Chapter 4 Facility-Based Environmental Health and Safety (EH&S) Procedures

4.1 Overview

Introduction

This section of the manual addresses environmental requirements that are "facility-related" rather than based on specific business processes and operations. These requirements include facility and equipment management operations, emergency spill response, general laboratory safety, PPE, MSDSs, and other facility-based health and safety procedures.

Contents

This section contains the following topics:

4.2 Facility and Equipment Maintenance Operations

Background

The Facility and Equipment Management Operations section is responsible for the handling of certain hazardous materials, as well as non-hazardous materials that can be recycled, that are generated as a result of maintaining the facility and equipment.

Application

This section is applicable to Facility and Equipment Management Operations personnel.

Policy

The Materials Lab will work to minimize the generation of waste, and will recycle or treat wastes that cannot be eliminated. All wastes that are generated will be handled, accumulated, transferred and disposed in accordance with all applicable federal and state laws and regulations.

Types of Wastes and Recyclable Materials Generated

The following are examples of wastes and recyclable materials that are handled at the Materials Lab. These are typically handled by Facility and Equipment Management Operations personnel. The wastes listed below are grouped in categories according to the regulations that govern their handling and disposal.

Waste Category	Material	Method of Disposal
Hazardous Waste	Full and partially filled chemical product containers (such as aerosol paint, oil-based paints, aerosol cleaners, degreasers, lubricants, etc.)	Review MSDS. Dispose of as hazardous waste (see Waste Handling Sheet in Appendix 6).
Universal Waste	Fluorescent lights (tubes and mercury lamps)	Accumulate in approved container. When full, contact Eco-Light for pick-up.
Universal Waste	Spent batteries (alkaline, NiCad, and lithium)	Accumulate in designated containers. When full, take it to the WSDOT Olympic Regional Office.

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4.2 Facility and Equipment Maintenance Operations, Continued

Types of Wastes and Recyclable Materials Generated (continued)

Waste Category	Material	Method of Disposal
Recyclable Material	Waste oil	Recycle at WSDOT Olympic Regional Office
Recyclable Material	Used shop rags	Accumulate in labeled container. WSDOT Laundry Services contractor will it pick up.
Recyclable Material	Paper, cardboard	Recycle in container provided by the contractor
Solid Waste	Used paint material	Dispose as solid waste

Training

Facility and Equipment Management Operations personnel should be trained on the appropriate handling of the waste streams listed in this section.

4.3 Emergency Response Procedures and Equipment

Application

This section applies to all Materials Lab personnel.

Policy

The WSDOT Materials Engineer and the individual Section/Lab Supervisors have the primary responsibility for ensuring that hazardous materials are used safely and for informing their staff of the proper procedures to follow in the event of a hazardous material spill or other emergency.
All accidents, regardless of severity, should be reported and investigated.

Emergency Action Plan

The Emergency Action Plan along with the Evacuation Plan is located in Appendix 7.

Spill Reporting

All product spills must be reported to laboratory management, and the employee and supervisor must complete the Chemical Spill Report Form (Appendix 7). All associated injuries and/or potential exposures related to an emergency spill (see below) must be reported to the Safety and Health Services Office. Minor spills should be cleaned up immediately using the appropriate PPE, spill-kits and neutralizing agents. In addition, all minor spills shall be reported to the lab supervisor with the following information:

- Date
- Time
- Location
- Chemical(s) and their volume,
- Names of all persons involved, including any visitors who were exposed and personnel involved in the cleanup

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4.3 Emergency Response Procedures and Equipment,
Continued

Spill Kit Contents and Locations

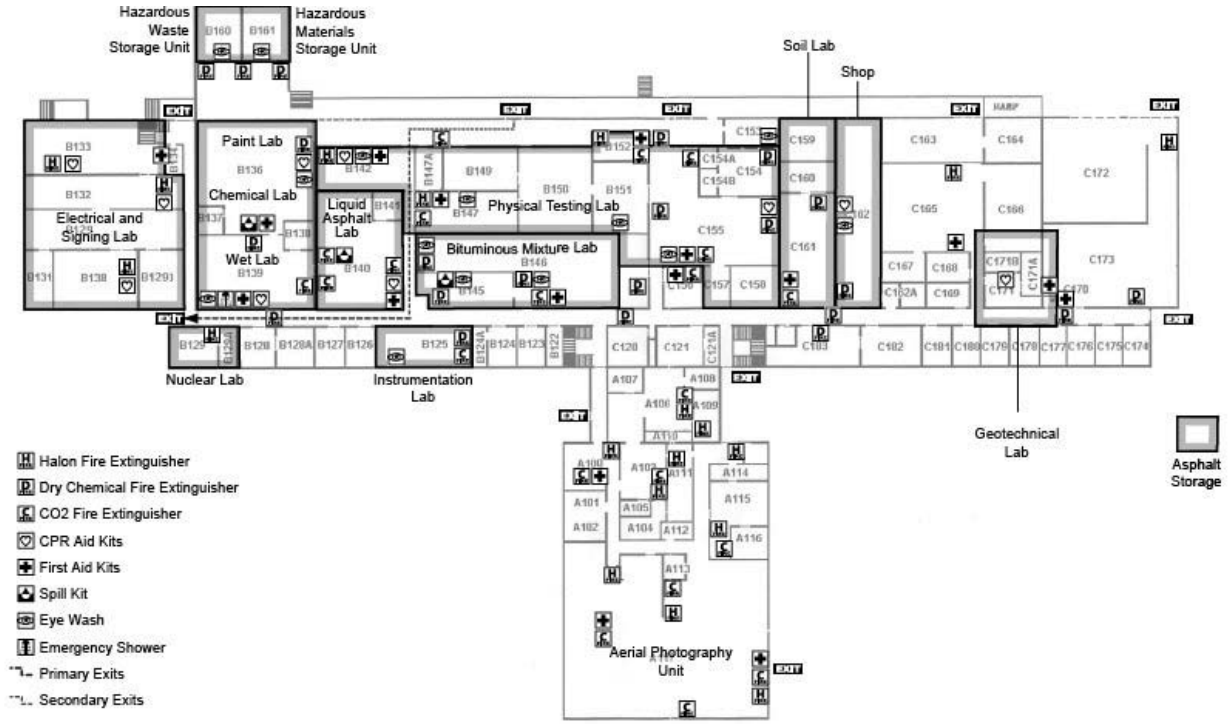
Special spill kits are available from a variety of sources. If a spill kit is purchased, follow the manufacturer's directions. A spill kit contains the following items at a minimum:

- An inert absorbent such as kitty litter or vermiculite
- A plastic(non-sparking) scoop
- Plastic bags to put the spilled material into
- Heavy gloves
- Goggles
- Sodium bicarbonate to neutralize acids

A spill kit should be immediately accessible at each location where hazardous material is used or stored (see figure below). All laboratory employees must know where spill kits are located and know how to use them. At a minimum, each lab should have a spill kit for chemicals used.

Emergency Wash Station Locations

The location of emergency wash stations are shown in the figure below. Emergency showers and eyewash stations must be check for functionality at least monthly and a record of the inspections shall be kept in the laboratory.



