in or on you in large quantity over an extended time, you may be harmed.
- GHS Labeling for Acute Toxicity consists of categories 1-5 (1=High, 5=Low) with a symbol, signal word and a hazard statement. The hazard statement is divided into three sections (oral, dermal, and inhalation). An example of a GHS Acute Toxicity can be seen in **Appendix L**.

9.2.4 Material Safety Data Sheets (MSDS)

9.2.4.1 Material Safety Data Sheets provide employees with detailed information on hazardous chemicals. Information found on MSDS documents can include, but is not limited to the following information: product name, chemical abstract service numbers, ingredients, handling precautions, type of personal protective equipment recommended, physical and health hazards, storage requirements, emergency and first-aid procedures, the date the MSDS was prepared, name, address and telephone number of the chemical manufacturer or the importer.

9.2.4.2 A MSDS must be kept for each hazardous chemical used and must be readily available to employees. All employees should review MSDS documents prior to using hazardous chemicals.

9.2.4.3 The supervisor or designee is responsible for obtaining MSDS documents for the department when new chemicals are procured. This designee also reviews incoming MSDS documents for safety and health information to convey pertinent information and training to affected employees.

9.2.4.4 MSDS documents can be managed electronically if:

- A back-up system is in place in case of emergency causing electronic documents to be unavailable.
- Employees have hard-copy access if requested.

9.2.5 National Fire Protection Association Rating System (NFPA)

9.2.5.1 NFPA 704 – Standard System for the Identification of the Hazard of Materials for Emergency Responders provides the following hazard rating for the Health, Flammability, and Reactivity classification of chemicals. An explanation of the system and an example of the NFPA 704 Diamond label can be found in **Appendix M**.

9.2.6 Hazardous Material Identification System (HMIS)

9.2.6.1 HMIS provides a 0-4 scale (0=Low, 4=High) for Health, Flammability, and Reactivity hazards. The "mode of entry" and "protective equipment" is depicted by a letter referring to a system of protective equipment. There are a number of variations to this type of labeling. An example of an HMIS label is found in **Appendix N** and the HMIS Personal Protection Index is found in **Appendix O**.

9.2.7 Department of Transportation Hazard Classes (DOT)

9.2.7.1 The DOT regulates the transportation of all hazardous materials in the United States. All hazardous chemicals must be properly labeled by the chemical manufacturer or distributor before transportation occurs. Chemical containers stored in laboratories are not required to be labeled per DOT standards.

9272 However, the DOT 9 hazard classes are often seen on chemical containers and are discussed in Section 14 of GHS-formatted SDSs. The DOT 9 hazard classes are illustrated in Appendix O. It should be noted that **Appendix P** only lists the primary hazard classes, the sub classes (e.g., Organic Peroxides, DOT Class 5.2) were omitted for stylistic purposes.

10. Chemical Waste Management

10.1. This section outlines the key elements of Central Washington University Laboratory Hazardous Waste Program. Additional information is available by contacting EH&S office (2252 or 2255) or the EH&S website at http://www.cwu.edu/ehs/hazardous-materials-hazardous-waste.

10.2. Waste Identification

10.2.1. Hazardous waste regulations require that hazardous waste be accurately identified. Common laboratory waste include:

- **Spent solvents, acids, bases, and oxidizers** used in extractions, cleaning or other processes.
- **Unused reagents and other chemicals** that are no longer needed, do not meet specifications, are contaminated, have exceeded their storage life, or are otherwise unusable in the lab.
- **Waste oils**.
- **Other miscellaneous materials**, including broken thermometers, heavy metal salts, poisons, etc.

10.2.2. These wastes may be identified as either "listed wastes" (appear on lists of specific chemicals defined as hazardous wastes issued by Washington State Department of Ecology (DOE)) or "dangerous wastes" (exhibit certain characteristics defined by the DOE including ignitibility, corrosivity, reactivity, and toxicity).

10.3. Storage and Disposal

10.3.1. Regulations require that hazardous wastes be accumulated and stored in properly managed containers on sufficiently impervious surfaces (free of cracks, gaps, etc.).

10.3.2. **Storage:** Hazardous wastes in laboratories are stored in satellite accumulation areas (SAA).

10.3.3. **Disposal:** Once a satellite accumulation area container is filled, it must be dated and transferred to a main accumulation area (primary) or shipped off-site within 3 days. EH&S is available to provide and/or arrange waste pick up services. Disposal of hazardous wastes and chemicals in laboratory sinks is prohibited by regulation.

10.3.4. **Labeling:** Containers that accumulate and store hazardous wastes must be labeled with the following:

- The words (Hazardous Waste."
- The waste type in words (Spent non-halogenated Solvents, Waste oil, etc.
- The associated hazard in words (i.e., Flammable, Toxic, etc.).
- The date upon which the container became filled.

10.3.4.1 Containers must be labeled and situated so that labels are clearly visible (facing forward).

10.3.4.2 **Hazardous Waste Tag** similar to the one below is supplied by EH&S to departments that generate hazardous wastes (see **Appendix Q**).

10.3.5. **Closure:** Containers must be closed at all times, unless waste is being added or removed. Open-top funnels may not be left in open containers.

10.3.6. **Condition:** Containers must be in good condition. There may not be severe rusting, dents or other conditions that could cause leaks, etc.

10.3.7. **Compatibility:** Containers must be compatible with hazardous waste stored within them. When in doubt, use the original shipping container.

10.3.8. **Inspections:** Containers must be inspected weekly by laboratory personnel to ensure that they are properly labeled, in good condition and meet the criteria described above.

10.4. Training

10.4.1. Laboratory personnel whose duties or activities involve the management of hazardous waste are required to receive hazardous waste training within 6 months of the start of such activities and annually thereafter. Initial and refresher training is offered by EH&S.

