Section 7

Engineering & Design Department
Chemical Hygiene Plan

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1.0 Purpose

The purpose of this Chemical Hygiene Plan (CHP) is to describe laboratory work practices and procedures which are necessary to ensure that University laboratory employees are protected from health hazards associated with many hazardous chemicals used in laboratories. The CHP addresses this objective by including the requirements of the state safety and health regulation, Occupational Exposure to Hazardous Chemicals in Laboratories (Laboratory Standard promulgated by the Washington State Department of Labor and Industries in Title 296, Washington Administrative Code, Part 828, based on Title 29, Code of Federal Regulation, Part 1910.1450).

2.0 Scope

The Chemical Hygiene Plan applies to all laboratory employees working on laboratory scale operations involving laboratory use of hazardous chemicals. (See Part 3 for definitions of these terms.) The Chemical Hygiene Plan also encompasses non-laboratory employees required to enter a laboratory where potential exposure may occur.

This Chemical Hygiene Plan does not apply to laboratories where the use of hazardous chemicals provides no potential for employee exposure, such as in procedures using chemically impregnated test media and commercially prepared test kits.

In general, the protective procedures and information described in this section are applicable to students, except when their exposures are minimal.

3.0 Definitions

- **Action Level:** A concentration of a specific substance calculated as an 8-hour time weighted average (TWA), which initiates certain required activities as designated in WAC 296-62.

- **Administrative Controls**: Operating procedures and policies that serve to reduce the risk of exposure to hazardous materials, such as minimum purchasing and storage, use of alternate materials, and controlled access to materials.

- **Ceiling Limit:** The maximum concentration of a contaminant in breathing air which may not be exceeded for any length of time.

- **Chemical Hygiene Officer (CHO):** An employee qualified by training or experience to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan. (See Parts 4.1 and 4.2.)

- **Chemical Hygiene Plan (CHP):** A written program which sets forth procedures, equipment, personal protective equipment, and work practices that are capable of protecting employees from the health hazards presented by hazardous chemicals used in the laboratory.

- **Control(s):** Equipment, wearing apparel, or prescribed procedures which, when in good working order and properly used, will prevent laboratory employees from being exposed to hazardous materials.

- **Designated Area**: An area which may be used for work with select carcinogens, reproductive toxins, or substances which have a high degree of acute toxicity. A designated area may be an entire laboratory, a section of a laboratory, or a device within a laboratory, such as a fume hood.

- **Engineering Control:** A device or apparatus designated to contain or reduce the risk of hazardous materials. Examples include ventilation, laboratory fume hoods, and shielding.

Personal protective equipment such as gloves and face shields are not engineering controls.

- **Exposure:** Physical contact of a person with any material (solid, liquid, or gas) or any form of energy (temperature extreme, electricity, laser, ionizing or non-ionizing radiation, etc.).

- **Exposure Assessment:** The gathering of information by one or more of the following methods for the purpose of estimating the extent of exposure.

    - Interview,
    - Inspection,
    - Sampling and analysis of air, water, etc.,
    - Investigation of materials and/or procedures used,
    - Medical evaluation, and
    - Other forms of inquiry as deemed appropriate by the Chemical Hygiene Officer.

- **Hazardous Chemical / Hazardous Substance / Hazardous Energy**: A chemical, substance, or form of energy for which there is statistically significant evidence, based on at least one scientific study, that acute or chronic health effects may result from exposure to that chemical, substance or energy. This definition includes substances which present both physical and health hazards.

- **Health Hazard:** Health hazards include chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin, eyes or mucous membranes.

- **Highly Toxic Chemical:** A chemical falling within any of the following categories:

    (a) A chemical that has a median lethal dose (LD_{50}) of 50 milligrams or less per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.

    (b) A chemical that has a median lethal dose (LD_{50}) of 200 milligrams or less per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each.

    (c) A chemical that has a median lethal concentration (LC_{50}) in air of 200 parts per million by volume or less of gas or vapor, or 2 milligrams per liter or less of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.

- **Laboratory:** A facility where laboratory use of relatively small quantities of hazardous chemicals are used on a non-production basis.

- **Laboratory Employee / Worker:** An individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments.

- **Laboratory Scale:** Work with substances involving containers that can be easily and safely manipulated by one person.

- **Laboratory Use of Hazardous Chemicals**: The handling or use of chemicals on a laboratory scale in which all of the following conditions are met:

  - Multiple chemical procedures or chemical substances are used.
  - Procedures involved are not part of a production process nor in any way simulate a production process.
  - Protective laboratory practices and equipment are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

- **Lower Flammable Limit (LFL) / Lower Explosive Limit (LEL):** The minimum concentration (percent by volume) of flammable vapor in air below which the mixture cannot be ignited.

- **Permissible Exposure Level (PEL):** The maximum concentration of a contaminant in breathing air to which a laboratory worker may be legally exposed, as an 8-hour weighted average.

- **Physical Hazard:** A substance for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric (ignites spontaneously in air), unstable (reactive) or water-reactive. Substances, processes, and forms of energy are also considered to be physical hazards if they involve a potential for skin or eye contact with a hot or cold material, surface, or source of energy sufficient to cause tissue damage or loss of eyesight.

- **Reproductive Toxins:** Chemicals that affect the reproductive capabilities, including chromosomal damage (mutations) and effects on fetuses (teratogeneses).

- **Required Respirator:** An appropriate respirator, excluding a dust mask, which is worn to prevent the wearer from breathing a contaminant whose concentration in the air exceeds the PEL. A respirator is required when the air in a work place contains one or more contaminants exceeding a PEL or when sudden failure of an engineering control would create an exposure above the STEL. (Note: Other methods of exposure control take precedence over respirator use. A required respirator is to be used only in situations where other forms of exposure control are not possible. Regulations require that any employee who must work in a respirator be certified by a physician to be physically fit to work in that respirator. This certification must be obtained before the employee can be allowed to work while wearing a respirator, whether supplied by the employer or not.

- **Select Carcinogen:** Any substance that meets one of the following criteria:
  - It is regulated by regulations as a carcinogen, or
  - It is listed under the category “Known To Be Carcinogens” in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition), or
  - It is listed under Group 1 (Carcinogenic To Humans) by the International Agency for Research on Cancer Monographs (IARC) (latest edition), or
  - It is listed in either Group 2A or 2B by IARC or under the category “Reasonably Anticipated To Be Carcinogens” by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:
  - After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime, to dosages of less than 10 mg/m^3,
  - After repeated skin application of less than 300 mg/kg of body weight per week, or
  - After oral dosages of less than 50 mg/kg of body weight per day.

- **Short Term Exposure Limit (STEL):** The maximum concentration of a contaminant in breathing air to which a laboratory employee may be legally exposed, as a time weighted average, for a maximum (for most contaminants) of 15 minutes.

- **Well Ventilated Area:** An area where the ambient conditions of use include sufficient ventilation to prevent a flammable or combustible vapor/air mixture from reaching the LFL/LEL and the concentration of air contaminants in the breathing zone of laboratory workers from exceeding a PEL.

4.0 Responsibilities

4.1 Chemical Hygiene Officer

The Director of Environmental Health and Safety will serve as the Chemical Hygiene Officer (CHO). The Chemical Hygiene Officer is responsible for the development and implementation of chemical hygiene policies and practices in the laboratory. He or she will:

- Monitor the procurement, use, and disposal of chemicals used in the laboratory,
- See that appropriate audits are maintained,
- Help the Laboratory Supervisor develop precautions and adequate facilities to maintain the safety of laboratory workers,
- Know the current legal requirements concerning regulated substances,
- Maintain adequate records detailing efforts and results of employee exposure monitoring, including associated accident reports, medical consultations and examinations when applicable,
- Seek ways to improve the Chemical Hygiene Plan, and
- Develop and oversee implementation of the Chemical Hygiene Plan.

4.2 Department Chemical Hygiene Officer

The Department Chemical Hygiene Officer has ultimate responsibility for implementing chemical hygiene at the department level and shall provide continuing support for chemical hygiene in addition to:

- Providing technical guidance in the development and implementation of the Chemical Hygiene Plan,
- Ensuring that Standard Operating Procedures (Part 5 – Standard Operating Procedures) are followed, and
- Conducting regular inspections of emergency equipment, chemical hygiene and housekeeping.

4.3 Laboratory Supervisor / Principle Investigator / Program Director

The Laboratory Supervisor is responsible for chemical hygiene in the laboratory. The Laboratory Supervisor shall ensure:

- Laboratory employees know and follow the chemical hygiene rules,
- Protective equipment is available and in working order, (See Parts 9.2 – Inspections, 5.4 – Personal Protective Equipment, and Appendix 7A – Glove Selection Chart)
- Laboratory employees have been provided with appropriate training, (See Part 13 – Employee Training)
- Facilities and training for the use of any material being ordered are adequate, (See Part 6 – Chemical Procurement, Distribution, and Storage)
- Locations of any “controlled work areas” within the laboratory are defined, and inventory of any toxic substances and potential or known carcinogens are properly maintained,
- Unwanted and/or hazardous chemicals and hazardous waste are disposed properly,
- The Chemical Hygiene Officer is notified of all incidents that constitute a danger of environmental contamination or that cause laboratory workers to be exposed to hazardous materials where symptoms of exposure are evident and/or medical treatment is rendered,

  - Note: “danger of environmental contamination” refers to the spill or release of a hazardous chemical when the nature of the material or the circumstances of the spill are such that personnel in the immediate area cannot clean up the spill without further environmental contamination or increased exposure to the hazardous material.

- Inspections of emergency equipment, chemical hygiene, and housekeeping are conducted. (See Parts 5.6 – Housekeeping, 9.2 – Inspections, and 11 – Emergency Equipment).

4.4 Laboratory Employee / Worker

Each laboratory employee is responsible for planning and conducting all operations in accordance with the chemical hygiene procedures and developing good personal chemical hygiene habits. This includes:

- Understanding the function and proper use of personal protective equipment and using personal protective equipment when mandated or necessary,
- Notifying the Laboratory Supervisor of conditions or actions that could result in an accident or injury, or significant problems arising from the use of the Standard Operating Procedures, and
- Asking the Laboratory Supervisor for clarification of any of the above responsibilities which they do not fully understand.

5.0 Standard Operating Procedures

5.1 General Safety Guidelines

- Faculty, staff, and students should never work alone at a potentially dangerous activity. Students should never work alone in any lab in the ET building, unless authorized to do so by an appropriate faculty or staff member.
- When working with flammable materials, be certain there are no sources of ignition near enough to cause a fire or explosion in the event of a spill or vapor release.
- Use a shield for protection whenever an explosion or implosion is possible.
- The hazardous properties of each material used in a procedure must be determined before the first time it is used. Assume a mixture to be more toxic than any of its components.
- Use proper protective equipment whenever required. Refer to the Department Safety Information Book, Section 5, Personal Protective Equipment.
- Know the location and proper use of emergency equipment and be familiar with emergency procedures.
- Minimize all chemical exposures; avoid skin contact with chemicals. Immediately notify a Laboratory Supervisor if exposure to a hazardous substance occurs.
- Store chemicals in tightly closed containers with readable and accurate labels.
- Use of hazardous chemicals that may produce gases, fumes, or hazardous vapors must be conducted in a working fume hood, in the paint booth, or in a room with sufficient and approved ventilation. Never use highly toxic agents, carcinogens, or reproductive toxins outside of a working fume hood, unless previously discussed with the Laboratory Supervisor.
- Work conducted in a laboratory (and its scale) must be appropriate to the physical facilities as well as the quality of the ventilation system.