Emergency Response Equipment

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4.3 Emergency Response Procedures and Equipment,
Continued

Spill Response Procedures

Three types of spills are discussed in the following sections:
- Emergency Spill
- Minor spills
- Mercury spills

Emergency Spill

A chemical spill is classified as an **Emergency Spill** whenever it:
- Causes personal injury or chemical exposure that requires medical attention
- Causes a fire hazard or uncontrollable volatility
- Requires a need for breathing apparatus of the supplied air or self-contained type to handle the material involved
- Involves or contaminates a public area
- Causes airborne contamination that requires local or building evacuation
- Causes a spill that cannot be controlled or isolated by laboratory personnel
- Causes damage to property that will require repairs
- Cannot be properly handled because of a lack of local trained personnel and/or equipment to perform a safe, effective cleanup
- Requires prolonged or overnight cleanup
- Involves an unknown substance
- Enters the land or water

Although the following tactics are prioritized in terms of usual preferred action sequences, each spill incident is unique and involves persons with varying levels of spill expertise and experience. Thus, for any individual incident, isolation of the spill and/or securing the area might best occur prior to or simultaneously with contacting the fire department at 911.

Step	Action
1	Contact the fire department at 911. Notify dispatcher of location of the spill and, if known, the chemical spilled.
2	If the spill presents an immediate danger, leave the spill site and warn others, control entry to the spill site, and wait for HazMat response.
3	Remove contaminated clothing. Flush skin/eyes with water at least 15 minutes to 30; use soap for intermediate and final cleaning of skin areas.
4	Protect yourself, then remove injured person(s) to fresh air if safe to do so.
5	Notify nearby persons and evacuate as necessary. Prevent entry, as necessary, by posting a guard in a safe area and/or shutting doors.

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4.3 Emergency Response Procedures and Equipment,
Continued

Emergency Spill (continued)

Step	Action
6	If flammable vapors are involved, do not operate electrical switches unless to turn off motorized equipment. Try to turn off or remove heat sources where safe to do so.
7	If the substance involved is an unknown, then emergency spill response procedures are limited to self-protection, notification of fire department at 911 for response, isolation of the chemical, and evacuating and securing the area involved. Do not touch the spill without protective clothing.
8	Where the spill does not present immediate personal danger, try to control the spread or volume of the spill. This could mean shutting a door, moving nearby equipment to prevent further contamination, repositioning an overturned container or one that has a hole in the bottom or side, creating a dike by putting an absorbent around a spill, or opening the sashes on the fume hoods to facilitate removal of vapors.
9	Never assume gases or vapors do not exist or are harmless because of lack of smell.
10	Increase ventilation by opening closed fume hood sashes to the 12-inch or full open position. Exterior doors may be opened to ventilate non-toxic vapors.
11	Use absorbents to collect substances. Reduce vapor concentrations by covering the surface of a liquid spill with absorbent. Control enlargement of the spill area by diking with absorbent.

Minor Spills

Minor spills are those spills that do not fit the requirements for emergency spills.

Step	Action
1	Attend to any persons who may have been contaminated. If these persons require medical attention this is an Emergency Spill.
2	Notify persons in the immediate area about the spill.
3	Evacuate all nonessential personnel from the spill area.
4	If the spilled material is flammable, turn off ignition and heat sources.
5	Avoid breathing vapors of the spilled material. If respiratory protection is necessary, this is an Emergency Spill (see above).
6	Leave on or establish exhaust ventilation if it is safe to do so.

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4.3 Emergency Response Procedures and Equipment,
Continued

Minor Spills (continued)

Step	Action
7	Secure supplies to conduct the cleanup.
8	Don appropriate PPE. Never assume gases or vapors do not exist or are harmless because of lack of smell.
9	**Spilled Liquids**

Step	Action
1	Confine or contain the spill to a small area. Do not let it spread.
2	For small quantities of inorganic acids or bases, use a neutralizing agent or an absorbent mixture (soda ash or diatomaceous earth). For small quantities of other materials, absorb the spill with a nonreactive material (such as vermiculite, clay, dry sand, or towels).
3	For larger amounts of inorganic acids and bases, flush with large amounts of water (providing the water will not cause additional damage). Flooding is not recommended in storerooms where violent spattering may cause additional hazards, or in areas where water-reactive chemicals may be present.
4	For solvent spills, extinguish all ignition sources in the area. Solvent spills need to be properly ventilated because of their flammability and ignitability. Do not clean up spills of toxic volatile solvents (see Dangerous Material Spills above). Solvent spills are cleaned up by applying the absorbent material in the spill kit to the area from the perimeter inward. Make sure enough of the material is added to cover all of the spill. Mix the absorbent material with the spill until the absorbent material regains its appearance as a dry powder is flammable, turn off ignition and heat sources.
5	Mop up the spill, wringing out the mop in a sink or a pail equipped with rollers.
6	Carefully pick up and clean any cartons or bottles that have been splashed or immersed.
7	If needed, vacuum the area with a HEPA-filtered vacuum cleaner designed for the material involved.
8	If the spilled material is extremely volatile, let it evaporate and be exhausted by the laboratory hood (if authorized for use with the spilled chemical).

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4.3 Emergency Response Procedures and Equipment,
Continued

Minor Spills (continued)

Step	Action
9 (cont.)	**Spilled Solids** Generally, sweep spilled solids of low toxicity into a dust pan and place them into a container suitable for that chemical. Additional precautions, such as the use of a vacuum cleaner equipped with a HEPA filter, may be necessary when cleaning up spills of more highly toxic solids.
10	Dispose of residues according to safe disposal procedures, remembering that PPE, brooms, dust pans, and other items may require special disposal procedures.
11	Report the chemical spill in writing as required above.

Mercury Handling and Spill Cleanup

Because of the health effects of mercury and the extremely difficult and time-consuming procedures required to properly clean mercury spills, every effort should be taken to prevent accidents involving mercury.
The following general procedures should be used for all minor spills:

Step	Action
1	Don protective clothing. For small spills, a laboratory coat, safety glasses, and gloves should be used. Gloves made of the following have been rated as excellent for protection against elemental mercury: • Chlorinated polyethylene (CPE) • PVC • Polyurethane, nitrile rubber (also called Viton and several other brand names) • Butyl rubber neoprene If mercury has been spilled on the floor, the workers involved in cleanup and decontamination should wear plastic shoe covers. The fire department at 911 should be called immediately if a spill is extensive enough to require workers to kneel or sit where mercury has been spilled, because Tyvek® or similar impermeable clothing will be required.