10.5. Waste Minimization

10.5.1. Laboratory waste minimization techniques include:

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

10.5.2. The exercise of prudence in ordering new chemicals will also ensure that excess chemical does not become subject to disposal as hazardous waste. Contact EH&S for more information regarding waste minimization.

11. Emergency Procedures

11.1. If there is a hazardous materials release/chemical spill inside a building:

- Isolate and secure the spill area.
- Warn others in the immediate area.

- Based upon the hazard, attempt clean-up if trained and if you have appropriate personal protective equipment.
- If assistance is needed, call 911 and give the location and type of material spilled.
- Evacuate the building and use of building fire alarm system.
- Meet with and assist emergency response personnel.

11.2 If there is a hazardous materials release/chemical spill outside the building:

- Isolate and secure the spill area
- Warn others in the immediate area
- If assistance is needed, call 911 and give the location and type of material spilled
- Do not wash or allow spilled material into storm drain
- Meet with and assist emergency response personnel

11.3 If there is a personnel injury involving chemical contamination:

- Assist with emergency eyewash / shower use, as appropriate
- Provide first aid immediately for serious injuries
- Call 911 and give the location and type of material involved
- Notify Environmental Health & Safety at (509) 963-2252
- As possible, without doing harm to the victim, remove and bag contaminated clothing and gross personal contamination
- Obtain a MSDS/SDS for the material involved, which will provide you with a manufacturer or distributor of a chemical that provides information about the contents, characteristics, physical hazards, and health hazards associated with the chemical

Appendix A

Chemical Hygiene Plan

WAC 296-828-20005

You must

- Develop and carry out a written chemical hygiene plan (CHP) that will protect your employees from hazardous substances in the laboratory and keep exposure levels below those listed in chapter 296-841 WAC , Airborne contaminants.
- Make sure the written plan is readily available to employees and their representatives.
- Include the following elements in your written CHP:
    - The names or job titles of the chemical hygiene officer, other personnel responsible for implementing the CHP, or when appropriate, the members of a chemical hygiene committee
    - Standard operating procedures that provide employee protection when working with hazardous substances
    - Criteria for how you will select and use control measures to reduce employee exposures to hazardous chemicals, especially chemicals known to be extremely hazardous
    - Additional employee protection for select carcinogens, reproductive toxins, and chemicals with high degree of acute toxicity. The following will be considered, when appropriate:
        - The establishment of exposure control areas
        - Containment devices, such as fume hoods or glove boxes
        - The safe removal of contaminated waste
        - Procedures for decontamination
    - Specific measures to make sure fume hoods and other protective equipment provide proper and adequate performance and are properly functioning
    - The circumstances when specific laboratory operation, activity, or procedure requires prior approval from the employer or their designated representative before implementation
    - A description of how you are going to train and inform your employees about laboratory use of hazardous chemicals

- A description of your provisions for medical consultations and medical examinations

- Review and evaluate the effectiveness of your written CHP at least annually and update as necessary.

Reference:

This publication can provide you with additional information to help you with your written chemical hygiene plan:

- National Research Council, Prudent Practices for Disposal of Chemicals from Laboratories, National Academy Press, Washington, DC, 1995.

Appendix B

Definitions of Terms Used in the Laboratory Standard

The following terms are used as part of the Chemical Hygiene Plan:

1. **Acute:** An adverse effect with symptoms of high severity coming quickly to a crisis.
2. **Carcinogen:** A substance capable of causing cancer.
3. **Chemical:** A wide variety of fluids that have a high potential for body entry by agents various means. Some are more toxic than others and require special measures of control for safety and environmental reasons.
4. **Chronic:** An adverse effect with symptoms that develop slowly over a long period of time or that frequently recur.
5. **Combustible:** Able to catch on fire and burn.
6. **DOT:** Department of Transportation
7. **EPA:** Environmental Protection Agency
8. **Flammable:** Capable of being easily ignited and burning with extreme rapidity.
9. **GHS:** Globally Harmonized System
10. **Infectious:** Sources that cause infections either by inhalation, ingestion, or direct contact with the host material.
11. **LC50:** The concentration of a substance in air that causes death in 50% of the animals exposed by inhalation. A measure of acute toxicity.
12. **LD50:** The dose that causes death in 50% of the animals exposed to a substance through ingestion. A measure of acute toxicity.
13. **MSDS:** Material Safety Data Sheet
14. **Mutagen:** Capable of changing cells in such a way those future cells are affected. Mutagenic substances are usually considered to be suspected carcinogens.
15. **OSHA:** Occupational Safety and Health Administration, the regulatory branch of the Department of Labor concerned with employee safety and health.
16. **PEL:** Permissible Exposure Limit. The legally allowed concentration in the workplace that is considered a safe level of exposure for an 8-hour shift, 40 hours per week.
17. **pH:** A measure of how acidic or caustic a substance is on a scale of 1 to 14. A pH of 1 indicates that a substance is strongly acidic; a pH of 14 indicated that a substance is strongly basic.
18. **Physical Workplace:** Sources recognized for their potential effects on the body. Heat exposure or excessive noise levels are examples of this risk group.
19. **Sensitizers:** Agents that can cause an allergic reaction at some point in time following repeated exposures.
20. **SDS:** Safety Data Sheets

21. **Sterility:** Changes made in male or female reproductive systems that result in and inability to reproduce.
22. **Teratogens:** A substance that causes a deformity in newborns if a significant exposure exists during pregnancy.
23. **TLV:** Threshold Limit Value. The amount of exposure allowable for and employee in an 8-hour day.