- Be alert to unsafe conditions and report them to the Laboratory Supervisor or the Environmental Health and Safety office correction. Refer to the Department Safety Information Book, Section 4, General Safety, Appendix 4A, Safety and Health Information for Employees.
- Faculty, staff, and students should always have lab badges on them and properly displayed when in any laboratory in the ET building. Authorized guest users need to get a guest badge from the ENGD office before entering any labs.
- Visitors to the laboratory are to be escorted by an employee and are the responsibility of that employee. All safety regulations must be observed.

5.2 Unattended Operations

An experiment is considered to be an unattended operation if there is no one immediately present who fully understands the operation and shutdown procedure to be used in the event of an emergency. Reactions that are not well understood should not be permitted to run unattended.

- Unattended operations must be approved by an appropriate faculty or staff member.
- Unattended operations must be prominently labeled with the laboratory employee's name, start date and time, intended stop date and time, and contact information for the laboratory worker and faculty advisor, if applicable. Leave the laboratory lights on and post warning signs of any associated hazards (e.g. flammable, reactive, explosive, etc.).
- Unattended operations that could result in a fire or explosion should be equipped with the necessary automatic shutdown controls.
- Use necessary shields or barriers to contain splashes, explosions or other releases.
- Establish provisions for containment of toxic substances in the event of a utility service failure, such as loss of cooling water.

5.3 Personal Hygiene

- Avoid skin contact with chemicals; wash promptly whenever a chemical contacts the skin.
- Avoid inhalation of chemicals; do not smell or taste chemicals.
- Never pipette by mouth or use mouth suction to start a siphon.
- Never bring food, chewing gum, beverages, cigarettes, or food containers into any laboratory in the ET building where chemicals are used or stored. Never eat, drink, smoke, bite fingernails, apply cosmetics, or handle contact lenses while in those laboratories.
- Always wash hands with soap and water before leaving the laboratory and before eating, drinking, smoking, using the restroom, applying cosmetics, or handling contact lenses. Areas of exposed skin (such as the forearms) should be washed frequently if there is a potential for contact with chemicals.
- Never store food in a refrigerator that is used to store chemicals.
- Never use laboratory glassware or utensils for storage, handling, or consumption of food or beverages.
- Ice generated for laboratory use shall not be used for human consumption or food storage.

5.4 Clothing

- Closed toe shoes and appropriate clothing are required in labs that require safety glasses.
- Confine loose hair and clothing while working in the laboratory; neckwear (scarves, ties, long necklaces, etc.) is not allowed when working in labs that require safety glasses.

- Use of headphones is never allowed in labs that require safety glasses. It is critical those in labs are able to hear equipment and each other at all times.
- Laboratory coats, aprons, or coveralls shall be worn by laboratory users according to specific laboratory policies (Appendices 7F-7H) whenever handling hazardous liquids.
- Laboratory coats, aprons, or coveralls must be cleaned regularly. If a spill occurs on the laboratory coat or personal clothing, it must be either decontaminated before reuse or disposed of as hazardous waste.
- Laboratory coats, aprons, or coveralls must not be laundered with personal laundry.

The commercial firm laundering any contaminated work clothing shall be notified of potentially contaminated substances. Grossly contaminated clothing shall be bagged and disposed of as hazardous waste.

5.5 Personal Protective equipment

- Laboratory workers must always wear appropriate eye protection. Safety glasses are required in most ET labs and should be worn at all times when in those labs. Whenever anyone is working with hazardous materials or performing hazardous processes in the laboratory other types of eye and face protection may be required. Goggles must be worn when there is a potential for splashing or spilling of a hazardous liquid. Face shields or full face respirators should be worn when appropriate.
- When working with hazardous chemicals, wear gloves made of a material that is resistant to permeation by that chemical. (See Appendix A – Glove Selection Chart). Latex gloves are not permitted for chemical handling. Disposable nitrile gloves are the minimum hand protection for chemical use.
- Use a fume hood when exposure to a toxic substance by inhalation is likely to exceed the PEL for that substance.

The Laboratory Supervisor (or designee) will be responsible for selecting and acquiring appropriate personal protective equipment, maintaining its availability, and establishing cleaning and disposal procedures. Standard personal protective equipment must be provided by the employer to employees free of cost.

Refer to Western Washington University's Safety Information Book, Section 5 (Personal Protective Equipment), Section 13 (Respiratory Protection Program), and Section 14 (Hearing Conservation Program).

Chemical protective clothing must be removed before leaving the work area. Gloves should be removed before touching other surfaces, such as doorknobs, drawer pulls, or faucet handles.

5.6 Housekeeping

- Lab areas should be kept clean and uncluttered. Spills must be immediately cleaned and floors must be maintained dry at all times. Contaminated glassware should not be left out.
- Access to exits, emergency equipment, eyewashes, safety showers, fire extinguishers, emergency spill equipment, circuit breakers, and fire alarm pull boxes must never be blocked.
- All primary chemical containers must be labeled with (at least) the identity and hazards of its contents.
- All secondary chemical containers must be labeled with chemical identity, name of user, date filled, and class or project name.

- All project specific chemicals must be labeled with date of acquisition, name of user, name of faculty or staff sponsor, name of project, and intended date of disposal.
- Waste must be properly labeled and kept in proper containers. (See Section 14 – Waste Disposal Procedures)
- Chemicals should be stored in an earthquake-safe storage area and should be returned to their storage area after use.

5.7 Operations Requiring Prior Approval

The following laboratory operations require prior approval from the Department or Assistant Chemical Hygiene Officer:

- Introduction of new materials/chemicals (see App. 7E for the approval procedure),
- Purchase of chemicals, and
- Disposal of chemical waste.

The following laboratory operations require prior approval from the Laboratory Supervisor:

- Procedures for which the laboratory employee has not been trained,
- Operations or activities for which there are no written procedures, and
- Work with unknown substances.
- Unattended operations.

5.8 Planning Chemical Laboratory Experiments

- Consider all possible reactions, including side-reactions, before beginning.
- Think through all reactants, intermediates, and products in terms of flammability, toxicity, route of entry, and reactivity hazards.
- Follow recognized safe practices concerning personal protective equipment, housekeeping, and handling of hazardous chemicals as outlined in this chemical hygiene plan.
- When conducting unknown reactions, always start with small quantities of material and carefully observe reaction characteristics before increasing quantities.
- Obtain safety information about reactants and by-products.
- If possible, determine the quantity and rate of evolution of heat and gases to be released during the reaction.
- Provide adequate cooling, ventilation, pressure relief, and gas purging. If possible, isolate the reaction vessel and make frequent inspections of equipment during the reaction. Do no leave a hazardous system unattended.
- Consider the recommended first aid treatment for each reactant, intermediate, and products.
- Develop a plan of action for situations such as power failure, cooling system failure, exposure of the system to water or air, unexpected increase in pressure, or broken reaction containers.

5.9 Emergency Procedures

Refer to Western Washington University Safety Information Book, Section 2 (Emergency Chemical Procedures) for information on emergency procedures and the Departmental Emergency Plan.

5.10 Accidents and Accident Reporting

Accidents or injuries that occur in the laboratory and require medical treatment must be reported immediately and treated immediately. Personnel trained in first aid and CPR must be available during working hours to render assistance until medical help can be obtained.

All accidents, whether resulting in injury or damage, should be carefully analyzed with the results reported to all who might benefit. Accident reports will be kept on file with the Director of Environmental Health and Safety and will be made available to employees upon request. Please refer to Western Washington University Safety Information Book, Section 4 (General Safety Information Accident Prevention Plan) for more information on accident reporting.

6.0 Chemical Procurement, Distribution, and Storage

6.1 Chemical Procurement and Distribution

- The Department or Assistant Chemical Hygiene Officer approves the purchase of all new hazardous chemicals at the recommendation of the Department Safety Committee (see App. 7E). Prior to purchase of new hazardous chemicals, the following must be considered:
    - If safer and/or greener alternatives are available,
    - If the chemical is already available on campus and can be obtained in necessary quantities from another unit,
    - The amount required and the minimum amount that can be purchased,
    - Any restrictions on quantity or use and any security risks,
    - Proper storage, handling, and disposal procedures,
    - Facility requirements for safe handling of the material
    - Personnel training or proficiency necessary for safe handling of the material, and
    - Additional PPE required beyond lab minimum.
- Before a substance is received, information of proper handling, storage, and disposal should be known. All Material Safety Data Sheets (MSDSs) received with shipments to a laboratory will be maintained on file in the department and at the Environmental Health and Safety office.
- No container will be accepted without an adequate identifying label. This label should include the substance name, an appropriate hazard warning, and specific target organ effects.
- Any new chemicals must be entered into Chimera system. They must also have a bar code attached to them, unless they are to become static materials.
- Chemicals that are introduced for a specific project should be labeled with the project end date so that they may be removed in a timely manner when the project is complete.

6.2 Chemical Inventory

- The chemical inventory is kept in the department. Refer to Western Washington University Safety Information Book, Section 9 (Chemical Inventory) provides the inventory or its location.
- Physical inventories are conducted annually to identify leaking or damaged containers, containers with missing or illegible labels, and chemicals that are no longer needed.

6.3 Chemical Distribution and Transportation

- When chemicals are hand-carried, they are placed in a secondary container to protect against breakage and spilling.
- Chemicals transported by vehicle should have secondary containment and meet all appropriate guidelines for allowable quantities.
- Large compressed gas cylinders are transported with a suitable handcart and strapped in place during transport.

6.4 Chemical Storage

- Storage and working amounts of hazardous chemicals are kept to a minimum.
- Chemical storage in fume hoods is kept to a minimum.
- Chemicals are stored in containers with which they are compatible; containers are kept closed when reagents are not being used.
- All chemical containers must have a legible, firmly attached label. The containers are dated when received and when opened.
- All flammable substances are stored in a flammable materials cabinet or refrigerator designated for flammable liquid storage. (See Part 16.1.2 – Flammable Liquids Storage)
- Compressed gas cylinders are individually secured at all times; cylinder caps must be in place on cylinders when not in use.
- Incompatible chemicals must be segregated. See Appendix 7C, Table 7-2 for a partial list of incompatible chemicals.
- Chemicals are stored on shelves or in cabinets that prevent the containers from falling in the event of an earthquake. Heavy items and corrosive materials are stored on shelves near the floor.