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4.3 Emergency Response Procedures and Equipment,
Continued

Mercury Handling and Spill Cleanup (continued)

Step	Action
2	Obtain Mercury Spill Kits. Special spill kits are available from a variety of sources. If a spill kit is purchased, **follow the manufacturer's directions**. Alternatively, a kit can be assembled with the following components: • Protective gloves • Mercury suction pump or disposable pipettes to recover small droplets • Elemental zinc powder (or commercial amalgam material) • Dilute sulfuric acid (5-10 percent) in spray bottle • Sponge or tool to work amalgam • Plastic trash bag • Plastic container (for amalgam) • Plastic sealed vial for recovered mercury
3	Remove gross contamination by pushing together pools and droplets of metallic mercury and then collect the mercury using a suction pump.
4	After the gross contamination has been removed, sprinkle the entire area with zinc powder. Spray the zinc with the dilute sulfuric acid.
5	Using the sponge, work the zinc powder/sulfuric acid into a paste consistency while scrubbing the contaminated surface and cracks or crevices.
6	To minimize contamination of housekeeping items, stiff paper may be used to assist in cleaning up the amalgam.
7	After the paste has dried, it can be swept up and placed into the plastic container for disposal.
8	Rags, shoe covers, sponges and anything used for the cleanup should be placed in a trash bag and labeled to be disposed of as hazardous waste. Leave on or establish exhaust ventilation if it is safe to do so.

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4.3 Emergency Response Procedures and Equipment,
Continued

Leaking Compressed Gas Cylinders	Occasionally, a cylinder or one of its component parts develops a leak. Most such leaks occur at the top of the cylinder in areas such as the valve threads, safety device, valve stem and valve outlet. If a leak is suspected, do not use a flame for detection; rather, a flammable-gas leak detector or soapy water or other suitable "snoop" solution should be used. If the leak cannot be remedied by tightening a valve gland or a packing nut, consult with the supplier for instructions. If the substance in the compressed gas cylinder is not inert, or is hazardous, evacuate the area immediately and contact 911. If the substance in the compressed gas cylinder is inert or non-hazardous, contact the supplier for instructions.
Training	All Materials Laboratory personnel who potentially may need to cleanup spills shall be adequately trained in hazard communications and the use, care, and maintenance of PPE.
Records	Chemical Spill Report Incident Report Form

4.4 General Laboratory Safety

Applicability

This section applies to all Materials Lab personnel who come into contact with hazardous material.

General Safety

Everyone in the lab is responsible for his or her own safety and for the safety of others. Before starting any work in the lab, become familiar with the procedures, equipment, and chemicals that are to be used.

Personal Practices

The following personal practice guidelines are recommended for working safely in a lab:

- Shorts, sandals, or open-toed shoes should not be worn in the lab.
- Pets and unsupervised children are not allowed in laboratories.
- Never pipette anything by mouth.
- Be aware of dangling jewelry, loose clothing, or long hair that might get caught in equipment.
- No eating, drinking, smoking, gum chewing, or applying of cosmetics of any kind will be permitted in designated areas of the lab.
- Store food and drinks in refrigerators that are designated for that use only.
- Wash your hands after handling hazardous materials.
- Use caution when wearing contact lenses in a lab because chemicals or particulates can get caught behind them and cause severe damage to the eye.
- Safety glasses must be worn at all times in the designated laboratory areas.
- Glasses must have American National Standards Institute (ANSI) Z87 approval, and must have side shields.
- All visitors must wear safety glasses in the designated laboratory areas.
- All injuries and accidents must be reported immediately to the employee's respective supervisor.
- Know the location of, and how to use, the emergency equipment (that is, fire extinguishers, eye-wash stations, showers, etc.).
- Avoid distracting or startling others. Practical jokes or horseplay are not tolerated in the laboratory.

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4.4 General Laboratory Safety, Continued

House Keeping

The following house keeping guidelines are recommended for working safely in a lab:

- Clean your work areas throughout the day and before you leave at the end of the day.
- If necessary, clean equipment after use to avoid the possibility of contaminating the next person who needs to use it.
- Keep all aisles and walkways in the lab clear to provide a safe walking surface and an unobstructed exit.
- Spills must be cleaned up immediately using established cleanup procedures described in Chapter 4.3 Emergency Response Procedures and Equipment.

Labels

The following labeling protocols must be followed:

Step	Action
1	When a new chemical container is received from the supplier, check to see if the supplier's containers have the following information written on the manufacturer's label for identification purposes: • Description of contents • Concentration • Appropriate hazard labels **Note:** Chemicals in the original container, as supplied by the manufacturer, are usually correctly labeled. Do not deface or remove this label.
2	Add the following information to the supplier's container label: • Date of receipt in laboratory • Name of person who purchased the chemical • Date first opened
3	When a chemical is transferred to a secondary container, the container must be labeled with the following: • Date of preparation • Name of person who prepared the solution • Name of chemical or mixture and percent concentration(s) • Appropriate hazard labels
4	Be sure to read the label before beginning work with any chemical.

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4.4 General Laboratory Safety, Continued

Working Alone

- Never work alone in a lab if it is avoidable!
- Arrangements must be made with the Section/Lab Supervisor prior to any employee working alone in the lab. Materials tests known to be hazardous are not to be undertaken by a worker who is alone in the laboratory.
- The Section/Lab Supervisor has the responsibility for determining whether the work requires special safety precautions, such as having two persons in the same room or in the laboratory during a particular operation.

Unattended Operations

Plan for possible interruptions in utility services such as electricity, water, and gas when laboratory operations are carried out continuously or overnight. Operations must be designed to be safe and plans must be made to avoid hazards in case of failure.

Whenever possible, arrangements for routine inspection of the operation must be made and, in all cases, the laboratory lights must be left on in the area of the unattended instrument.

If there is a power outage, or if a water line break occurs while the operation is unattended, make sure the equipment safely stops the operation and does not pose a fire or health threat.

Glassware

Accidents involving glassware are a leading cause of laboratory injuries. Careful handling and storage of glassware is essential. The following guidelines should be followed while using glassware:

- Chipped or cracked glassware should be discarded or repaired immediately.
- Hand protection, such as a towel or cut-resistant gloves, must be used when inserting glass tubing into rubber stoppers or corks, or when placing rubber tubing on glass hose connections.
- Glass tubing will be fire-polished or rounded and lubricated.
- The use of plastic or metal connectors shall be considered and used wherever possible.
- Vacuum-jacketed glass apparatus must be handled with extreme care to prevent implosions.
- Equipment such as Dewar flasks will be taped or shielded.
- Only glassware designed for vacuum work will be used for that purpose.
- Heavy gloves are to be used as hand protection when picking up broken glass.
- Detailed instruction from the on-the-job training must be given on the proper use of glass equipment designed for specialized tasks that can represent unusual risks for the first-time user (for example, separatory funnels containing volatile solvents can develop considerable pressure during use).
- Designate a receptacle for broken glass.

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4.4 General Laboratory Safety, Continued

Training

- General laboratory safety principles and practice
- Labeling
- General chemical hazards and controls
- Procedures for the use of chemicals with unusual hazard potential, or extremely hazardous chemicals.

4.5 Use of Fume Hood

Applicable

This section applies to Materials Lab employees who use fume hoods.

Procedure for Checking the Fume hood Prior to Use

Prior to use, check to see that the fume hood is working properly by doing the following:

Step	Action
1	Close the sash to within 1 inch of being completely closed
2	Take a small strip of tissue and place it near the 1-inch opening
3	If the hood is working, the strip of tissue should be drawn into the hood, demonstrating negative pressure. If the strip does not show negative pressure, inform the Section/Lab Supervisor or Facilities Manager.