Appendix C

Permissible Exposure Limits (PELs) (Exposure Limits, Air Contaminants)

Rules for Specific Activities or Workplaces

- 1,2-Dibromo-3-chloropropane (WAC 296-62-07342(14))
- Asbestos - Permissible exposure limits (PEL) (WAC 296-62-07705)
- Butadiene (WAC 296-62-07460(3))
- Cadmium (General Industry) (WAC 296-62-07405)
- Coke Ovens (WAC 296-62-20003)
- Ethylene Oxide, Airborne (WAC 296-62-07359)
- Exposure Control Areas, Arsenic (WAC 296-848-400)
- Exposure Control Areas, Benzene (WAC 296-849-130)
- Laser Radiation (WAC 296-62-09005(4))
- Lead (WAC 296-62-07521(4))
- Methylene Chloride (WAC 296-62-07470(3))
- Methylenedianiline (MDA) (WAC 296-62-07605)
- Permissible exposure limits (PELs) - Airborne Contaminants (WAC 296-841-20025)
- Respiratory Hazards, Table 3 (WAC 296-841-20020)
- Vinyl Chloride (WAC 296-62-07329(10))

Appendix D

Example of Laboratory Self-Inspection Checklist

LABORATORY INSPECTION CHECKLIST

Building & Room:	**Inspected By:**
PI/Area Supervisor:	**Date:**

All laboratory spaces containing hazardous materials must be inspected at least quarterly. For each item check Yes, No, or N/A. Be sure to retain all documentation regarding inspections, including findings **and** corrective actions taken for any "No" responses, for a minimum of 3 years. Contact EH&S at 509-963-2338 for questions or additional information.

Y	N	N/A	GENERAL SAFETY
			1. Area around fire extinguishers, pull alarms, emergency showers, and electrical panels kept clear?
			2. Eighteen-inch vertical clearance maintained below fire sprinkler heads (e.g., over shelves)?
			3. Cabinets, furniture, and equipment taller than 4 feet braced or anchored?
			4. Food and drink stored and consumed away from toxic and infectious materials?
			5. Refrigerators/freezers labeled either "Food & Drink Only" or "No Food & Drink"?
			6. Extension cords and power strips not daisy chained and no permanent extension cords in use?
			7. No exposed wiring or damaged electrical cords?
			8. Floors are clear and aisles and adjacent hallways unobstructed?
			9. Floors dry and free of slip hazards; bench tops (including hoods) reasonably organized and clean?
Y	**N**	**N/A**	**HAZARDOUS MATERIALS & WASTES**
			10. All containers, including non-hazardous chemicals and wastes, legibly labeled with the full chemical or trade name (note: abbreviations/formulas are not adequate)?
			11. All hazardous materials and oil pumps stored in secondary containment free of spilled material?
			12. Incompatible materials properly segregated (see Stanford's Storage Group Classification System)?
			13. Chemical and waste containers in good condition and kept closed except during use (no funnels)?
			14. Flammable liquids (including flammable waste and glacial acetic acid) stored in flammable liquid storage cabinets? Note: Up to 10 gallons per control area (NOT per individual lab) may be stored outside of cabinets. Control areas with cabinet credit are required to store 100% of their flammable liquid inventory inside cabinets.

			15. Flammables that are refrigerated are placed in explosion-proof or flammables refrigerators only?
			16. No hazardous materials near sinks or drains unless secondary containment is provided?
			17. Lab practices minimize volatilization (i.e. traps used, open-container procedures minimized)?
			18. “Chemical Waste Compliance” poster posted in lab where hazardous waste is accumulated?
			19. Storage in fume hoods minimized and sashes kept closed when not in use?
			20. Emergency contacts, chemical storage maps, and chemical inventory in life safety box are current?
			21. Hazardous material spill cleanup kits and first aid kits available (recommended)?
			22. All hazardous wastes collected in compatible containers with completed waste tags and kept for no longer than 9 months from “accumulation date” on waste tag?
			23. Biohazardous waste in red bags with proper signage in hard sided, closed secondary containment with biohazard symbols on four sides and top?
Y	**N**	**N/A**	**COMPRESSED GASES**
			24. Cylinders listed on chemical inventory, positioned so that contents label is visible, and stored in a dry, well-ventilated location protected from heat sources?
			25. Cylinders > 26” tall secured to a rigid structure at 1/3 and 2/3 height with metal chains and a maximum of 2 cylinders per pair of chains (one restraint for cylinders <26” and dewars)?
			26. Cylinder valves closed and valve caps in place when cylinders not in use?

Comments & Additional Findings Comments & Additional Findings

Appendix E

Common Incompatible Chemicals

Chemical	Incompatible with	Chemical	Incompatible with
acetic acid	chromic acid, nitric acid, perchloric acid, peroxides, permanganates	**hydrogen sulfide**	fuming nitric acid, oxidizing gases
acetic anhydride	hydroxyl-containing compounds such as ethylene glycol and perchloric acid	**hypochloites**	acids, activated carbon
acetylene	chlorine, bromine, copper, fluorine, silver, mercury	**iodine**	acetylene, ammonia (aqueous or anhydrous), hydrogen
acetone	concentrated nitric acid and sulfuric acid mixtures	**mercury**	acetylene, fulminic acid, ammonia
alkali and alkaline earth metals	water, carbon tetrachloride or other chlorinated hydrocarbons, carbon dioxide, halogens	**nitrates**	sulfuric acid
ammonia (anhydrous)	mercury, chlorine, calcium hypochlorite, iodine, bromine, hydrofluoric acid (anhydrous)	**nitric acid (concentrated)**	acetic acid, aniline, chromic acid, hydrocyanic, hydrogen sulfide, flammable liquids, flammable gases, copper, brass, any heavy metals
ammonium nitrate	acids, powdered metals, flammable liquids, chlorates, nitrates, sulfur, finely divided organic or combustible materials	**nitrites**	acids
aniline	nitric acid, hydrogen peroxide	**nitroparaffins**	inorganic bases, amines
arsenical materials	any reducing agent	**oxalic acid**	silver, mercury
azides	acids	**oxygen**	oils, greases, hydrogen, flammable liquids, solids, or gases
bromide	see chlorine	**perchloric acid**	acetic anhydride, bismuth and its alloys, alcohol, paper, wood, grease, oils
calcium oxide	water	**peroxides, organic**	acids (organic or mineral), avoid friction, store cold
carbon (activated)	calcium hypochlorite, all oxidizing agents	**phosphorus pentoxide**	alcohols, strong bases, water