6.5 Spill Response

Locations where chemicals are stored should have available a supply of equipment and materials for use in the event of a chemical spill. Spill response materials may include:

- Absorbent
- Personal protective equipment
- Scoops and/or pans for picking up granular solids
- Plastic bags to contain contaminated absorbent

For spills creating an airborne hazard or that require equipment beyond standard laboratory apparel, contact the Environmental Health and Safety office for assistance in containment and clean up.

7.0 Hazard Identification

- All chemical containers must have a legible, firmly attached label showing the contents of the container.
- Labels on incoming containers of hazardous chemicals must not be removed or defaced.
- Material Safety Data Sheets (MSDSs) received with incoming shipments of hazardous chemicals are maintained and made readily accessible to laboratory employees. MSDSs are kept on file in the department. Refer to Western Washington University Safety Information Book, Section 9 (MSDSs) for information on MSDS locations.
- A hazard review of new materials not previously used in the laboratory shall be completed before working with the new material. The Department Safety Committee conducts this review. (See Part 6.1 – Chemical Procurement and Distribution and App. 7E)

- Chemical substances developed in the laboratory are assumed to be hazardous in the absence of other information.
- Laboratory areas that have special or unusual hazards should be identified with an appropriate warning sign.

8.0 Environmental Monitoring

Employee exposure to regulated substances shall not routinely exceed the action level or, in the absence of an action level, the PEL. When there is reason to believe that employee exposure levels of regulated substances are routinely exceeding the action levels, employee exposure to these substances will be monitored.

In the event that the action level is exceeded, Western Washington University will immediately comply with the exposure monitoring requirements of the standard for that substance (WAC 296-62). In addition, environmental monitoring of airborne concentrations of hazardous chemicals should be conducted in the following conditions:

- When requested by a laboratory employee as a result of a documented health concern or suspicion that a PEL is being exceeded,
- When a highly toxic substance is being regularly and continuously used outside of a chemical fume hood (three or more times a week), or

The Environmental Health and Safety office will ensure that employee exposure is monitored. Exposure testing procedures and monitoring results are provided to the Department and Assistant Chemical Hygiene Officers, Laboratory Supervisor, and employees within 15 working days after receipt of the results. An accurate record of all measurements taken to monitor employee exposures will be kept, transferred, and made available for each employee in accordance with Access to Employee Exposure and Medical Records requirement (WAC 296-62- 40007).

9.0 Maintenance and Inspections

9.1 Maintenance

All local exhaust ventilation hoods and other engineering controls shall be functioning properly. Improperly functioning equipment, out of service equipment, and equipment under repair shall be tagged “OUT OF SERVICE” and locked out if possible. The equipment shall not be restarted without the approval of the Chemical Hygiene Officer or designee, Laboratory Supervisor, and Facilities Maintenance personnel.

9.2 Inspections

Each laboratory employee will evaluate the condition of all personal protective equipment (safety glasses, goggles, gloves, hearing protection, etc.) before use. For more information, refer to Section 5 of the Safety Information Book – Personal Protective Equipment. Laboratory employees ensure that fume hoods and local exhaust ventilation hoods are working before each use. (See Part 15.2 – Ventilation Inspections)

Facilities Management will conduct annual inspections of chemical fume hoods, safety showers, eyewashes, and fire extinguishers.

The Department Chemical Hygiene Officer (or designee) will conduct quarterly inspections of personal protective equipment, first aid kits, and, if present, emergency blankets.

Facilities Management inspects the following items at appropriate intervals:

- Emergency lighting and/or illuminated exit signs,

- Fire alarms,
- Smoke and heat detectors and sprinklers,
- Fire doors, and
- Fire suppression systems.

10.0 Medical Program

Medical attention, including medical consultation and follow-up, is provided to employees under the following circumstances:

- Where exposure monitoring is over the action level for a regulated substance that has medical surveillance requirements.
- Whenever a laboratory employee develops signs or symptoms that may be associated with a hazardous chemical to which the employee may have been exposed in the laboratory.
- Whenever a spill, leak, or explosion results in the likelihood of a hazardous exposure.

All medical examinations will be provided by or under the direct supervision of a licensed physician, at no cost to the employee, without loss of pay, and at a reasonable time and place. All questions regarding medical consultations and examinations should be directed to the Chemical Hygiene Officer.

When medical consultations or examinations are provided, the examining physician will be provided with the following information:

- The identity of the hazardous chemical(s) or material(s) to which the employee(s) may have been exposed,
- The MSDSs for the hazardous chemical(s) or material(s) if available,
- 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.

For examinations or consultations provided to employees, the Chemical Hygiene Officer shall obtain a written opinion from the examining physician. It shall include:

- Recommendations for further medical follow-up,
- Results of the examination and associated tests,
- Any medical condition revealed that places the employee at an increased risk of exposure to a hazardous substance found in the workplace, and
- A statement that the employee has been informed of the results of the examination or consultation.

The written opinion will not reveal specific diagnoses unrelated to occupational exposure, except as noted above.

The Environmental Health and Safety office keeps an accurate record of any medical consultations or medical examinations. Records for each employee are transferred and made available as specified under Access to Employee Exposure and Medical Records requirement (WAC 296-62-40019).

11.0 Emergency Equipment

11.1 General

The Department Chemical Hygiene Officer will ensure that adequate emergency equipment is available in the laboratory and inspected periodically to ensure that it is functioning properly. Signs may be posted to show the location of safety showers, eyewashes, exits, first aid kits, fire extinguishers, etc. Each laboratory employee must be familiar with the location, application, and/or correct way to operate the following emergency equipment:

- Fire extinguishers,
- Fire alarms,
- Fire doors,
- Smoke detectors,
- Fire sprinklers
- Safety showers,
- Eyewashes,
- First aid kits.

11.2 Fire Extinguishers

- Fire extinguishers are provided along normal paths of travel.
- Fire extinguishers are labeled to show the type of fire for which they are intended.
- Access must be maintained and the location clearly marked in an appropriate manner.
- The fire extinguisher type and size must be selected for the appropriate hazards.
- Documented inspections are conducted at least annually by Facilities Management to ensure:
    - The extinguisher is in its designated location,
    - Access is maintained,
    - The pin is in place and attached with unbroken wire,
    - The indicator, if present, is in full range, and
    - No physical damage is evident.

11.3 Fire Alarms

- Fire alarms are provided along normal paths of travel and exit routes.
- Access must be maintained and the location should be clearly marked in an appropriate manner.
- Documented inspections involving activation of fire alarms are conducted at appropriate intervals to insure proper operation.

11.4 Fire Doors

- Fire doors are provided per building codes, fire codes, and fire insurer's requirements.
- Fire doors are not blocked open and must be able to close properly.
- Inspections are conducted at appropriate intervals to ensure proper working order.

11.5 Smoke or Heat Detectors

- Smoke or heat detectors are selected and installed for the appropriate hazards per building code, fire codes, and fire insurer's requirements.
- Inspections are conducted at appropriate intervals to ensure proper working order.

11.6 Safety Showers

- Safety showers are within the work area for immediate emergency use.
- Safety shower water is potable and provides at least fifteen minutes of flushing.

- Access is maintained at all times.
- Inspections are conducted by Facilities Management to ensure adequate flow.

11.7 Eyewashes

- Eyewashes are within the work area for immediate emergency use.
- Eyewashes are plumbed, whenever possible. Water is potable and provides at least fifteen minutes of flushing.
- Access is maintained at all times.
- Inspections are conducted by Facilities Management to ensure adequate flow.

11.8 First Aid Kits

- First aid kits are available for treatment of minor injuries or for short-term emergency treatment before medical assistance is available.
- Inspections are conducted by the Department Chemical Hygiene Officer (or designee) to ensure first aid kits are adequately stocked and maintained.

11.9 Emergency Lighting

- Emergency lighting provides adequate illumination for evacuation during an emergency situation or power failure.
- Inspections are conducted at appropriate intervals to ensure proper working order.

11.10 Fire Suppression Systems

- The fire suppression system is selected based on the hazards.
- Documented inspections involving activation of the system are conducted at appropriate intervals to ensure proper working order.

11.11 Emergency Blankets

- Blankets MAY be provided in the vicinity of safety showers to prevent shock and provide privacy.
- If present, inspections are conducted annually by the Department Chemical Hygiene Officer or a designee to ensure blankets are not contaminated or damaged.

12.0 Record Keeping

- The Environmental Health and Safety office retains accident and incident records, medical records and industrial hygiene monitoring records.
- Departments maintain Material Safety Data Sheets and send copies to the Environmental Health and Safety office.
- Departments maintain chemical inventories and department-related inspections of equipment and training.

13.0 Employee and Student Training

13.1 Training

- Refer to the Safety Information Book, Section 3, Responsibilities, for information on training responsibilities. Generally, the Department or Assistant Chemical Hygiene Officer or Laboratory Supervisor or designee trains all laboratory employees and student users on the hazards of the chemicals present in their work area. The purpose of this training is to assure that all laboratory employees and students are adequately informed about the risks associated with working in the laboratory and what to do in the event of an accident.

- Training is provided at the time of an employee's or student's initial assignment to a work area where hazardous chemicals are present. Additional training is provided prior to assignments involving new exposure situations. Refresher information and training is provided annually. The department maintains employee and student training records and sends a copy to the Environmental Health and Safety office. (See Appendix B for sample.)
    - General lab safety, personal protective equipment and hazardous waste training, among other required elements can be found at this link on the EHS website. This training may become basic departmental lab training, or may be used to supplement departmental training.
- Employees and students may not use any personal protective clothing until they have received instruction on the proper selection, use, and limitations of the equipment. Refer to the Safety Information Book, Section 5, Personal Protective Equipment.
- Training should include:
    - Methods used to detect the release or presence of hazardous chemicals,
    - Physical and health hazards associated with chemicals in the work area,
    - Personal protective equipment,
    - Respirator protection, medical evaluation and fit-testing program, if respirators are used,
    - General rules for laboratory safety and good personal hygiene,
    - Laboratory operations and activities requiring approval,
    - Handling of hazardous chemicals and hazardous waste disposal,
    - Emergency response and evacuation procedures,
    - Interpretation of MSDSs,
    - Engineering controls, and
    - First aid.

13.2 Reference Materials

Reference materials on the hazards, safe handling, storage, and disposal of hazardous chemicals can be found in many location(s). Contact the Environmental Health and Safety office or refer to their website at http://www.wwu.edu/ehs/ for links.

14.0 Waste Disposal Procedures

Chemical waste disposal procedures can be found in Western Washington University Safety Information Book, Section 10 (Hazardous Waste Program).

15.0 Ventilation

15.1 General Guidelines

- General laboratory ventilation shall provide airflow into the laboratory from non-laboratory areas and out to the exterior of the building.
- All operations that might result in the release of unpleasant and/or potentially hazardous fumes, vapors, gases or dust must be conducted with local exhaust ventilation.
- Storage in a fume hood is kept to a minimum, should not include flammable chemicals, and should not restrict ventilation or airflow.