Proper Use of Fume hoods

The quality of protection afforded by the fume hood is affected by the manner in which the fume hood is used. The following precautions should be taken:

- Maintain sash and/or sash-panels in proper position.
- Never remove sliding sashes that are permanently installed on fume hoods.
- Make sure that the vertical sash is lowered to the marks indicated on the hood. This mark corresponds to a face velocity meeting the OSHA requirements. This also provides splash protection from the operation being performed.
- The face velocity of the hood is dependent on the sash being in the proper position. If the face area of the hood is increased by sliding the sash too high, the face velocity will be lowered, which reduces the capacity of the fume hood to capture and control airborne chemicals used inside of it. Decreasing the face area by pulling the sash down too low generally increases the face velocity. Increased velocities may create eddy currents around the body of the hood user and around articles inside the fume hood that may draw materials out of the hood and into the room, thereby compromising the protection the hood is designed to provide.
- Confirm that the flow is sufficient in the hood by checking the testing sticker and magnehelic gauge. The testing sticker should show that the hood has been tested within the last year and that the indicated flow rate average air velocity is above 100 feet per minute (fpm) (150 fpm for carcinogen use). The magnehelic gauge should show a pressure consistent with previously observed acceptable readings (for example, those readings that have a check mark in the column with the heading "OK").

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4.5 Use of Fume Hood, Continued

Proper Use of Fume hoods (continued)

- Do not put your head in the fume hood, particularly when there are contaminants in the hood.
- Perform work in a shallow tray if possible. If the hood does not have a recessed work area, minor spills will be contained in the tray or it will serve to minimize spillage out onto the lab floor.
- Locate the procedure, experiment, or apparatus as deeply as possible within the hood. This will act to maximize the efficiency of the hood.
- Keep the fume hood free of extraneous materials. Only those materials necessary to the procedure or experiment should be in the hood while work is being conducted.
- Do not block the slots between the airflow distribution baffles by storing containers in the hood. Blocking the baffles disrupts the airflow distribution and is an additional cause of poor fume hood performance.
- Never perform repairs or make mechanical connections to an existing fume hood, fume hood ducting, or other local exhaust ventilation system. The ventilation system may not have sufficient flow to handle the additional effluent and may disrupt other fume hoods and their users.
- Never remove distribution baffles (panels) installed in the exhaust systems and at the rear and top of the fume hood. The purpose of these baffles is to properly distribute air flow over the hood opening and work area.
- Never use a room or portable fan in a laboratory with a fume hood or local exhaust system. The air velocity developed by a room fan will disrupt the face velocity and overwhelm the ability of the fume hood to capture and control air contaminants generated inside it.
- If the door to the laboratory is difficult to open when the fume hood or local exhaust ventilation system is operating, a "make-up" air problem may exist. This develops when an inadequate supply of air is delivered to the room to compensate for the air exhausted by the operating fume hood. Notify the Section/Lab Supervisor or the Facilities Manager if this happens.
- Do not paint or cover fume hood inspection stickers or sash opening indicators.

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4.5 Use of Fume Hood, Continued

Proper Use of Fume hoods (continued)

- Do not locate a work station opposite a fume hood. Materials splattered or forced out of a hood during an accident could injure a person seated across an aisle from a hood.
- Do not locate a work station where the only egress from the work station requires passage in front of the hood. A fire or chemical accident, both of which often start in a fume hood, can block an exit, rendering it impassable. For this reason, all labs are required to maintain two unobstructed means of egress.
- Do not locate flammable/combustible storage cabinets directly under a fume hood. Storage of flammable and combustible liquids under a fume hood creates a potential fire hazard because of the use of open flames and electrical devices in the fume hood.

Training

Employees should be trained in the proper operation of fume hoods.

4.6 Personal Protective Equipment

Background

This section contains information regarding the common types of PPE available, including protective clothing, eye protection, hand protection, respiratory protection, and hearing protection. Failure to properly select, maintain, and use the appropriate PPE required for specific work activities can result in bodily injuries to workers. These injuries vary greatly in severity (minor to severe) and type (for example, chemical or thermal burns, eye damage, broken bones, hearing loss, lacerations, amputation).

Policy

PPE alone should not be relied on to provide protection for Materials Lab workers. PPE should be used after all other reasonable means of reducing hazards have been carried out.

Application

All laboratory workers that handle hazardous material and wastes.

Responsibility

Section/Lab supervisors and laboratory personnel, in consultation with the Chemical Hygiene Officer, are responsible for determining the proper PPE requirements for each activity. They also are responsible for ensuring that the appropriate PPE is available, and for communicating information about hazards and appropriate PPE selection to all workers in the area. It is the responsibility of the laboratory worker to use the appropriate PPE at all times.

PPE Hazard Assessment Procedure

Hazard assessments are part of the PPE program requirements at the Materials Lab. The PPE rule (WAC 296-800-16005) states that the employer (Section/Lab Supervisor) must assess physical and chemical hazards to which lab employees may be exposed. Then, based on the hazard assessment, a determination is made as to whether PPE is required and, if required, the exact kind of PPE needed to protect the employee. Finally, the employee is trained to properly use the PPE. A written record must be kept of the hazard assessment and the employee training for PPE use.

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4.6 Personal Protective Equipment, Continued

PPE Hazard Assessment Procedure (continued)

Step	Action
1	The Section/Lab Supervisors, in consultation with the Chemical Hygiene Officer, will determine the appropriate PPE for laboratory activities. In almost every instance, safety eyewear, durable clothing and footwear, lab shirts/coats, disposable latex/nitrile gloves, and hearing protection will be adequate for most lab activities.
2	Train the employee to properly use the PPE.
3	Whenever the employee's work activity changes, the PPE Hazard Training Certification Form must be reviewed to ensure proper PPE training has taken place.
4	Record the PPE training in the Training Records.

PPE Hazard Assessment Certification Form

The PPE Hazard Assessment Certification Form is located in the Appendix 8.

Protective Clothing

Protective equipment, such as eyewear, gloves, and respirators, is needed in designated areas. Instructions for selection and use of protective laboratory clothing are as follows:

- Wear protective aprons for special procedures such as transferring large volumes of corrosive material
- Remove protective clothing if there is visible or suspected hazardous contamination.

Eye Protection

Eye protection is required in all laboratory areas where corrosive or toxic materials are used or stored, and anywhere near high pressure or high vacuum equipment, or when carrying out work that can generate dust, spray, or other projectiles. Safety eyewear is required for lab visitors in these areas as well. Wear protection appropriate for the work being performed, as follows:

- In designated areas, glasses should be of unbreakable lenses (plastic or heat-tempered glass) with side shields.
- Work with significant risk of splash of chemicals, or projectiles: goggles.
- Work with significant risk of splash on face, or possible explosion: full-face shield, plus goggles.
- If safety glasses with correction lenses are needed, first consult with your optometrist or ophthalmologist.