Chemical	Incompatible with	Chemical	Incompatible with
carbon tetrachloride	sodium	**potassium**	carbon tetrachloride, carbon dioxide, water
chlorates	ammonium salts, acids, powdered metals, sulfur, finely divided organic or combustible materials	**potassium chlorate**	sulfuric and other acids
chromic acid and chromium trioxide	acetic acid, naphthalene, camphor, glycerol, alcohol, flammable liquids in general	**potassium perchlorate (also see chlorates)**	sulfuric and other acids
chlorine	ammonia, acetylene, butadiene, butane, methane, propane or other petroleum gases, hydrogen, sodium carbide, benzene, finely divided metals, turpentine	**selenides**	reducing agents
chlorine dioxide	ammonia, methane, phosphine, hydrogen sulfide	**silver and silver salts**	acetylene, oxalic acid, tartaric acid, ammonium compounds, fulminic acid
copper	acetylene, hydrogen peroxide	**sodium**	carbon tetrachloride, carbon dioxide, water
cumene hydroperoxide	acids (organic and inorganic)	**sodium nitrite**	ammonium nitrate and other ammonium salts
cyanide	acids	**sodium peroxide**	ethanol and methanol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerin, ethylene glycol, ethyl acetate, methyl acetate, furfural
flammable liquids	ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens	**sulfides**	acids
fluorine	everything	**sulfuric acid**	potassium chlorate, potassium perchlorate, potassium permanganate (and similar compounds of light metals such as sodium, lithium)
hydrazine	hydrogen peroxide, nitric acid, any other oxidant	**tellurides**	reducing agents

Chemical	Incompatible with	Chemical	Incompatible with
hydrocarbons (e.g., propane, butane, benzene)	fluorine, chlorine, bromine, chromic acid, sodium peroxide		
hydrocyanic acid	nitric acid, alkali		
hydrofluoric acid (aqueous or anhydrous)	ammonia (aqueous or anhydrous)		
hydrogen peroxide	copper, chromium, iron, most metals or their salts, alcohols, acetone, organic materials, aniline, nitromethane, combustible materials		

Appendix F

Peroxide Forming Chemicals

This list should not be considered all-inclusive. Chemicals with similar names to the ones on this list should be given consideration when assessing the potential for peroxide formation.

Classes of Chemicals That Can Form Peroxides Upon Aging

(Reference: Prudent Practices for Disposal of Chemicals from Laboratories)

LIST A: Severe Peroxide Hazard on Storage with Exposure to Air

Discard within 3 months

- □ Diisopropyl ether (isopropyl ether)
- □ Divinylacetylene (DVA)
- □ Potassium metal
- □ Potassium amide
- □ Sodium amide
- □ Vinylidene chloride (1,1-dichloroethylene)

LIST B: Peroxide Hazard on Concentration; Do Not Distill or Evaporate Without First Testing for the Presence of Peroxides

Discard or test for peroxides within 6 months

- □ Acetaldehyde diethyl acetal
- □ Cumene (Isopropylbenzene)
- □ Cyclohexene
- □ Cyclopentene
- □ Decalin (decahydronapthylene)
- □ Diacetylene (butadiene)
- □ Dicyclopentadiene
- □ Diethyl ether (ether)
- □ Diethylene glycol dimethyl ether (diglyme)
- □ Dioxane
- □ Ethylene glycol dimethyl ether (glyme)
- □ Ethylene glycol ether acetate
- □ Ethylene glycol monoethers (cellusolves)
- □ Furan
- □ Methylacetylene
- □ Methylcyclopentane
- □ Methyl isobutyl ketone
- □ Tetrahydrofuran (THF)
- □ Tetralin (tetrahyronaphthalene)
- □ Vinyl ethers

LIST C: Hazard of Rapid Polymerization Initiated by Internally Formed Peroxides

a. Normal liquids: **Discard or test for peroxides after 6 months**

- Chloroprene (2-chloro-1,3-butadiene)
- Styrene
- Vinyl acetate
- Vinylpyridine

Normal gases: **Discard after 12 months**

- Butadiene
- Tetrafluoroethylene (TFE)
- Vinylacetylene (MVA)
- Vinyl chloride

Peroxide Testing Method

Peroxide forming compounds should be tested on a regular basis to detect the presence of peroxides before they reach dangerous concentrations.

One testing method is the Redox test strip (available through Sigma Aldrich). The strip contains the enzyme peroxidase which transfers oxygen from the peroxide to an organic redox indicator, which is then converted to a blue oxidation product. Follow manufacturer's instructions for testing and interpreting results.

- Although it has not been determined what concentration of peroxide is explosive, the following rules should provide a reasonable margin of safety:
- If the peroxide concentration is greater than 25 ppm, but less than 100 ppm, the chemical may be used, but DO NOT DISTILL OR CONCENTRATE.
- If the peroxide concentration is greater than 100 ppm, it should be considered as potentially explosive and should not be used. It should be disposed of as hazardous waste (see next section).