15.2 Inspections

Laboratory employees should check fume hoods to ensure proper working order before each use. This should include a visual inspection of the hood area for storage or other visible blockages. Refer to Part 9 – Maintenance and Inspections.

Further information on chemical fume hoods can be found in Western Washington University Safety Information Book, Section 8 (University Chemical Fume Hood Program).

16.0 Chemical Handling Procedures

16.1 Flammable Liquids

16.1.1 Hazards

- Flammable vapors can form ignitable mixtures in air. Vapors can travel great distances and be ignited by remote ignition sources, flashing back violently to the source.
- Many flammable liquids are toxic by inhalation and/or skin contact.
- Flammable liquids or their vapors can cause eye injury, ranging from irritation to severe damage.

16.1.2 Storage

Research laboratories should limit the amount of flammable liquids in a laboratory to less than 10 gallons per 100 square feet of laboratory unit space. Total amounts of flammable and combustible liquids should not exceed an additional 10 gallons per 100 square feet of laboratory. Note that the 2009 and future International Fire Code editions will specify the maximum allowable amount of flammables per control area. Contact Environmental Health and Safety for updates.

16.1.3 Controls

- Perform work with flammable liquids in a properly functioning chemical fume hood whenever possible.
- Clean up spills of flammable materials immediately.

16.1.4 Examples of Flammable Liquids

Examples of flammable liquids are listed in Appendix 7C, Table 7-3.

16.2 Corrosive Chemicals

16.2.1 Hazards

Contact with the skin, eyes, respiratory system, or digestive tract can cause severe irritation and burns.

16.2.2 Storage

- Store concentrated acids and bases separately in appropriate secondary containers (acid- or base-resistant trays or catch basins).
- Transport concentrated acids and bases in a break-resistant protective carrier.
- Store oxidizing acids (perchloric, nitric, and sulfuric acids) away from combustible materials such as organic chemicals, paper, and wood.

16.2.3 Controls

- Use appropriate personal protective equipment when handling corrosives. Safety goggles are required for liquid corrosives.
- In case of contact, flush the affected area with large amounts of water for at least 15 minutes, remove contaminated clothing, and seek medical attention.
- Always add acid to water when diluting.

16.2.4 Examples of Corrosives

Examples of common corrosives are listed in Appendix 7C, Table 7-4.

16.3 Reactive Chemicals

16.3.1 Hazards

Reactive chemicals are those which:

- Are oxidizers (can initiate or support combustions),
- Are organic peroxides (can form shock-sensitive explosives upon prolonged storage),
- Are explosive,
- Can react with other materials (including water) to release hazardous gases or can react violently or with the generation of large amounts of heat, or
- Can polymerize violently with the release of large amounts of heat.

16.3.2 Storage

- Materials that are reactive hazards shall be stored in such a way as to prevent their mixture with incompatible materials.

16.3.3 Controls

- Use appropriate personal protective equipment when handling reactive chemicals.
- Read and understand handling instructions provided by the precautionary label or MSDS.
- Perform work with reactive chemicals in a properly functioning chemical fume hood whenever possible.
- Perform potentially violent reactions behind a barrier or shield, or at a sufficient distance from any laboratory employees.

16.3.4 Examples of Reactive Chemicals

Examples of reactive chemicals are listed in Appendix 7C, Table 7-5.

16.4 Compressed Gases

16.4.1 Hazards

Compressed gases contain large amounts of energy that can cause serious injury and physical damage. Compressed gases may also be flammable, toxic, or corrosive.

16.4.2 Storage

- Compressed gases must be stored in the upright position with caps on when not in immediate use.
- Compressed gas cylinders must be individually secured with straps, chains, or stands designed for this purpose.

16.4.3 Controls

- Transport compressed gas cylinders with caps in place, secured to suitable containers.
- Each cylinder must be matched with the appropriate fitting and regulator. Using regulator-adaptors is prohibited.
- Regulators must be fitted with check valves to prevent inadvertent mixing of gases and suck-back into the cylinder.
- Cylinder valves should always be opened slowly; do not stand in front of regulators when “cracking open” cylinder valves.

- Avoid completely emptying cylinders. Leave residual pressure in the cylinder and mark it as “empty”.

16.4.4 Compressed and Liquefied Gases

Information regarding compressed and liquefied gases is listed in Appendix 7C, Table 7-6.

16.5 Carcinogens, Mutagens, Teratogens, and Reproductive Toxins

16.5.1 Hazards

Exposure can induce carcinogenesis, mutagenesis (chromosomal damage), teratogenesis (fetal damage), and infertility. Exposure may have an effect on future generations.

16.5.2 Storage

Store these chemicals in a dedicated storage fume hood or glove box. All containers must be unbreakable and properly labeled. Maintain a minimum quantity and dispose of unneeded material(s) immediately.

16.5.3 Controls

- Work with these chemicals only in designated areas. (See Part 17.1 – Use of Designated Areas)
- Wear appropriate personal protective equipment. Avoid skin contact and always wash hands and arms immediately after working with these chemicals.
- Work only with adequate engineering controls such as glove bags, glove boxes, and fume hoods.
- Laboratory employees should be familiar with emergency procedures for accidents or spills involving these chemicals. The Department Chemical Hygiene Officer should be notified of all incidents of exposure or spills.
- The Laboratory Supervisor should keep records of the amounts of these materials used and the names of workers involved.

16.5.4 Examples of Carcinogens, Mutagens, Teratogens, and Reproductive Toxins

Examples of these chemicals are listed in Appendix 7C, Tables 7-1 and 7-7, 8, and 9.

16.6 Toxic Metals

16.6.1 Hazards

These chemicals are toxic by inhalation, ingestion, and possibly by skin absorption.

16.6.2 Storage

Maintain a minimum quantity of toxic metals and disposed of unneeded material(s) immediately.

16.6.3 Controls

- Wear appropriate personal protective equipment when handling toxic metals.
- Work in a fume hood whenever possible.
- Spills should be immediately cleaned up and the work area properly decontaminated.

16.6.4 Examples of Toxic Metals

Examples of toxic metals are listed in Appendix 7C, Table 7-10.

16.7 Radionuclides

The Radiation Safety Officer and State of Washington have strict policies and procedures for the procurement, handling, use, and disposal of radioactive materials. These procedures must be

followed by anyone using radionuclides. Contact the Environmental Health & Safety Department for further information.

17.0 Substances of Moderate to High Chronic Toxicity or High Acute Toxicity (Including Select Carcinogens)

17.1 Use of Designated Areas

A “designated area” must be established and clearly marked for storage and work with “Select Carcinogens”, reproductive toxins, and substances that have a high degree of acute toxicity. This area may be an entire laboratory, a section of a laboratory, or a device within a laboratory, such as a fume hood or balance. See Appendix D for a table of designated areas within the department.

17.2 Storage

Store these chemicals in a designated area that is well ventilated. All containers must be unbreakable and properly labeled.

17.3 Controls

- The Department or Assistant Chemical Hygiene Officer approves the use and disposal of these substances.
- Use properly functioning control equipment (fume hood, glove box, etc.) for procedures that may result in the generation of aerosols or vapors containing the substance. Released vapors should be trapped to prevent their discharge with the hood exhaust.
- Protect vacuum pumps from contamination by traps or other devices. Decontaminate vacuums pumps and other contaminated equipment before removing them from the designated area.
- Weigh materials only in closed containers unless balances are included in designated areas. Open containers to add or remove chemical in ventilated areas.
- Wear appropriate personal protective equipment. Avoid skin contact and always wash hands, arms, face, and neck immediately after working with these chemicals.
- The Laboratory Supervisor maintains records of the amounts of these materials on hand, amounts and dates used, and names of laboratory employees involved.
- Laboratory employees should be familiar with emergency procedures for accidents or spills involving these chemicals. The Department Chemical Hygiene Officer should be notified of all incidents of exposure or spills. If a major spill occurs outside of the fume hood or glove box, emergency responders should wear appropriate personal protective equipment and all other workers should evacuate the area.
- Do not work alone when using compounds of high or unknown toxicity.
- Contaminated clothing should be chemically decontaminated or destroyed.
- Determine the appropriateness of medical surveillance for employees if they are working with toxicologically significant quantities of these substances on a regular basis.

Appendix 7A – Glove Selection Chart

Nitrile (heavy green or disposable blue) Use when handling most acids, caustics, alcohols, and ethers	Acetic Acid Ammonia Butyl Cellosolve Chromic Acid Cumene Diamine Diethanolamine Diethyl Ether Ethanol Ethylene Glycol Formaldehyde Freon Heptane	Hexane Hydrochloric Acid Hydrofluoric Acid Isopropyl Alcohol Kerosene Methanol Oleic Acid Phosphoric Acid Potassium Hydroxide Sodium Hydroxide Sulfuric Acid Triethanolamine
Butyl (Dull black with rolled cuff) Use when handling acids, ketones, esters, and some amines	Acetone Acetonitrile Acetophenone Acetylacetone Acrolein Amyl Acetate Aniline Benzyl Alcohol Butyl Acetate Cyclohexanone Diethylene Glycol Dibutyl Phthalate Diisobutyl Ketone Diisopropyl Ketone Dimethyl Ether Dimethyl Formamide Dimethyl Sulfoxide	Dioxane Ethyl Acetate* Ethylamine Furfural Hydrazine Methyl Isobutyl Ketone Methyl Ethyl Ketone Morpholine Nitropropane Phenol Propyl Acetate Propianaldehyde 1,2-Propylene Glycol Tetrahydrofuran* 2,4-Toluene Diisocyanate Tricresyl Phosphate
Viton (Shiny black with straight cuff) Use when handling PCB's, chlorinated solvents, and aromatic solvents	Carbon Disulfide Carbon Tetrachloride Benzene* Chlorobenzene Chloroform Cyclohexane Glutaraldehyde Hexane Methylamine Methylene Chloride	PCB's (Polychlorinated Biphenyls) Pentane Perchloroethylene Phenol 1,1,2,2-Tetrachloroethylene Trichloroethylene* Toluene 1,1,1-Trichloroethane Xylene

* Use with SilverShield Liner

Appendix 7B – Sample Employee Training Record

LABORATORY EMPLOYEE TRAINING RECORD

Employee Name:

Department:

Supervisor:

Date:

Training Requirement: Occupational Exposure to Hazardous Chemicals in Laboratories
WAC 296-828-20015 (29 CFR 1910.1450), Chemical Hygiene Plan

The following information was covered in the training session:

- ☐ Laboratory Standards Act
- ☐ General laboratory safety rules
- ☐ Laboratory operations or activities requiring approval
- ☐ Procedures for handling and labeling chemicals and working alone
- ☐ Identity of Chemical Hygiene Personnel
- ☐ Emergency procedures
- ☐ Fire extinguishers
- ☐ Specific exposure control measures
- ☐ Methods and observations to detect the presence or release of a hazardous chemical
- ☐ Physical and health hazards of chemicals in the work area
- ☐ Measures of protection from the hazards posted by chemicals in the lab
- ☐ Material Safety Data Sheets (MSDS)
- ☐ Proper waste disposal methods
- ☐ Other: _____