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4.6 Personal Protective Equipment, Continued

Hand Protection

In the laboratory, gloves are used for protection from chemical products and physical hazards such as abrasion, tearing, puncture and exposure to temperature extremes. The basis for selecting glove material is as follows:

- Identification of the work procedures requiring hand protection
- Flexibility and touch sensitivity required; a need for high tactile sensitivity, for example, would restrict glove thickness, and some protocols may require the use of gloves with non-slip or textured surfaces
- Type and length of contact (for example, occasional or splash versus prolonged or immersion contact)
- Whether disposable or reusable gloves are more appropriate.

No single glove material is resistant to all chemicals, nor will most gloves remain resistant to a specific chemical for longer than a few hours. Determine which gloves will provide an acceptable degree of resistance by consulting the MSDS for the product, contacting the glove manufacturer, or by referring to a compatibility chart or table for permeation data. These resources may use the following terms:

- "Permeation rate" refers to how quickly the chemical seeps through the intact material: the higher the permeation rate, the faster the chemical will permeate the material
- "Breakthrough time" refers to how long it takes the chemical to seep through to the other side of the material
- "Degradation" is a measure of the physical deterioration (for example, glove material may actually dissolve or become harder, softer, or weaker) following contact with the chemical.

Guidelines for Glove Use

Guidelines for glove use include the following:

- Choose a glove that provides adequate protection from the specific hazard(s)
- Be aware that some glove materials may cause adverse skin reactions in some individuals, and investigate alternatives
- Inspect gloves for leakage before using; test rubber and synthetic gloves by inflating them
- Make sure that the gloves fit properly
- Ensure that the gloves are long enough to cover the skin between the top of the glove and the sleeve of the lab coat
- Discard worn or torn gloves as appropriate
- Discard disposable gloves that are, or may have become, contaminated
- Avoid contaminating "clean" equipment: remove gloves and wash hands before carrying out tasks such as using the telephone

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4.6 Personal Protective Equipment, Continued

Guidelines for Glove Use (continued)

- Always wash your hands after removing gloves, even if they appear not to be contaminated
- Follow the manufacturer's instructions for cleaning and maintenance of reusable gloves
- Before using gloves, learn how to remove them without touching the contaminated outer surface with your hands

Do not wear gloves outside lab areas.

Respiratory Protection

Respirators should be used only in emergency situations (for example, hazardous spills or leaks) or when other measures, such as ventilation, cannot adequately control exposures.

There are two classes of respirators: air-purifying, and supplied-air. The latter supply clean air from a compressed air tank or through an air line outside the work area, and are used in oxygen-deficient atmospheres or when gases or vapors with poor warning properties are present in dangerous concentrations. Air-purifying respirators are suitable for many laboratory applications and remove particulates (dusts, mists, metal fumes, etc.) or gases and vapors from the surrounding air.

Selection, use, and care of respirators

Follow proper procedures for selecting and using respiratory protective equipment. Correct use of a respirator is as vital as choosing the right respirator. An effective program for respiratory protection should include the following:

- Written standard operating procedures and training
- Selecting a respirator that is suitable for the application. Consult the MSDS or the Industrial Hygiene Officer before purchasing and using a respirator
- Assigning respirators to individuals for their exclusive use, whenever possible
- Fit testing: evaluation of facial fit for all users of respirators; beards, long sideburns, glasses or the wrong size of respirator may prevent an effective seal between the wearer's face and the respirator
- Protocols for using, cleaning, and sanitary storage of respirators
- Regular inspection of the respirator, and replacement of defective parts
- Medical surveillance, before an individual is assigned to work in an area where respirators are required, to verify the person's ability to function under increased breathing resistance.

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4.6 Personal Protective Equipment, Continued

Hearing Protection

Ear protection should be worn where the noise level is above 85 decibels (dBa), 8-hour time-weighted average (TWA). Areas where excessive noise is present should be posted with signs indicating ear protection is required. Ear protectors should be readily available and composed of rubber or plastic. Types of ear protection include:

- Ear plugs - provide basic protection to seal the ear against noise
- Ear muffs - provide protection against noise and may be more comfortable than ear plugs.

Training

Each laboratory worker should know the availability, location, and proper use of protective apparel and equipment. Examples include safety glasses, goggles, face shields, gloves, aprons, respirators, etc.

Records

PPE Hazard Assessment Certification Form for each employee.

4.7 Material Safety Data Sheets

Definition

The MSDS is a format for describing the characteristics and properties of chemicals and products. Each chemical or product will have a unique MSDS. For all chemicals and products used in the Materials Lab, the MSDS must be readily available. Every employee must know how to access the MSDS for the chemicals and products they use.

How to Obtain an MSDS

MSDSs must be received with each incoming shipment of hazardous chemical or material. If a MSDS is not received with the shipment, MSDSs can be obtained by calling the manufacturer or checking their website. This does not apply to chemicals and products that may come in to the Materials Lab from the field.

MSDS Storage Locations

MSDSs are stored in the following locations:

- The MSDS Database can be viewed on the Mats Lab home web site .
- Each Section/Lab Supervisor keeps a set of MSDSs of the chemicals used within his/her respective lab unit.

Example of MSDS

See below to better understand the contents of a MSDS. An example of a MSDS is provided in Appendix 9.

Contents of MSDS

MSDSs are the cornerstone of hazard communications standards. They provide most of the information you need to know in order to work with chemicals safely. The following information is normally contained in a MSDS:

Product Name and Identification	• Name of the chemical as it appears on the label. • Manufacturer's name and address. • Emergency telephone numbers: can be used to obtain further information about a chemical in the event of an emergency. • Chemical name or synonyms. • CAS #: refers to the Chemical Abstract Service registry number that identifies the chemical. • Date of Preparation: the most current date that the MSDS was prepared.

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4.7 Material Safety Data Sheets, Continued

Contents of MSDS (continued)

Hazardous Ingredients/ Identity Information	• Hazardous ingredients: substances which, in sufficient concentration, can produce physical or acute or chronic health hazards to persons exposed to the product. Physical hazards include fire, explosions, corrosion, projectiles, etc. Health hazards include any health effect, even including irritation or development of allergies. • TLV: refers to the threshold limit value. A TLV is the highest airborne concentration of a substance to which nearly all adults can be repeatedly exposed, day after day, without experiencing adverse effects. These are usually based on an 8-hour TWA. • PEL: refers to the permissible exposure limit. The PEL is an exposure limit established by OSHA. • STEL: refers to the short-term exposure limit. The STEL is a 15-minute time-weighted average exposure that should not be exceeded at any time during a workday. A STEL exposure should not occur more than four times per day and there should be at least 60 minutes between exposures. • LD50 (lethal dose 50): lethal single dose (usually oral) in milligrams of chemical per kilogram of animal body weight (mg/kg) of a chemical that results in the death of 50 percent of a test animal population. • LC50 (lethal concentration 50): concentration dose expressed in parts per million (ppm) for gases or micrograms of material per liter (µg/L) of air for dusts or mists that results in the death of 50 percent of a test animal population administered in one exposure. **Note:** These terms are found in the MSDSs.
Physical/ Chemical Character-istics	Boiling point, vapor pressure, vapor density, specific gravity, melting point, appearance and odor: all provide useful information about the chemical. Boiling point and vapor pressure provide a good indication of how volatile a material is. Vapor density shows whether vapors will sink, rise, or disperse throughout the area. The further the values are from 1 (the value assigned to atmospheric air), the faster the vapors will sink or rise.