Disposal

If a peroxide forming compound has been stored either beyond its useful shelf life or safe storage time/testing frequency, or if its age or history cannot be determined, it shall be considered potentially explosive and must be disposed of as hazardous waste. Contact the EH&S at extension 2338 if you have questions regarding safety. Waste disposal questions should be addressed to EH&S at extension 2252.

Appendix G

Carcinogens

Carcinogens are agents that can cause cancer. In industry, there are many potential exposures to carcinogens. Generally, workplace exposures are considered to be at higher levels than for public exposures. Material safety data sheets (MSDSs) should always contain an indication of carcinogenic potential.

OSHA Standards

Carcinogens are addressed in specific standards for general industry, shipyard employment, the construction industry, and the identification, classification, and regulation of carcinogens. This section highlights OSHA standards, directives (instructions for compliance officers), and standard interpretations (official letters of interpretation of the standards) related to carcinogens. Twenty-five states, Puerto Rico and the Virgin Islands have OSHA-approved State Plans and have adopted their own standards and enforcement policies. For the most part, these States adopt standards that are identical to Federal OSHA. However, some States have adopted different standards applicable to this topic or may have different enforcement policies.

General Industry (29 CFR 1910)

The following standards apply to substances that are classified as carcinogens or potential carcinogens by the National Toxicity Program (NTP).

- 1910 Subpart Z, Toxic and hazardous substances [related topic page]
  - 1910.1001, Asbestos [related topic page]
  - 1910.1003, 13 Carcinogens (4-Nitrobiphenyl, etc.)
  - 1910.1004, alpha-Naphthylamine
  - 1910.1006, Methyl chloromethyl ether
  - 1910.1007, 3,3'-Dichlorobenzidine (and its salts)
  - 1910.1008, bis-Chloromethyl ether
  - 1910.1009, beta-Naphthylamine
  - 1910.1010, Benzidine
  - 1910.1011, 4-Aminodiphenyl
  - 1910.1012, Ethyleneimine
  - 1910.1013, beta-Propiolactone
  - 1910.1014, 2-Acetylaminofluorene
  - 1910.1015, 4-Dimethylaminoazobenzene
  - 1910.1016, N-Nitrosodimethylamine
  - 1910.1017, Vinyl chloride
  - 1910.1018, Inorganic arsenic [related topic page]
  - 1910.1026, Chromium (VI) [related topic page]
  - 1910.1027, Cadmium [related topic page]

- 1910.1028, Benzene [related topic page]
- 1910.1029, Coke oven emissions
- 1910.1044, 1,2-dibromo-3-chloropropane
- 1910.1045, Acrylonitrile
- 1910.1047, Ethylene oxide [related topic page]
- 1910.1048, Formaldehyde [related topic page]
- 1910.1050, Methylenedianiline
- 1910.1051, 1,3-Butadiene [related topic page]
- 1910.1052, Methylene chloride [related topic page]

WAC 296-62-07302 List of carcinogens.

(1) The following substances are deemed to be carcinogens for the purposes of WAC 296-62-073 through 296-62-07316.

(2) Any reference to carcinogens in WAC 296-62-07304 through 296-62-07316 shall mean only those carcinogens listed in WAC 296-62-07302.

(a) 4-Nitrobiphenyl - Chemical Abstracts Service Registry Number 92-93-3.

(b) Alpha-Naphthylamine - Chemical Abstracts Service Registry Number 134-32-7.

(c) 4,4' Methylene bis (2 - chloroaniline) - Chemical Abstracts Service Registry Number 101-14-4.

(d) Methyl chloromethyl ether - Chemical Abstracts Service Registry Number 107-30-2.

(e) 3,3'-Dichlorobenzidine (and its salts) - Chemical Abstracts Service Registry Number 91-94-1.

(f) Bis-Chloromethyl ether - Chemical Abstracts Service Registry Number 542-88-1.

(g) Beta-Naphthylamine - Chemical Abstracts Service Registry Number 91-59-8.

(h) Benzidine - Chemical Abstracts Service Registry Number 92-87-5.

(i) 4-Aminodiphenyl - Chemical Abstracts Service Registry Number 92-67-1.

(j) Ethyleneimine - Chemical Abstracts Service Registry Number 151-56-4.

(k) Beta-Propiolactone - Chemical Abstracts Service Registry Number 57-57-8.

(l) 2-Acetylaminofluorene - Chemical Abstracts Service Registry Number 53-96-3.

(m) 4-Dimethylaminoazobenzene - Chemical Abstract Service Registry Number 60-11-7.

(n) N-Nitrosodimethylamine - Chemical Abstracts Service Registry Number 62-75-9.

[Statutory Authority: RCW 49.17.010, .040, .050. 02-12-098 (Order 00-20), § 296-62-07302, filed 06/05/02, effective 08/01/02. Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-62-07302, filed 7/20/94, effective 9/20/94. Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), § 296-62-07302, filed 4/19/85; 82-13-045 (Order 82-22), § 296-62-07302, filed 6/11/82; 81-07-048 (Order 81-4), § 296-62-07302, filed 3/17/81. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW. 80-17-014 (Order 80-20), § 296-62-07302, filed 11/13/80.]

Appendix H

Proper Use of a Chemical Fume Hood

Fume hoods are devices designed for work with toxic or hazardous chemicals with the effect of safely capturing the harmful gases, vapors, and fumes generated and exhausting them to the outside air. The fume hood is very effective if installed and used properly and maintained in good working order. Fume hoods are not just fixtures but are installed into the ventilation system of a building and so affect the ventilation of the entire building and the exhaust at the stack. As a result, fume hood function and proper installation not only affects your safety but the safety of others in the building.