Employee's Signature: _____ Date:_____

Trainer's Signature: _____ Date: _____

Appendix 7C – Chemical Information
Table 7-1. Classes of Carcinogenic Compounds
(* Denotes Select Carcinogen)

Alkylating Agents: a-Halo Ethers	*bis(Chloromethyl)Ether *Methyl Chloromethyl Ether
Alkylating Agents: Sulfonates	*1,4-Butanediol Dimethanesulfonate Diethyl Sulfate Dimethyl Sulfate Ethyl Methanesulfonate Methyl Methanesulfonate Methyl Trifluoromethanesulfonate 1,3-Propanesultone
Alkylating Agents: Epoxides	*Ethylene Oxide Diepoxybutane Epichlorohydrin Propylene Oxide Styrene Oxide
Alkylating Agents: Aziridines	*Ethylenimine 2-Methylaziridine
Alkylating Agents: Diazo, Azo, and Azoxy Compounds	4-Dimethylaminoazobenzene
Alkylating Agents: Electrophilic Alkenes and Alkynes	*Acrylnotrile Acrolein Ethyl Acrylate
Acylating Agents	*b-Propiolactone b-Butyrolactone Dimethylcarbamoyl Chloride
Organohalogen Compounds	*1,2-Dibromo-3-chloropropane *Mustard Gas (bis(2-chloroethyl)sulfide) *Vinyl Chloride Carbon Tetrachloride Chloroform 3-Chloro-2-methylpropene 1,2-Dibromoethane 1,4-Dichlorobenzene 1,2-Dichloroethane 2,2-Dichloroethane 1,3-Dichloropropene Hexachlorobenzene Methyl Iodide Tetrachloroethylene 2,4,6-Trichlorophenol

Appendix 7C – Chemical Information
Table 7-1. Classes of Carcinogenic Compounds Continued

Hydrazines	Hydrazine and hydrazine salts 1,2-Diethylhydrazine 1,1-Dimethylhydrazine 1,2-Dimethylhydrazine
N-Nitroso Compounds	*N-Nitrosodimethylamine N-Nitroso-N-alkylureas
Aromatic Amines	*4-Aminobiphenyl *Benzidine (p,p'-diaminobiphenyl) *α-Naphthylamine *β-Naphthylamine Aniline o-Anisidine (2-Methoxyaniline) 2,4-Diaminotoluene o-Toludine
Aromatic Hydrocarbons	*Benzene Benz[a]anthracene Benzo[a]pyrene
Natural Products (Including Anti-Tumor Drugs)	Adriamycin Aflatoxins Bleomycin Cisplatin Progesterone Reserpine Safrole
Miscellaneous Organic Compounds	*Formaldehyde (gas) Acetaldehyde 1,4-Dioxane Ethyl Carbamate (Urethane) Hexamethylphosphoramide 2-Nitropropane Styrene Thiourea Thioacetamide
Miscellaneous Inorganic Compounds	*Arsenic and certain As compounds *Chromium and certain Cr compounds *Thorium Dioxide Beryllium and certain Be compounds Cadmium and certain Cd compounds Lead and certain Pb compounds Nickel and certain Ni compounds Selenium Sulfide

Appendix 7C – Chemical Information
Table 7-2 – Partial List of Incompatible Chemicals

Chemical	Is Incompatible With
Acetic Acid	Chromic Acid, Nitric Acid, hydroxyl compounds, Ethylene Glycol, Perchloric Acid, peroxides, permanganates
Acetylene	Chlorine, Bromine, Copper, Fluorine, Silver, Mercury
Acetone	Concentrated Nitric and Sulfuric Acid mixtures
Alkali and Alkaline Earth Metals	Water, Carbon Tetrachloride or other chlorinated metals, hydrocarbons, Carbon Dioxide, halogens
Ammonia (anhydrous)	Mercury (e.g. in manometers), Chlorine, Calcium Hypochlorite, Iodine, Bromine, Hydrofluoric Acid (anhydrous)
Ammonium Nitrate	Acids, powdered metals, flammable liquids, chlorates, nitrates, Sulfur, finely divided organic or combustible materials
Aniline	Nitric Acid, Hydrogen Peroxide
Arsenical materials	Any reducing agent
Azides	Acids
Bromine	See Chlorine
Calcium Oxide	Water
Carbon (activated)	Calcium Hypochlorite, all oxidizing agents
Carbon Tetrachloride	Sodium
Chlorates	Ammonium salts, acids, powdered metals, Sulfur, finely divided organic or combustible materials
Chromic Acid and Chromium Trioxide	Acetic Acid, Naphthalene, Camphor, Glycerol, alcohols, flammable liquids
Chlorine	Ammonia, Acetylene, Butadiene, Butane, Methane, Propane (or other petroleum gases), Hydrogen, Sodium Carbide, Benzene, finely divided metals, Turpentine
Chlorine Dioxide	Ammonia, Methane, Phosphine, Hydrogen Sulfide
Copper	Acetylene, Hydrogen Peroxide
Cumene Hydroperoxide	Acids (organic or inorganic)
Cyanides	Acids
Flammable Liquids	Ammonium Nitrate, Chromic Acid, Hydrogen Peroxide, Nitric Acid, Sodium Peroxide, halogens
Fluorine	Isolate from everything
Hydrocarbons	Fluorine, Chlorine, Bromine, Chromic Acid, Sodium Peroxide
Hydrocyanic Acid	Nitric Acid, alkalis
Hydrofluoric Acid (anhydrous)	Ammonia (aqueous or anhydrous)

Appendix 7C – Chemical Information
Table 7-2 – Partial List of Incompatible Chemicals Continued

Hydrogen Peroxide	Copper, Chromium, Iron, most metals or their salts, alcohols, Acetone, organic materials, Aniline, Nitromethane, combustible materials
Hydrogen Sulfide	Fuming Nitric Acid, oxidizing gases
Hypochlorites	Acids, Activated Carbon
Iodine	Acetylene, Ammonia (aqueous or anhydrous), Hydrogen
Mercury	Acetylene, Fulminic Acid, Ammonia
Nitrates	Sulfuric Acid
Nitric Acid (concentrated)	Acetic Acid, Aniline, Chromic Acid, Hydrocyanic Acid, Hydrogen Sulfide, flammable liquids, flammable gases, Copper, Brass, any heavy metals
Nitrates	Sulfuric Acid
Nitroparaffins	Inorganic bases, amines
Oxalic Acid	Silver, Mercury
Oxygen	Oils, grease, Hydrogen, flammable liquids, solids, or gases
Perchloric Acid	Acetic Anhydride, Bismuth and its alloys, alcohols, paper, wood, grease, oils
Peroxides, Organic	Acids (organic or mineral), avoid friction, store cold
Phosphorous (white)	Air, Oxygen, alkalis, reducing agents
Phosphorous Pentoxide	Water
Potassium	Carbon Tetrachloride, Carbon Dioxide, water
Potassium Chlorate	Sulfuric and other acids
Potassium Perchlorate (also see chlorates)	Sulfuric and other acids
Potassium Permanganate	Glycerol, Ethylene Glycol, Benzaldehyde, Sulfuric Acid
Selenides	Reducing agents
Silver	Acetylene, Oxalic Acid, Tartaric Acid, ammonium compounds, Fulminic Acid
Sodium	Carbon Tetrachloride, Carbon Dioxide, water
Sodium Nitrate	Ammonium Nitrate and other ammonium salts
Sodium Peroxide	Ethyl or Methyl Alcohol, Glacial Acetic Acid, Acetic Anhydride, Benzaldehyde, Carbon Disulfide, Glycerin, Ethylene Glycol, Ethyl Acetate, Methyl Acetate, Furfural
Sulfides	Acids
Sulfuric Acid	Potassium Chlorate, Potassium Perchlorate, Potassium Permanganate, similar compounds of light metals such as sodium or lithium
Tellurides	Reducing Agents

Appendix 7C – Chemical Information
Table 7-3 – Partial List of Flammable Liquids

Chemical	Flash Point	Boiling Point	Ignition Temperature	Flammable Limit (% by volume air)	
	(°C)	(°C)	(°C)	Lower	Upper
Acetaldehyde	-37.8	21.1	175.0	4.0	60.0
Acetone	-17.8	56.7	465.0	2.6	12.8
Benzene	-11.1	80.0	560.0	1.3	7.1
Carbon Disulfide	-30.0	46.1	80.0	1.3	50.0
Cyclohexane	-20.0	81.7	245.0	1.3	8.0
Diethyl Ether	-45.0	35.0	160.0	1.9	36.0
Ethyl Alcohol	12.8	78.3	365.0	3.3	19.0
N-Heptane	-3.9	98.3	215.0	1.05	6.7
N-Hexane	-21.7	68.9	225.0	1.1	7.5
Isopropyl Alcohol	11.7	82.8	398.9	2.0	12.0
Methyl Alcohol	11.1	64.9	385.0	6.7	36.0
Methyl Ethyl Ketone	-6.1	80.0	515.6	1.8	10.0
Pentane	-40.0	36.1	260.0	1.5	7.8
Styrene	32.2	146.1	490.0	1.1	6.1
Toluene	4.4	110.6	480.0	1.2	7.1
p-Xylene	27.2	138.3	530.0	1.1	7.0

Appendix 7C – Chemical Information
Table 7-4 – Partial List of Corrosives

Acids	Nitric Sulfuric Phosphoric Hydrochloric Acetic Chromic Perchloric Periodic Hydrofluoric Chloroacetic Cresylic
Bases	Sodium Hydroxide Potassium Hydroxide Ammonium Hydroxide Calcium Oxide Sodium Carbonate Potassium Carbonate Calcium Carbonate Trisodium Phosphate Barium Hydroxide Barium Carbonate
Others	Bromine Glutaraldehyde

Appendix 7C – Chemical Information
Table 7-5 – Partial List of Reactive Chemicals

Water-Reactive Chemicals

- Alkali metals (Na, Li, K)
- Alkali metal hydrides (LiH, CaH_2, $LiAlH_4$, $NaBH_2$)
- Alkali metal amides ($NaNH_2$)
- Metal alkyls (RLi, RNa, R_3Al, R_2Zn)
- Grignard Reagents (RMgX)
- Halides of nonmetals (BCl_3, BF_3, PCl_3, $SiCl_4$, S_2Cl_2)
- Inorganic acid halides ($POCl_3$, $SOCl_2$, SO_2Cl_2)
- Anhydrous metal halides ($AlCl_3$, $TiCl_4$, $ZrCl_4$, $SnCl_4$)
- Phosphorous Pentoxide
- Calcium Carbide
- Organic acid halides and anhydrides of low molecular weight, such as acetylchloride acetic acid anhydride

Pyrophoric Chemicals

- Grignard Reagents (RMgX)
- Metal alkyls and aryls (RLi, RNa, R_3Al, R_2Zn)
- Metal carbonyls
- Alkali metals (Na, Li, K)
- Metal powders (Al, Co, Fe, Mg, Mn, Pd, Pt, Ti, Sn)
- Metal Hydrides (NaH, $LiAlH_4$)
- Nonmetal hydrides (B_2H_6 and other boranes, PH_3, AsH_3)
- Nonmetal alkyls (R_3B, R_3P, R_3As)
- Phosphorous (white)

Peroxide Forming Chemicals
List A: Discard within 3 months

- Diisopropyl Ether (Isopropyl Ether)
- Divinylacetylene (DVA)
- Potassium metal
- Potassium Amide
- Sodium Amide (Sodamide)
- Vinylidene Chloride (1,1-Dichloroethylene)

Appendix 7C – Chemical Information
Table 7-5 – Partial List of Reactive Chemicals Continued

Peroxide Forming Chemicals
List B: Do not distill or evaporate without testing for the presence of peroxides. Discard or test for peroxides after 6 months.