Continued on next page

4.7 Material Safety Data Sheets, Continued

Contents of MSDS (continued)

Fire and Explosion Hazard Data	• Flash point: refers to the lowest temperature at which a liquid gives off enough vapor to form an ignitable mixture with air. • Flammable or Explosive Limits: the range of concentrations over which a flammable vapor mixed with air will flash or explode if an ignition source is present. • Extinguishing Media: the fire-fighting substance that is suitable for use on the substance that is burning. • Unusual Fire and Explosive Hazards: hazards that might occur as the result of overheating or burning of the specific material.
Reactivity Data	• Stability: indicates whether the material is stable or unstable under normal conditions of storage, handling, and use. • Incompatibility: lists any materials that would, upon contact with the chemical, cause the release of large amounts of energy, flammable vapor or gas, or toxic vapor or gas. • Hazardous Decomposition Products: any materials that may be produced in dangerous amounts if the specific material is exposed to burning, oxidation, heating, or allowed to react with other chemicals. • Hazardous Polymerization: a reaction with an extremely high or uncontrolled release of energy, caused by the material reacting with itself.

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4.7 Material Safety Data Sheets, Continued

Contents of MSDS (continued)

Health Hazard Data	• Routes of Entry: inhalation - breathing in of a gas, vapor, fume, mist, or dust. Skin absorption - a possible significant contribution to overall chemical exposure by way of absorption through the skin, mucous membranes, and eyes by direct or airborne contact. Ingestion - the taking up of a substance through the mouth. Injection - having a material penetrate the skin through a cut or by mechanical means. • Health Hazards (Acute and Chronic): acute - an adverse effect with symptoms developing rapidly. Chronic - an adverse effect that can be the same as an acute effect, except that the symptoms develop slowly over a long period of time or with recurrent exposures. • Carcinogen: a substance that is determined to be cancer-producing or potentially cancer-producing. • Signs and Symptoms of Overexposure: the most common symptoms or sensations a person could expect to experience from overexposure to a specific material. It is important to remember that only some symptoms will occur with exposures in most people. • Emergency and First Aid Procedures: instructions for treatment of a victim of acute inhalation, ingestion, and skin or eye contact with a specific hazardous substance. The victim should be examined by a physician as soon as possible.
Precautions for Safe Handling and Use	• Spill Cleanup: includes methods to be used to control and clean up spills. Also includes precautions such as avoiding breathing the vapors, avoiding contact with liquids and solids, removing sources of ignition, and other important considerations. May also include special equipment used for the cleanup. • Waste Disposal Methods: acceptable and prohibited methods for disposal, as well as dangers to the environment. **Note:** These are methods recommended by the chemical manufacturer and are not necessarily in compliance with federal, state, or local regulations. For waste disposal procedures, please refer to the Chemical Waste section of this manual. • Other Precautions: any other precautionary measures not mentioned elsewhere in the MSDS.

Continued on next page

4.7 Material Safety Data Sheets, Continued

Contents of MSDS (continued)

Control Measures	• Respiratory Protection: whenever respiratory protection is needed, the type required and special conditions or limitations should be listed. • Ventilation: if required, the type will be listed, as well as applicable conditions of use and limitations. • Protective Gloves: when gloves are necessary to handle the specific material, the construction, design, and material requirements should be listed. • Eye Protection: when special eye protection is required, the type will be listed along with any conditions of use and limitations. • Other Protective Equipment or Clothing: will list items not discussed elsewhere in the MSDS, such as aprons.

Training

- New employees must receive training after they are hired and prior to working with or being exposed to chemicals. This training must cover the specific hazards in their work area.
- Employees must be re-trained when new chemical hazards are introduced in their workplace or when new hazards are shown on updated MSDSs.
- Employees must be re-trained when they are assigned to different workplaces that involve new chemical hazards.
- Employees must be shown where MSDSs are kept.
- Employees must be trained and able to read and understand the information presented in the MSDS.

Records

Updated and readily accessible MSDSs
MSDS Training Records

4.8 Chemical Hazard Communication

Background

The WISHA code, WAC 296–800-170, Employer Chemical Hazard Communication Standards, requires employers to provide employees information about the potential of hazardous chemical exposure under normal use conditions or in a foreseeable emergency, and the transmittal of this information by means of a comprehensive Hazard Communication Program that includes container labeling and other forms of warning, MSDSs, and employee training.

Laboratories are required to have a written Chemical Hygiene Plan (which is incorporated in this manual) under WAC 296-62-400. A written Chemical Hazard Communication Program is not required.

Requirements

Under WAC 296-800-170, the Materials Lab is required to do the following:

- Make sure that labels on incoming containers of hazardous chemicals are in place and readable.
- Maintain MSDSs received with incoming shipments of hazardous chemicals and make them readily accessible to laboratory employees when they are in their work areas.
- Provide laboratory employees with information and training as described in: "Inform and train your employees about hazardous chemicals in your workplace," WAC 296-800-17030. You do not have to cover the location and the availability of the Hazard Communication Program.

Labels

The labeling requirements are discussed in Chapter 4.4 General Laboratory Safety.

MSDS

The MSDS requirements are discussed in Chapter 4.7 MSDS.

Training

The training requirements are discussed throughout this document and in Chapter 6, Environmental Training and Awareness.

4.9 Occupational Exposure Monitoring

Application

All employees at Materials Lab who conducts particular process or activities that require occupational exposure monitoring.

Policy

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

Definitions

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

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.).

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 TWA.

When Monitoring is Required

Representative air monitoring is mandatory for some chemicals because they are regulated by substance-specific health standards. Of these, inorganic arsenic, lead, and benzene are regularly used at the Materials Lab. If the action level is exceeded, the Materials Lab will immediately comply with the exposure monitoring requirements of the standard for that substance (WAC 296-62-075 through 296-62-07515).

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, or
- When a highly toxic substance is being regularly and continuously used outside of a chemical fume hood (three or more times a week).

Routine Air Monitoring

Routine monitoring of exposure levels in the laboratory will be conducted if determined to be necessary by the Office of the Safety and Health.

Records

Exposure testing procedures and monitoring result will be maintained in the Safety and Health Services Office. All exposure testing results will be provided to the Section/Lab Supervisor and participating employees.

4.10 Medical Consultation and Examination

Policy

Laboratory personnel that believe or suspect they have sustained an injury or illness from exposure to chemicals or products at the Materials Lab must immediately seek medical attention. All medical costs for this scenario will be the responsibility of WSDOT.

When Medical Attention Will be Provided

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.

Reproductive Hazards

As determined by a licensed and practicing physician, for those individuals, male or female, who are actively trying to conceive a child, or females who are pregnant, special care may be required in evaluating possible exposure to chemicals and products that are know or may be reproductive hazards. It is the responsibility of the employee and supervisor to put together a detailed list of these chemicals and products routinely or potentially used at the Materials Lab. In addition, a detailed job description shall be provided to the examining physician. The physician in writing shall submit his/her opinion regarding the potential reproductive hazards and any reasonable accommodation or work activity changes.