The primary parts of the fume hood are:

Face – The face of the hood is the opening where air capture takes place.

Sash – The sash is the glass "window" that travels in the plane of the hood face that opens or closes the hood and protects the user during use.

Baffles – The baffles are located in the back of the hood and direct air in the appropriate direction. The baffles can also be adjusted to account for different vapor densities of chemicals (heavier than air and lighter than air).

Duct – The duct connects the hood to the ventilation system and exhausts to the outside air.

Air foil – The air foil is fixed to the bottom front edge of the hood and is a vent that keeps a minimum gap open at all times but more importantly gives aerodynamic properties that allow better, less turbulent air flow and better capture.

Safety Guidelines for Fume Hoods

- Keep the sash as low as possible to minimize the risk of exposure. The sash acts a safety shield and protects your face, so you should be looking through the sash to perform your work. The green arrows are a good guideline for sash position, but sash height should be adjusted depending on the height of the person using the hood.
- If an airfoil is not installed on your hood, consider having one installed. This will provide more laminar air flow and better capture of contaminants.
- Always use an airflow indicator. This is a small piece of crepe paper (or similar) attached to the bottom of the sash that blows with the air current. This is the only way to know for certain that air is flowing through the hood in the proper direction. The indicator should be blowing into the hood (sometime the flow is reversed by accident during

maintenance). Please note, an airflow indicator only indicates the direction of airflow and does not indicate whether the fume hood has the proper face velocity.

- Keep lab doors and windows closed. These extra sources of inlet air can: affect the performance of the hood, cause turbulent air currents in the room or cause the room to lose its negative pressure.
- Limit traffic near hoods when in use. Pedestrian traffic or fast movement in front of hoods can cause turbulence and can negatively affect the capture ability of the fume hood.
- Reduce clutter and do not store large amounts of chemicals in the hood. Excess clutter and chemicals can impede airflow especially to the lower openings. Necessary bottles and equipment should be elevated an inch or two to allow airflow underneath to the rear baffles (a small shelf or blocks of some kind will work for this). Excess chemicals can be a hazard in themselves due to their properties. Store chemicals in cabinets or on shelves, except for the chemicals you need immediately for the work at hand.
- Work at least 6 inches into the hood from the plane of the sash. This will reduce the risk of eddy currents blowing vapors back at you and will maximize capture ability of the hood.
- If hoses or cords must be inserted through the face of the hood, run them underneath the airfoil so the sash can close completely.

Other Considerations

- If there is a potential for an explosion hazard due to the chemicals you are using or the experiment you are conducting, special shielding should be used in addition to the sash.
- Protect against blockage of ducts. Lightweight materials such as aluminum foil or tissues can be sucked into the vents and reduce the performance of the hood.
- Run water in hood drains periodically so they do not dry out. Open drains can possibly affect airflow and can cause nuisance odors.
- In a power outage, lower the sash to within an inch or two so the chimney effect will keep some air flowing into the hood and contain any vapors.
- Other than sash height and baffle adjustment, never make changes to the hood without the advice of EH&S.
- If other apparatus requires venting, the exhaust should not be injected into the face of a hood but rather should be ducted to the ventilation system. This kind of work should be cleared through Facilities Planning and Projects.
- Evaporations and digestions using Perchloric acid should only be done in a specially designed Perchloric acid fume hood with a wash down function. Heated Perchloric acid can form shock sensitive crystals in the duct work that can explode.

- Whenever you are not using the fume hood, always close the sash of the hood as low as possible. Closing the fume hood sash provides added protection of better capture ability of any chemicals being stored in the hood as part of an experiment and also greatly enhances energy conservation measures for the laboratory.

Appendix I

GHS Definitions

- **GHS –** means "The Globally Harmonized System of Classification and Labelling of Chemicals."
- **Hazard Statement –** a statement assigned to a hazard class and category that describes the nature of the hazards of a hazardous product, including, where appropriate, the degree of hazard.
- **Pictogram –** a graphical composition that may include a symbol plus other graphic elements, such as a border, background pattern or color that is intended to convey specific information.
- **Precautionary Statement –** a phrase that describes recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a hazardous product, or improper storage or handling of a hazardous product.
- **Signal Word –** a word used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label. The GHS uses "Danger" and "Warning" as signal words.
- **Supplemental Label Element –** any additional non-harmonized type of information supplied on the container of a hazardous product that is not required or specified under the GHS.