- Acetaldehyde Diethyl Acetal (Acetal)
- Cumene (Isopropyl Benzene)
- Cyclohexene
- Cyclopentene
- Decalin (Decahydronaphthalene)
- Diacetylene (Butadiene)
- Diethyl Ether (Ether)
- Diethylene Glycol Dimethyl Ether (Diglyme)
- Dioxane
- Ethylene Glycol Dimethyl Ether (Glyme)
- Ethylene Glycol Ether Acetates
- Ethylene Glycol Monoethers (Cellosolves)
- Furan
- Methylacetylene
- Methylcyclopentane
- Tetrahydrofuran (THF)
- Tetralin (Tetrahydronaphthalene)
- Vinyl Ethers

Peroxide Forming Chemicals
List C: 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
- Tetrafluroethylene (TEE)
- Vinylacetylene (MVA)
- Vinyl Chloride

Appendix 7C – Chemical Information
Table 7-6 – Compressed and Liquefied Gases

Gas	Threshold Limit Values (ppm)	Flammability Limits in Air (% by vol)	Major Hazards
Acetylene (dissolved)	Not established*	2.5-81.0	Flammable, asphyxiant
Ammonia (liquid)	25	15-28	Toxic
Argon	Not established (non-toxic)	None	Asphyxiant
Boron Trifluoride	1	None	Toxic, causes burns
1,3-Butadiene (liquid)	10	2-11.5	Flammable, skin irritant, suspect carcinogen
Butane (liquid)	Not established*	1.9-8.5	Flammable
Carbon Dioxide (liquid)	5000	None	Flammable, toxic
Carbon Monoxide	50	12.5-74.0	Toxic, severe
Chlorine (liquid)	0.5	None	Irritant, causes burns, corrosive
Ethane (liquid)	Not established*	3.0-12.5	Flammable, asphyxiant
Ethylene	Not established*	3.1-32.0	Flammable, asphyxiant
Ethylene Oxide (liquid pure)	1	3.0-100.0	Flammable, toxic, can cause burns when trapped by clothes or shoes, suspect carcinogen
Helium	Not established	None	Asphyxiant
Hydrogen	Not established	4.0-75.0	Flammable, asphyxiant
Hydrogen Bromide (liquid)	3	None	Toxic, causes burns, corrosive
Hydrogen Chloride (liquid)	5	None	Toxic, causes burns, corrosive
Hydrogen Fluoride (liquid)	3	None	Toxic, causes severe slow healing burns, corrosive
Hydrogen Sulfide (liquid)	10	4.3-45.0	Toxic, flammable, irritant
Methane	Not established	5.3-14.0	Flammable, asphyxiant
Methyl Bromide (liquid)	5	13.5-14.5	Toxic, causes burns
Methyl Chloride (liquid)	50	10.7-17.4	Toxic, flammable
Methyl Mercaptan (liquid)	0.5	Unknown	Toxic, flammable
Nitrogen	Not established (non-toxic)	None	Asphyxiant
Nitrogen Dioxide (liquid)	3	None	Toxic, corrosive
Oxygen	Non-toxic	None	Highly reactive
Phosgene (liquid)	0.1	None	Toxic
Propane (liquid)	Not established*	2.2-9.5	Flammable, asphyxiant
Sulfur Dioxide (liquid)	2	None	Toxic, causes burns
Vinyl Chloride	5	4.0-22.0	Flammable, causes burns, human carcinogen

* non-toxic, produces anesthetic effects

Appendix 7C – Chemical Information
Table 7-7 – Partial List of Select Carcinogens

- 2-Acetylaminofluorene
- Acrylonitrile
- Aflatoxins
- 4-Aminobiphenyl
- Analgesic mixtures containing phenacetin
- Arsenic and certain arsenic compounds
- Asbestos
- Azathioprine
- Benzene
- Benzidine
- Bis(chloromethyl) ether and technical grade chloromethyl methyl ether
- 1,4-Butanediol Dimethylsulfonate (Myleran)
- 1-(2-Chloroethyl)-3-(4-Methylnitrobiphenylcyclohexyl4-)-1-Nitrosourea (ME CCNU)
- Chlorambucil
- Chloromethyl methyl ether
- Chromium and certain chromium compounds
- Conjugated estrogens
- Cyclophosphamide
- 1,2-Dibromo-3-chloropropane
- 3,3'-Dichlorobenzidine and it's salts
- Diethylstilbestrol
- 4-Dimethylaminoazobenzene
- Erionite
- Ethylene Oxide
- Ethyleneimine
- Formaldehyde
- Melphalan
- Methoxsalen with ultraviolet A therapy
- 4,4'-Methylene-bis(2-chloroaniline)
- Bis(2-Chloroethyl)sulfide (mustard gas)
- N,N'-bis(2-Chloroethyl)-2-naphthylamine (chlornaphazine)
- α-Naphthylamine
- β-Naphthylamine
- N-Nitrosodimethylamine
- β-Propiolactone
- Thorium dioxide
- Tresulphan
- Vinyl Chloride

Appendix 7C – Chemical Information
Table 7-8 – Regulated Carcinogens (Substances Reasonably Anticipated to Cause Cancer in Humans)

- Acetaldehyde
- 2-Acetylaminofluorene
- Acrylamide
- Acrylonitrile
- Adriamycin
- 2-Aminoanthraquinono
- o-Aminoazotoluene
- 1-Amino-2-methylanthraquinone
- Amitrole
- o-Anisidine hydrochloride
- Benzotrichloride
- Beryllium and certain beryllium compounds
- Bischloroethyl nitroso-urea
- Bromodichloromethane
- 1,3-Butadiene
- Butylated hydroxyanisole
- Cadmium and certain cadmium compounds
- Carbon tetrachloride
- Chlorendic acid
- Chlorinated paraffins (C_{12} , 60% chlorine)
- Chloroform
- 1-(2-Chloroethyl)-3-cyclohexyl-1-nitrosourea (CCNU)
- 3-Chloro-2-methylpropene
- 4-Chloro-o-phenylenediamine
- C.I. Basic Red 9 Monohydrochloride
- Cisplatin
- p-cresidine
- Cupferron
- Dacarbazine
- DDT
- 2,4-Diaminoanisole Sulfate
- 2,4-Diaminotoluene
- 1,2-Dibromo-3-chloropropane
- 1,2-Dibromoethane (EDB)
- 1,4-Dichlorobenzene
- 3,3'-Dichlorobenzidine
- 3,3'-Dichlorobenzidine-dihydrochloride
- 1,2-Dichloroethane
- Dichloromethane (methylene chloride)
- 1,3-Dichloropropene (technical grade)
- Diepoxybutane
- Di(2-ethylhexyl)phthalate
- Diethyl Sulfate
- Diglycidyl Resorcinol Ether
- 3,3'-Dimethoxybenzidine and 3,3'-Dimethoxybenzidine Hydrochloride
- 4-Dimethylaminoazobenzene
- Dimethylcarbamall Chloride
- 3,3’-Dimethylbenzidine
- 1,1’-Dimethylhydrazine
- Dimethyl Sulfate
- Dimethylvinyl Chloride
- 1,4-Dioxane
- Direct Black 38
- Direct Black 6
- Epichlorohydrin
- Estrogens (not conjugated): Estradiol-17
- Estrogens (not conjugated): Estrone
- Estrogens (not conjugated): Ethinylestradiol
- Estrogens (not conjugated): Mestranol
- Ethyl Acrylate
- Ethylene Oxide
- Ethylene Thiourea
- Ethyl Methanesulfonate
- Formaldehyde (gas)
- Hexachlorobenzene
- Hexamethylphosphoramide
- Hydrazine and Hydrazine Sulfate
- Hydrazobenzene
- Iron Dextran Complex
- Kepone® (Chlordecone)
- Lead Acetate and Lead Phosphate
- Lindane and other hexachlorocyclo-hexane isomers
- 2-Methylaziridine (Propyleneimine)
- 4,4'-Methylenebis(2-Chloroaniline)
- 4-4'-Methylenebis(N,N-dimethyl)benzenamine
- 4,4'-Methylenedianiline and its dihydrochloride
- Methyl Methanesulfonate
- N-Methyl-N’-nitro-N-nitrosoguanidine
- Metronidazole
- Michler’s Ketone
- Mirex
- Nickel and certain nickel compounds
- Nitrilotriacetic Acid
- Nitrofen
- Nitrogen Mustard Hydrochloride
- 2-Nitropropane
- N-Nitrosodi-N-butylamine
- N-Nitrosodiethanolamine
- N-Nitrosodiethylamine

- N-Nitrosodimethylamine
- N-Nitrosodi-N-propylamine
- N-Nitroso-N-ethylurea
- 4-(N-Nitrosomethylamine)-1-(3-pyridyl)-1-Butanone
- N-Nitroso-N-methylurea
- N-Nitrosomethylvinylamine
- N-Nitrosomorphonline
- N-Nitrosonornicotine
- N-Nitrosopiperidine
- N-Nitrosopyrrolidine
- N-Nitrososarcosine
- Norethisterone
- Ochratoxin A
- 4,4'-Oxydianiline
- Oxymetholone
- Phenacetin
- Phenazopyridine Hydrochloride
- Phenoxybenzamine Hydrochloride
- Phenytoin
- Polybrominated Biphenyls
- Polychlorinated Biphenyls
- Procarbazine Hydrochloride
- Progesterone
- 1,3-Propane Sultone
- β-Propiolactone
- Propylene Oxide
- Propylthiouracil
- Reserpine
- Saccharin
- Safrole
- Selenium Sulfide
- Silica, Crystalline (respirable), Quartz, Cristobalite, Tridymite
- Streptozotocin
- Sulfallate
- 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)
- Tetrachloroethylene (Perchloroethylene)
- Thioacetamide
- Thiourea
- Toluene Diisocyanate
- o-Toluidine and o-Toluidine Hydrochloride
- Toxaphene
- 2,4,6-Trichlorophenol
- Tris(1-Aziridinyl)Phosphine Sulfide
- Tris(2,3-Dibromopropyl) Phosphate
- Urethane
- Polycyclic Aromatic Hydrocarbons,
- Benz[A]Anthracene
- Benzo[B]Fluoranthene
- Benzo[J]Fluoranthene
- Benzo[K]Fluoranthene
- Benzo[A]Pyrene
- Dibenz[A, H]Acridine
- Dibenz[A, J]Acridine
- Dibenz[A,H]Anthracene
- 7H-Dibenzo[C,G]Carbazole
- Dibenzo[A,E] [A,H] [A,I] [A,L] Pyrene
- Ideno[1,2,3-CD]Pyrene5-Methylchrysene
- 5-Methylchrysene