Note: Physician costs for potential or real chemical and product injuries or illness are the responsibility of WSDOT.

Information to be Provided to the Examining Physician

For chemical and project related injuries or illnesses 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 products(s) to which the employee(s) is or may be exposed to as part of his/her routine work activities
- The MSDSs for the hazardous chemical(s) and product(s) if available
- A description of the conditions under which the exposure occurred, including quantitative exposure data if available
- A description of the signs and symptoms of exposure that the employee is experiencing, if any
- Any other information that the physician may request.

Continued on next page

4.10 Medical Consultation and Examination, Continued

Written Opinion Provided by the Examining Physician

For examinations or consultations provided to employees, the Safety and Health Services Office shall obtain a written opinion from the examining physician. It shall include:

- Recommendations for further medical follow-up
- Recommendations for reasonable accommodations or light duty work
- 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
- A statement that the employee has been informed of the results of the examination or consultation

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

Employee Exposure and Medical Records

OSHA regulation 29 CFR 1910.20, Access to Employee Exposure and Medical Records, addresses the storage and access to employee exposure and medical records pertaining to toxic substances or harmful physical agents. The following is a summary of this regulation:

- The medical record for each employee is to be preserved and maintained for at least the duration of employment plus 30 years.
- Each employee exposure record shall be preserved and maintained for at least 30 years.
- Each analysis using employee exposure or medical records shall be preserved and maintained for at least 30 years.
- MSDSs and other descriptions of substances do not have to be retained, as long as some record of the identity (chemical name if known) of the substance or agent, where it was used, and when it was used is retained for 30 years.

All WSDOT personnel medical records are maintained in the Safety and Health Services Office. Under no circumstances will non-authorized personnel have access to employee medical records. Under no circumstances are Section/Lab Supervisors or employees to keep medical records at the Materials Lab.

If an employee or their designated representative requests a copy of the employee's health record, the Safety and Health Services Office is to provide a copy within 15 days of the request.

Records

Employee Exposure and Medical Records must be preserved and maintained for at least the duration of employment plus 30 years.

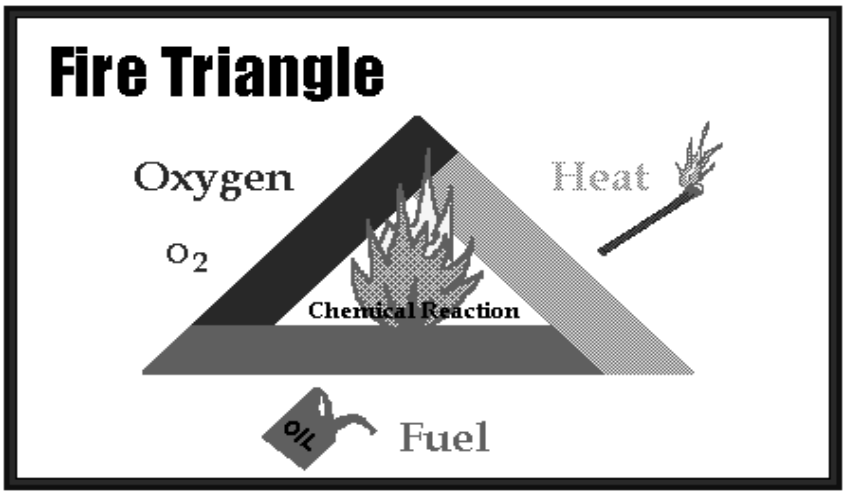
4.11 Fire Safety

Fire Safety

Laboratory fires can be caused by Bunsen burners, runaway chemical reactions, electrical heating units, failure of unattended or defective equipment, or overloaded electrical circuits.
Familiarize yourself with the operation of the fire extinguishers and the location of pull stations, emergency exits, and evacuation routes where you work. If the general alarm is sounded, use the evacuation routes established for your area and follow the instructions of the Wing Commanders. Once outside of the building, follow the procedures established in the Materials Lab Evacuation Plan.

Fire Triangle

Fire cannot occur without an ignition source, fuel, and oxygen, the three elements that comprise what is called the "fire triangle:"



Classes of Fire

The NFPA has four defined classes of fire, according to the type of fuel involved. These are:

Class	Description
A	Class A fires involve combustibles such as paper, wood, cloth, rubber and many plastics.
B	Class B fires entail burning of liquid fuels such as oil-based paints, greases, solvents, oil and gasoline.
C	Class C fires are of electrical origin (fuse boxes, electric motors, wiring)
D	Class D fires encompass combustible metals such as magnesium, sodium, potassium and phosphorus.

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4.11 Fire Safety, Continued

Fire Extinguishers

Fire extinguishers are rated as A, B, C or D (or combinations of A, B, C and D) for use against the different classes of fires. Familiarize yourself with the fire class ratings of the extinguishers in your work area so that you will know what types of fire you can attempt to extinguish with them.
Learn how to use the extinguisher in your lab, because there will be no time to read instructions during an emergency. Attempt to fight small fires only, and only if there is an escape route behind you. Remember to have the extinguisher recharged after every use. If you do fight a fire, remember the acronym "PASS" when using the extinguisher:
P: Pull and twist the locking pin to break the seal.
A: Aim low, and point the nozzle at the base of the fire.
S: Squeeze the handle to release the extinguishing agent.
S: Sweep from side to side until the fire is out.
Be prepared to repeat the process if the fire breaks out again

Prevention Fires

Use the following precautions when working with or using flammable chemicals in a laboratory. Keep in mind that these precautions also apply to flammable chemical waste.

- Minimize the quantities of flammable liquids kept in the laboratory.
- Except for the quantities needed for the work at hand, keep all flammable liquids in NFPA- or Underwriter's Laboratories- (UL) approved flammable liquid storage cabinets. Keep cabinet doors closed and latched at all times. Do not store other materials in these cabinets.
- Use and store flammable liquids and gases only in well-ventilated areas. Use a fume hood when working with products that release flammable vapors.
- Keep flammable solvent containers, including those for collecting waste, well-capped. Place open reservoirs or collection vessels for organic procedures such as HPLC inside vented chambers.
- Store flammable chemicals that require refrigeration in "explosion-safe" (non-sparking) laboratory refrigerators.
- Keep flammable chemicals away from ignition sources such as heat, sparks, flames and direct sunlight. Avoid welding or soldering in the vicinity of flammables.
- Bond and ground large metal containers of flammable liquids in storage. To avoid the build-up of static charges, bond containers to each other when dispensing.
- Use portable safety cans for storing, dispensing, and transporting flammable liquids.
- Clean spills of flammable liquids promptly.