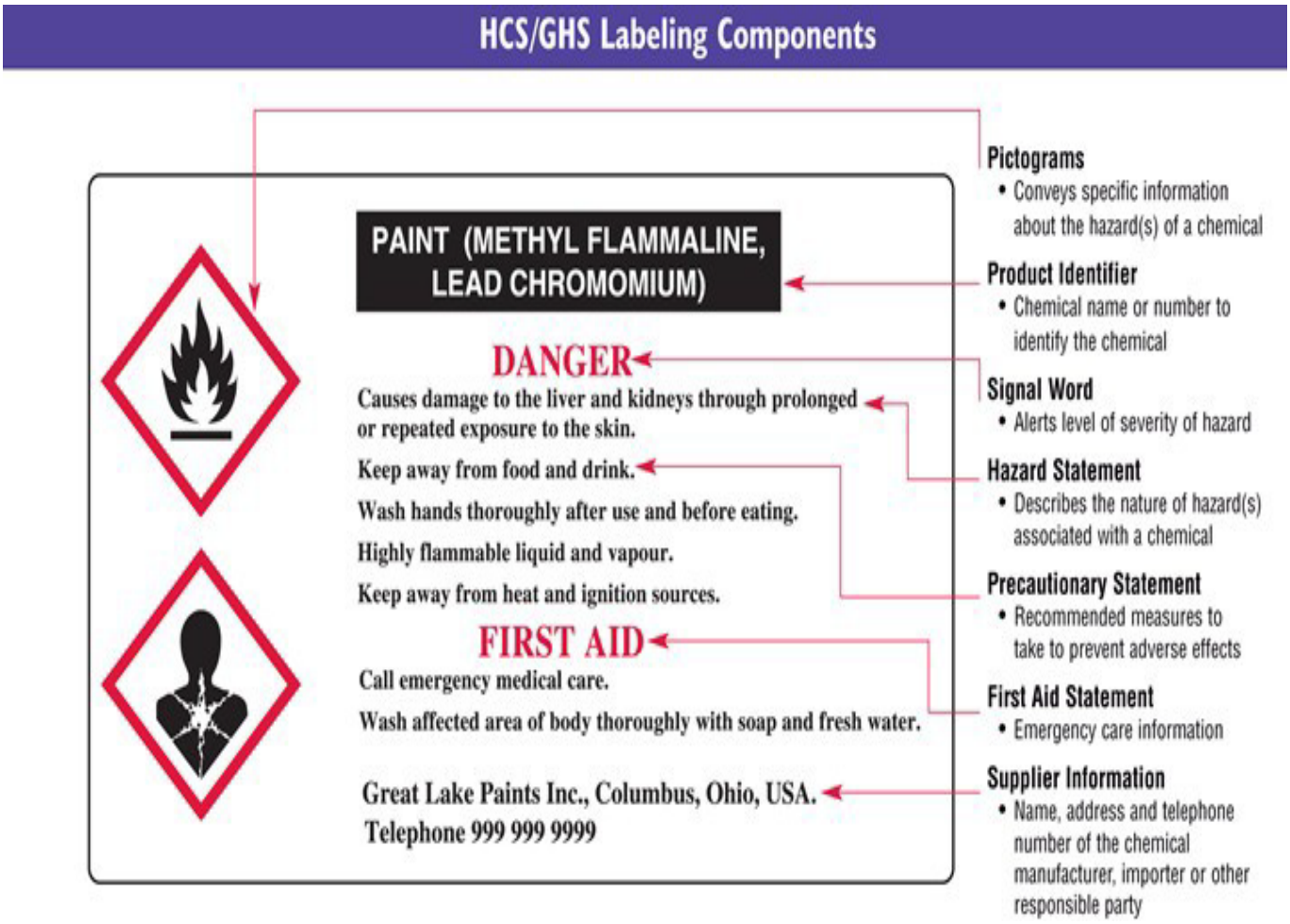
Appendix J

GHS Pictogram Reference Chart

		
Explosives **Self Reactives** **Organic Peroxides**	**Flammables** **Self Reactives** **Pyrophorics** **Self-Heating** **Emits Flammable Gas** **Organic Peroxides**	**Oxidizers**
		
Gases Under Pressure	**Corrosives**	**Acute Toxicity (severe)**
		
Irritant **Dermal Sensitizer** **Acute Toxicity (harmful)** **Narcotic Effects** **Respiratory Tract Irritation**	**Carcinogen** **Respiratory Sensitizer** **Reproductive Toxicity** **Target Organ Toxicity** **Mutagenicity** **Aspiration Toxicity**	**Environmental Toxicity**

Appendix K

Example of GHS Label



Appendix L

Example of GHS Acute Toxicity Chart

	Category 1	Category 2	Category 3	Category 4	Category 5
Symbol					No Symbol
Signal Word	Danger	Danger	Danger	Warning	Warning
Hazard Statement: Oral	Fatal if swallowed	Fatal if swallowed	Toxic if swallowed	Harmful if swallowed	May be harmful if swallowed
Dermal	Fatal if contact with skin	Fatal if contact with skin	Toxic in contact with skin	Harmful in contact with skin	May be harmful in contact with skin
Inhalation	Fatal if inhaled	Fatal if inhaled	Toxic if inhaled	Harmful if inhaled	May be harmful if inhaled

Appendix M

Explanation and Example of NFPA 704 Diamond Label

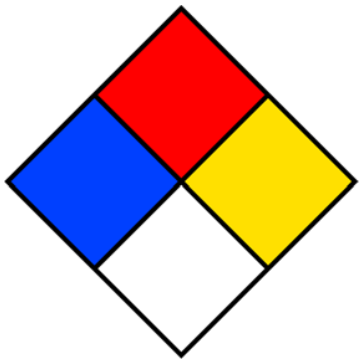
Health Hazard Rating (BLUE on label, left side of diamond)
4 – Lethal
3 – Serious or permanent injury
2 – Temporary incapacitation or residual injury
1 – Significant irritation
0 – No Hazard

Flammability Hazard Rating (RED on label, upper diamond)
4 – Flash point below 73^0 F
3 – Flash point 73^0 F to 100^0 F
2 – Flash point 101^0 F to 200^0 F
1 – Flash point greater than 200^0 F
0 – Will not burn

Reactivity Hazard Rating (YELLOW on label, right side diamond)
4 – Capable of Detonation or Explosion
3 – Shock and heat may detonate
2 – Violent chemical change under increased heat or pressure
1 – Unstable under increased heat or pressure
0 – Stable

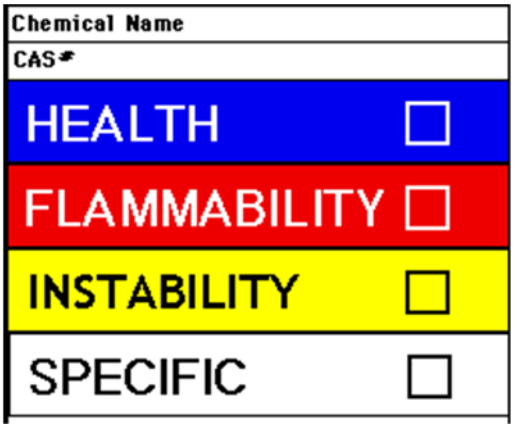
Special Hazard Symbols (WHITE on label, lower diamond)