Table 7-9 –Partial List of Reproductive Toxins (Teratogens)

- Acrylic Acid
- Aniline
- Benzene
- Cadmium
- Carbon Disulfide
- N,N-Dimethylacetamide
- Dimethylformamide (DMF)
- Dimethyl Sulfoxide (DMSO)
- Diphenylamine
- Estradiol
- Formaldehyde
- Formamide
- Hexachlorobenzene
- Iodoacetic Acid
- Lead compounds
- Mercury compounds
- Nitrobenzene
- Nitrous Oxide
- Phenol
- Polychlorinated and Polybrominated Biphenyls
- Toluene
- Vinyl Chloride
- Xylene

Table 7-10 – Toxic Metals and Toxic Metal Compounds

- Antimony and antimony compounds
- Arsenic and arsenic compounds, arsine
- Barium, soluble barium compounds, barium sulfate
- Beryllium compounds
- Boron, borates, boron halides
- Cadmium salts
- Chromium compounds
- Germanium tetrahydride
- Indium compounds
- Iron salts, soluble
- Lead salts and organo compounds
- Manganese compounds
- Mercury and mercury compounds, organo compounds
- Molybdenum compounds
- Nickel compounds
- Osmium compounds, tetroxide
- Rhodium compounds
- Selenium compounds
- Silver compounds, soluble
- Tellurium compounds
- Thallium compounds, soluble
- Tin compounds, inorganic and organic
- Tungsten compounds, soluble
- Uranium compounds
- Yttrium metal and compounds
- Zinc, chromates, oxide dust
- Zirconium compounds

Appendix 7D - Department Specific Information
Table 7D-1 – Locations of Designated Areas

Department _Engineering & Design__
Department Head/chemical hygiene officer _Jeff Newcomer/David Frye__
Building _Ross Engineering Technology_

Room Number	Laboratory Supervisor	Class of Chemical or Name	Designated Location(s) in Room (Hood Number)
110	David Frye	Tox • Methyl Ethyl Ketone, Klean-Strip	
111	David Frye	Tox • Sodium Dodecylbenzenesulfonate	
111	David Frye	Carc • TC-300 Part A	
112	David Frye	Tox • Vinyl Ester Resin 781-2140	
112	David Frye	Carc • EPON Resin 862 • Hydrex 100 33350-00 • L/F Orange Tooling • Polycor Black Tooling • Polyester Resin • Speed Patch Aid • Vinyl Ester Resin 781-2140	
113	David Frye	Carc • Ejector Pin Lube • Ethyl Alcohol Denatured • Non-Flammable Cleaner/Degreaser • Slide Mold Cleaner Plus Degreaser III Aerosol	
122	David Frye	Tox • 765-1147 NAPA Penetrating Grade Threadlocker Green (PTX29040) 36 ml • Weld-On 66 Vinyl Cement	
122	David Frye	Carc • 765-1151 Napa Anti-Seize Lubricant • Hydrex 100 33350-00	
124	David Frye	Carc • Dichloromethane • Zynolyte Multipurpose Primer - Aerosol	
125	David Frye	Tox • 1,2,7,8-Diepoxyoctane • Cupric Sulfate	

		• EPIKURE 3223 Curing Agent • GC TX2 BLND Marine UV Clear • Methyl Ethyl Ketone, Klean-Strip® • Surfacing Agent • Weld-On 66 Vinyl Cement	
125	David Frye	Carc • 1,2,7,8-Diepoxyoctane • 3M Aerospace Sealant AC-236 B-1/2, B-2, and B-4 Base • 3M™ Perfect-It II Rubbing Compound • Dichloromethane, HPLC • Ejector Pin Lube • Ethanol, 200 Proof • GC TX2 BLND Marine UV Clear • Higher Concentration Super Silicone Mold Release • Hysol® EA 9394 • QM 280 A • Slide Mold Cleaner Plus Degreaser III Aerosol • Surfacing Agent • SYNASOL 200 PM-509 • Tetrahydrofuran • Toolfusion 1A • Universal Repair Filler • Weld-On 600 Low VOC Cement for Contact Adhesive	
127	Stephen James	Htx • Fast Tack 894	
127	Stephen James	Carc • 2BR Form A Gasket #2 Sealant • CRC Brakleen Brake Parts Cleaner • Crown Dry Graphite Lubricant	
128	David Frye	Tox • S-L-X Denatured Alcohol, Klean-Strip	
128	David Frye	Carc • SCIGRIP 3 Solvent Cement for Acrylic	
134	Mark Dudzinski	Tox • Low VOC Blue Epoxy Primer	

		Methyl Ethyl Ketone, Klean-Strip®	
134	Mark Dudzinski	Carc • 2K Urethane Surfacer • 3M Imperial Compound and Finishing Material • Black Tooling • Hydrex 100 33350-00 • Low VOC Blue Epoxy Primer • Part #29 – 1/16 Inch Milled Glass Fibers	
135	Mark Dudzinski	• Carc Anti-Spatter and Nozzle Shield Aerosol Spray • Crest Anti-Spatter	
152	Mark Dudzinski	Htx • Byron Originals Premium Competition 25% Nitro Blend, Gallon • Byron Originals Premium Competition 25% Nitro Blend, Gallon	
152	Mark Dudzinski	Tox • Sodium Hydroxide	
152	Mark Dudzinski	Carc • Byron Originals Premium Competition 25% Nitro Blend, Gallon • CRC Brakleen Brake Parts Cleaner • High Build Primers • Jasco Premium Paint & Epoxy Remover • K&N Air Filter Aerosol • Nickel Grade Anti-Seize • Zip Kicker	
304	Jeff Newcomer	Carc • Repelzit Silicone Protective Spray	
327	Reza Afshari	Carc • Chip Quik Leaded Solder Paste	
332	Reza Afshari	Tox • SP-30	
332	Reza Afshari	Carc • Thermally conductive epoxy A • Thermally conductive epoxy B	
342	Stephen James	Tox • S-L-X Denatured Alcohol, Klean-Strip®	
342	Stephen James	Carc	

		• R500 Sn63Pb37	
344	Jason Morris	Carc • 3M Fastbond Contact Adhesive 30-NF Neutral • Hi Hide Primer • Krud Kutter Rust Remover & Inhibitor	
350	Jason Morris	Tox • Brasso Metal Polish	
350	Jason Morris	Carc • Ronsonol Lighter Fuel	
Yard	Mark Dudzinski	Carc • Gasoline, Unleaded Automotive	

Maintain this table in the Department Safety Information Book, Section 7, Chemical Hygiene Plan.

Provide a copy to the Environmental Health and Safety Office, MS 9070

Appendix 7D - Department Specific Information
Table 7D-2 –Chemical Hygiene Personnel

Chemical Hygiene Officer

Name: Sue Sullivan	Title: Director, Environmental Health and Safety	
Location: Environmental Studies Rm 70	Extension: 6512	Home Phone: (360) 756-2263
	Cell Phone: 360-303-9662	Pager: 650-3064

Department Chemical Hygiene Officer (Department Head or Chair)

Name: Jeff Newcomer	Title: Professor and Chair
Location: ET 209	Extension: x7239
Home Phone: 360-756-1215	Cell Phone: n/a

Assistant Department Chemical Hygiene Officer

Name: Stephen James	Title: Engineering Technician Lead/Safety Officer
Location: ET 342	Extension: x3434
Home Phone: ?	Cell Phone: ?

Assistant Department Chemical Hygiene Officer

Name: David Frye	Title: Instr. & Clssm Spprt Tech./Chem. Safety Off.
Location: ET 108	Extension: x4128
Home Phone: ?	Cell Phone: ?

WWU Medical Director - Contact Director of Environmental Health and Safety

Department Laboratory Supervisors (Principal Investigators)

Refer to the Safety Information Book, Section 2, Emergency Procedures for names and contact information for laboratory supervisors

Receipt of Chemicals

Chemicals are received by the Chemistry Stockroom and inspected by the Department or Assistant Chemical Hygiene Officer or a designee before inventory and distribution. OR

Describe Receipt of Chemicals:

Maintain this table in the Department Safety Information Book, Section 7, Chemical Hygiene Plan.

Provide a copy to the Environmental Health and Safety Office, MS 9070

Appendix 7E - **ENGD New Chemical Review Form**

Fill out sections 1 through 4 completely and ***attach a Safety Data Sheet (SDS)*** to this form. If the answer to any of the questions in section 3 is yes, the chemical must be reviewed by the ENGD Safety Committee before it is purchased or otherwise brought into the building. If the answer to all questions in Section 3 is no, then the chemical may be purchased once this form has been completed and given to the ENGD Chemical Safety Officer.

Section 1: Basic Information

Chemical Name:

Manufacturer:

Section 2: Acquisition Information

a) Is there a safer chemical appropriate for this application?
b) Is the chemical already available on campus (e.g. from the Chemistry stock room)?
c) What is the amount that is needed?
d) What is the minimum amount that can be ordered?

Section 3: Hazard Review (see back of form for definitions.)

a)	Is the chemical a carcinogen?	Y	N
		Y	N
b)	Is the chemical highly toxic?	Y	N
c)	Is the chemical a nanomaterial?	Y	N
d)	Is the chemical an explosive?	Y	N
e)	Is the chemical a poison gas or a pyrophoric?	Y	N
f)	Does the chemical have a rating of 1 or 2 in any GHS category?		

Section 4: Storage, Use, and Disposal Information

a) Beyond what was noted in Section 3, what risks does the chemical introduce? (e.g. Does this chemical become unstable after a short period of time?)
b) Are there additional controls needed for this chemical? (e.g. personal protective equipment beyond lab minimums, special training, etc.)
c) What will be the procedure for using this chemical, and how will users be trained?
d) Are there unique storage requirements? And if so, is the necessary equipment to meet those requirements in place? (e.g. refrigeration, security, etc.)
e) In case of emergency (e.g. spill, fire, etc.) what is(are) the recommended action(s) to take for this particular chemical?
f) Will there be problems with disposal?
g) When will the project be completed/when will the chemical no longer be needed?