- **W** - reacts with Water in an unusual or dangerous manner (e.g. cesium, sodium)
- **OX** or **OXY** - Oxidizer (e.g. potassium perchlorate, ammonium nitrate)
- **COR** - Corrosive; strong acid or base (e.g. sulfuric acid, potassium hydroxide)
- **ACID** and **ALK** to be more specific.
- **BIO** - Biological hazard (e.g. smallpox virus)
- **POI** - Poisonous (e.g. Spider Venom)
- The Radioactive trefoil ☢) - is radioactive (e.g. plutonium, uranium)
- **CRY** or **CRYO** - Cryogenic



Appendix N

Example of HMIS Hazard Rating Label



4= DEADLY HAZARD

3= SEVERE HAZARD

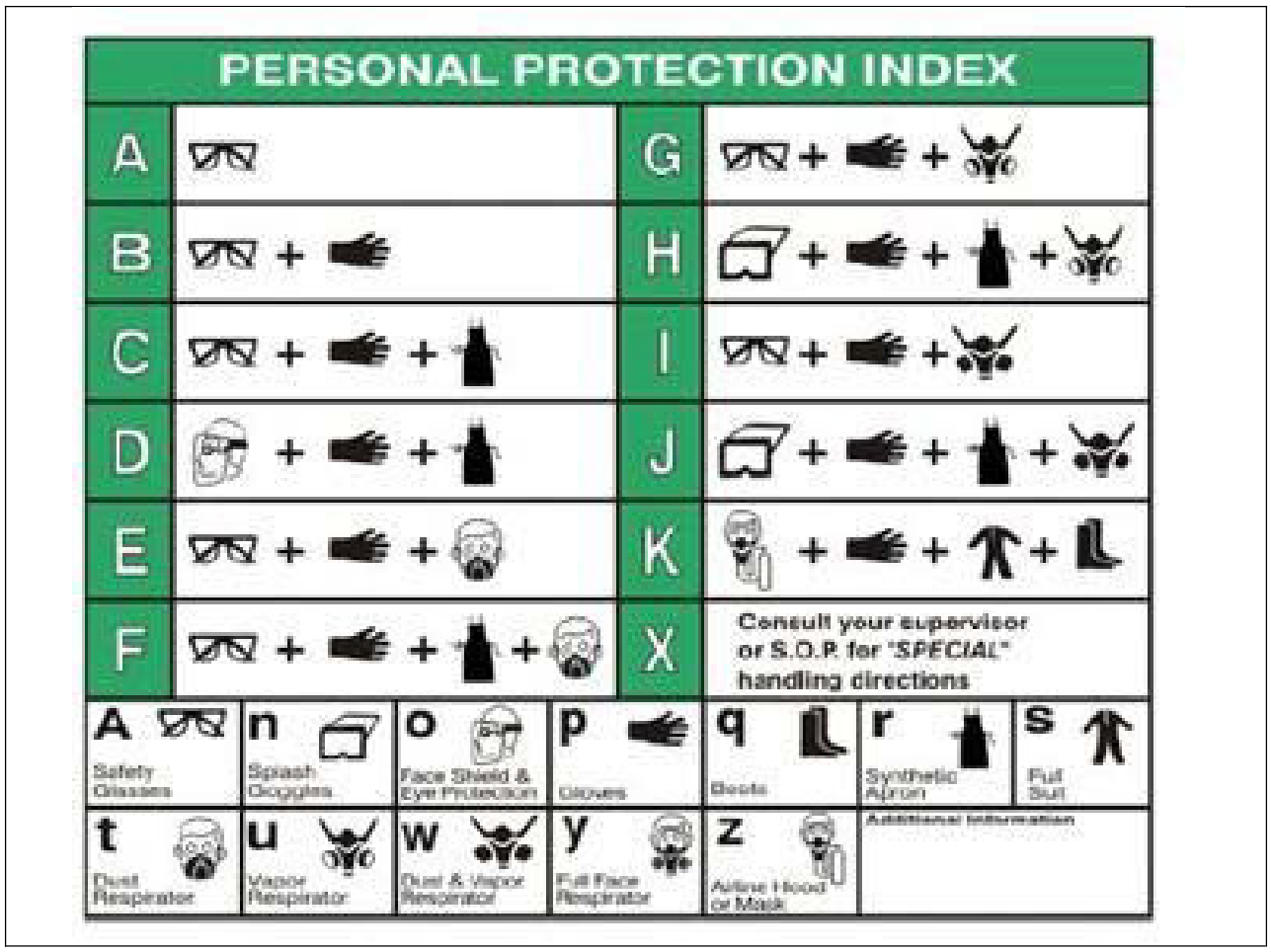
2= MODERATE HAZARD

1= SLIGHT HAZARD

0= NO HAZARD

Appendix O

Example of HMIS Personal Protection Index



Appendix P

Department of Transportation Labels & Placards

Appendix Q

Example of Hazardous Waste Tag

Caution - *Hazardous Waste*

Building:

Responsible Party:

Phone: Room:

Start Date: _____

Description of Contents

Chemical Name	Quantity

Hazardous Properties:

- ☐ Toxic
- ☐ Reactive
- ☐ Ignitable / Flammable
- ☐ Acutely Hazardous
- ☐ Corrosive
- ☐ Explosive
- ☐ None

_____