Definitions for Section 3:

a) A **carcinogen** is a substance that meets one of the following criteria:
   (a) It is listed under Group 1 ("carcinogenic to humans") or Group 2A ("probably carcinogenic to humans") by the International Agency for Research on Cancer Monographs (IARC) or
   (b) It is listed under the category, "Known to be Human Carcinogens" in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (See Appendix I)

b) Chemical agents that are classified as **highly toxic** are substances which have a high degree of acute toxicity. OSHA (29 CFR 1910.1200)
   Such agents meet the following criteria:
   (a) Chemical has a median lethal dose (LD_{50}) of 50 milligrams or less when administered orally to rats **[LD_{50} < 50 mg/kg]**; or
   (b) Chemical has a median lethal dose (LD_{50}) of 200 milligrams or less when administered by continuous dermal contact for 24 hours (or less if death occurs within 24 hours) to the skin of rabbits **[LD_{50} < 200 mg/kg]**; or
   (c) Chemical has a median lethal concentration (LC_{50}) in air of 200 parts per million by volume when administered by continuous inhalation for one hour (or less if death occurs within one hour) to rats **[LC_{50} < 200 ppm]**

c) **Nanomaterial** is classified as material that has been purposefully manufactured, synthesized, or manipulated to have a size with at least one dimension in the range of approximately 1 to 100 nanometers and exhibit unique properties determined by their size as defined by the Occupational Health and Safety Administration (OSHA)

d) An **explosive** is defined as "any chemical compound, mixture, or device which is designed to function by explosion that is substantially instantaneous with the release of gas and heat" by the U.S. Department of Transportation. Explosives are regulated by the Bureau of Alcohol, Tobacco, Firearms, and Explosives, ATF (27 CFR 555.23)
   Such agents meet the following criteria:
   (a) Contain chemical functional groups that are known to be explosive
   (b) Involves incompatibles that could potentially lead to the formation of chemical functional groups known to be explosive
   (c) Involves a pure substance or mixture containing peroxides, peroxide formers, or other strong oxidizers (see Appendix II)

e) A **poison gas** is defined as gases that are known to be poisonous by inhalation listed under Class 2.3 of US Department of Transportation Hazardous Materials Table. DOT (49 CFR 173.115) (See Appendix III)

   A **pyrophoric substance** is "a chemical which, even in small quantities, is liable to ignite within five minutes after coming into contact with air" as defined by OSHA (29 CFR 1910.1200) (See Appendix IV)

f)

GHS Rating System	
Rating	Hazard Level
1	Severe
2	Serious
3	Moderate
4	Slight

(See Appendix V for more specific definitions)

Appendix 7F – Laboratory Suite Addenda

Western Washington University

Industrial Design Lab

Chemical Policy Addendum

Revision Date 1.22.2016

A. Introduction: The following lab policies are intended for all users of the Industrial Design laboratory spaces, including rooms ET 128 and 344.

The ID lab is appropriate for ID model making and prototyping. The ID lab is not for doing composites (fiberglass, carbon fiber, Kevlar) layup or curing.

B. Materials:

Chemicals, paints, resins, adhesives, etc. The ID lab (room 344) is not for doing composites (fiberglass, carbon fiber, Kevlar) layup or curing. Nor is it for welding, brazing, or any high-heat application work. See the technicians for appropriate labs for doing this work.

1. This lab spray booth is primarily for spray can finishing. If you intend to work with stains or other liquid finishes, clear your plan with a technician first. Work out the safety and disposal issues first. See Spray Booth section D for specific instructions.
2. Sanding. Use of the downdraft table is encouraged and proper ventilation must be used. Sanding of hazardous materials (ex: polyurethane foam) requires use of a respirator with P100 Niosh filter or equivalent- notify neighboring shop users and be aware of how materials can be hazardous when airborne as fine particulate matter.

C. ID Studios:

The ID studios (rooms 347, 348, 349, 350) are for clean work, such as drawing, rendering, paper, foam core, fabrics, glue guns, laptops, projectors and student meetings.

1. No sanding is allowed in any of the studios.
2. No applications of stains, epoxies, or any off-gassing finishes are allowed.
3. No heat guns or any powered machine tools are allowed.
4. No tools from the ID shop should leave the shop.
5. No spray glue is to be applied in the studio.

D. Spray Booth

1. This lab spray booth is primarily for spray can finishing. If you intend to work with stains or other liquid finishes, clear your plan with a technician first. Work out the safety and disposal issues first.
2. NO combustible materials may be left in the spray booth (including aerosol cans, scrap paper, wood, paper etc.) Violation of this rule will result in an immediate $100 fine.
3. Finishes, paints, fillers, or any process that off gasses MUST be applied and left in the spray booth until off gassing is complete.
4. Fan must be on during application and drying of all paints, fillers, etc.
5. Spray cans must be labeled with a piece of tape and the name of the owner unless they are for communal use.
6. Both eye protection and a respirator protecting against organic vapors must be worn at all times within the spray booth.

Western Washington University

Manufacturing Engineering Lab Chemical Policy Addendum

Revision Date 2.12.2016

A. Introduction:

The following lab policies are intended for all users of the Manufacturing Engineering Lab including rooms ET 136 and 138. Prior to working in the Manufacturing Engineering Laboratory suite, proper training by faculty or staff is required.

B. Machining Laboratory:

The Machining Laboratory (room 136) is primarily intended for teaching and research of machining processes. The machining portion of the laboratory has no unusual requirements or hazards for chemical handling or chemical PPE.

However, the machining laboratory also has an area set aside for welding. Before using the welding equipment, users must be trained by faculty or staff, must have permission to complete the current welding task, must notify other shop users that welding will be occurring in the weld area, and must use appropriate PPE for welding. The welding area has a hood and a snorkel for fume removal and users should employ one of these two methods to maintain a safe atmosphere. Safety in the weld area is paramount and users shall review the details of welds to be completed and materials to be used with faculty or staff. Standard practices for the safe use of pressurized gases are required in the shop and weld area.

C. The Manufacturing Cell:

The Manufacturing Cell (room 138) is primarily for class and project utilization of machining and robotics. The area requires that users be trained by a faculty or staff member before engaging in the use of any machinery or robots. However, there are no unusual requirements or hazards for chemical handling or chemical PPE.

Western Washington University

Plastics & Composites Lab

Chemical Policy Addendum

Revision Date 2.09.2016

A. Introduction:

The following lab policies are intended for all users of the Plastics-Composites Engineering (PCE) laboratory spaces, including rooms ET 110, 112, 113, 114, 122, 124, 126, 128. Prior to working in the PCE lab suite a review of the PCE lab policies and a formal orientation are required.

B. Analysis Lab:

The Analysis Lab (room 110) is primarily intended for materials testing. Testing machine operation and safety is paramount. Each person may only use testing equipment and the vent hood for which he/she has received specific training from the faculty/technician on safe operating procedures and potential hazards.

C. Processing Lab:

The Processing Labs (rooms 113 & 114) are primarily for designated plastics processes. Plastics processing equipment operation and safety is paramount. Each person may only use equipment for which he/she has received specific training from the faculty/technician on safe operating procedures and potential hazards. Ensure that the ventilation is on upon entering the lab, and that the ventilation snorkels are properly placed during plastic processing. In the event of plastic degradation, clear the lab immediately and find a technician or faculty member to make sure the lab is safe to occupy.

D. Composites Lab:

The Composites Labs (rooms 112 & 126) are to be used primarily for composite lay-ups and pre-preg composites preparation. These rooms have additional ventilation which helps cycle the air during composites work. Additional PPE beyond the lab minimum may be required, and could include lab coats and respirators with Organic Vapor (OV) cartridges.

E. Paint Booth:

The Paint Booth (room 124) should be used primarily for surface coatings, such as, primer, paint, and gel-coat finishes. Certain activities require prior training by faculty or a technician before a student is allowed to perform them. Safety Data Sheets (SDS) must be reviewed prior to work with liquid chemicals to ensure that proper PPE and safety procedures are being followed. Additional PPE may be required, and could include Tyvek suits and respirators with OV cartridges.

F. Soft Tooling Lab:

The Soft Tooling Lab (room 122) is primarily for part finishing and the creation of soft tooling. Composite lay-ups and painting are prohibited and should be performed in the proper lab space. When using any equipment or the downdraft table the dust collection system must be turned on. When sanding, P-95 dust masks or respirators with P-100 filters are required.

Western Washington University

Vehicle Research Institute

Chemical Policy Addendum

Revision Date 2.23.2016

A. Introduction:

The following lab policies are intended for all users of the Vehicle Research Institute laboratory spaces, including rooms ET 134 Composites Lab, 135 Chassis and Sheet Metal (Hot metals and welding), 151 Machining and Fitting, 152 Vehicle Assembly, 154 Tool Room, and 155 Classroom (Electronics). Prior to working in the VRI lab suite a review of the VRI lab policies and a formal orientation are required. Upon entry to room 151 and the rest of the lab suite,

B. Machining and Fitting:

The Machine and Fitting Lab (room ET 151) is primarily intended for machining and fabrication. The intent is to have all tools and equipment necessary to complete most metal working tasks related to class and program activities. Use of equipment in this section requires instruction from appropriate faculty and staff. Access to machine tools requires prerequisite classes or approval from faculty or staff based on the user's prior experience. Unless otherwise specifically designated, no unusual PPE is required.

C. Vehicle Assembly Lab:

Vehicle Assembly Lab (room 152) is primarily used for vehicle repair, testing and vehicle assembly. It is also used for engine assembly. This area is intended to be kept free from metal working dust and debris during all normal use. Unless otherwise specifically designated, no unusual PPE is required.

D. Composites Lab:

The Composites Lab (room 134) is used primarily for composite work and related tooling used to support model building for the curriculum as well as vehicle processes that require the construction of larger chassis tooling. Chemicals that support these processes are contained in this lab. Cabinets for oxidizers are separate from flammable cabinets and other material storage. This room has additional ventilation which helps cycle the air during composites work. Additional PPE beyond the lab minimum may be required, and could include lab coats and respirators with Organic Vapor (OV) or when sanding, P100 particulate cartridges.

E. Chassis and Sheet Metal:

Room 135 is primarily used for hot work and welding. Weld jigging and metal chassis fabrication occur here as well. The area is set up to minimize all flammables that are not specifically designated for hot work. Before using the welding equipment, users must be trained by faculty or staff, must have permission to complete the current welding task, must notify other shop users that welding will be occurring in the weld area, and must use appropriate PPE for welding. The welding area has a hood and a snorkel for fume removal and users should employ one of these two methods to maintain a safe atmosphere. Safety in the weld area is paramount and users should review the details of welds to be completed and materials to be used with faculty or staff. Standard practices for the safe use of pressurized gases are required in the shop and weld area. Specific PPE required with associated hot work processes includes (but not limited to) welding gloves, welding apron or jacket, and welding helmets. Additional PPE such as organic vapor and/or particulate respirators may also be required (material dependent)

F. Wind Tunnel, Flow Bench Testing and Dry Fabric Preparation:

Room 251A is primarily used for wind tunnel testing, flow bench testing and dry composite fabric preparation. No unusual PPE is required.