Continued on next page

4.11 Fire Safety, Continued

Fire Response Procedures

Fires are a common emergency in a chemistry laboratory. In the event of a fire, do the following:

Step	Action
1	Assist any person in immediate danger to safety, if it can be accomplished without risk to yourself.
2	Immediately activate the building fire alarm system.
3	If the fire is small enough, use a nearby fire extinguisher to control and extinguish the fire. Don't fight the fire if these conditions exist: - The fire is too large or out of control - The atmosphere is toxic
4	If the first attempts to put out the fire do not succeed, evacuate the building immediately.
5	Doors and, if possible, windows, should be closed as the last person leaves a room or area of a lab.
6	Do not use elevators; use building stairwells.
7	When the fire alarm sounds, all personnel in the affected areas shall evacuate the building immediately.
8	Upon evacuating the building, personnel shall proceed to the designated meeting area where the Wing Commanders are responsible for taking a head count and accounting for all personnel.
9	No personnel will be allowed to re-enter the building without the permission

4.12 Medical Emergency Including Injury or Illnesses

Medical Emergency Response Procedures

Personal injury is not uncommon in laboratories. These injuries are usually minor cuts or burns but can be as severe as acute effects of chemical exposure, or incidents such as heart attacks or strokes.

The procedures for responding to medical emergence are as follows:

- The names of persons in your area trained in CPR and First Aid should be posted by your telephone.
- The number to call for medical emergencies (**911**) should also be posted by your telephone.
- All first aid, chemical exposures, and medical emergencies should be reported.
- In the event of an injury or illness resulting in hospitalization, lost work days, and filling a claim with the WA State Department of Labor and Industries, employees and supervisors are required to complete WSDOT form 750-002.

Step	Action
1	The initial responsibility for first aid rests with the first person(s) at the scene, who should react quickly but in a calm and reassuring manner.
2	Summon medical help (be explicit in reporting suspected types of injury or illness, location of victim, and type of assistance required).
3	Send people to meet the ambulance crew at likely entrances of the building.
4	The injured person should not be moved except where necessary to prevent further injury.

General First Aid

First aid is defined as any one-time treatment and any follow-up visit for the purpose of observation or treatment of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care. Prevention of injuries should be a major emphasis of any laboratory safety program. Proper training will help prevent injuries from glassware, toxic chemicals, burns and electrical shock. In the event of any type of injury beyond that which first aid can treat, call 911 for medical assistance.

The following general first aid guidelines should be followed:

- First aid equipment should be readily available in each laboratory. .
- Following any first aid, a nurse or physician qualified to handle chemical emergencies should provide further examination and treatment. The location and phone number of emergency services and the State of Washington Poison Control Center (1-800-222-1222) should be clearly posted.

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4.12 Medical Emergency Including Injury or Illnesses, Continued

General First Aid (continued)

- It is recommended that each laboratory have at least one person trained in basic first aid and cardiopulmonary resuscitation.
- Someone knowledgeable about the accident should always accompany the injured person to the medical facility, and a copy of any appropriate MSDS(s) shall accompany the victim.
- Minor injuries requiring first aid should always be reported to a supervisor and recorded on the Accident Report Form (WSDOT Form 750-010) (Appendix 10.)

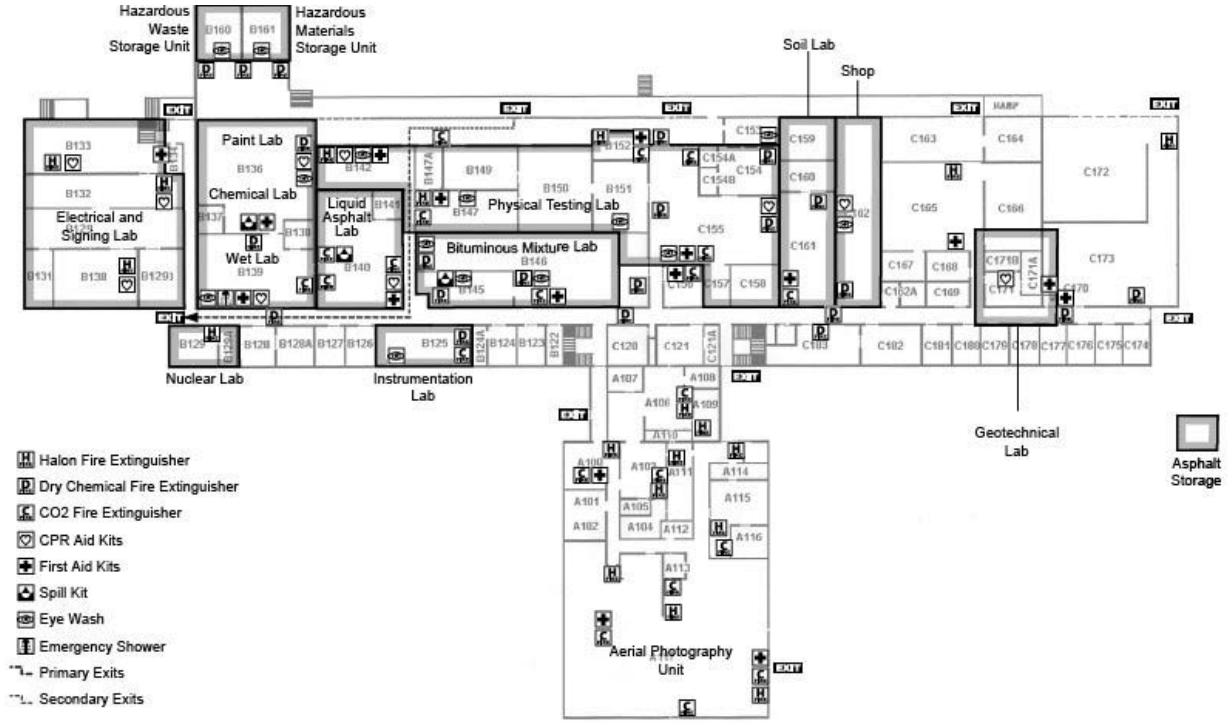
Reasons for this are as follows:

– A minor injury may indicate a hazardous situation which should be corrected to prevent a serious future injury.

It is important to document a minor injury as having been "work related" if the injury later leads to serious complications, such as from an infected cut.

First Aid Kits

The locations of first aid kits are shown below.



Emergency Response Equipment

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4.12 Medical Emergency Including Injury or Illnesses, Continued

Personal Protection During First Aid

OSHA requires adherence to "Universal Precautions" when employees respond to emergencies that involve potential exposure to blood and other potentially infectious materials. "Universal Precautions" stresses that all patients should be assumed to be infectious for human immunodeficiency virus (HIV) and other bloodborne pathogens.

Persons responding to a medical emergency should be protected from exposure to blood and other potentially infectious materials. Protection can be achieved through adherence to work practices designed to minimize or eliminate exposure, and through the use of PPE (that is, gloves, masks, and protective clothing), which provides a barrier between the worker and the exposure source. For most situations in which first aid is given, the following guidelines should be adequate:

- For bleeding control with minimal bleeding and for handling and cleaning instruments with microbial contamination, disposable gloves alone should be sufficient.
- For bleeding control with spurting blood, disposable gloves, a gown, a mask, and protective eye wear are recommended.
- For measuring temperature or measuring blood pressure, no protection is required.

After emergency care has been administered, hands and other skin surfaces should be washed immediately and thoroughly with warm water and soap if contaminated with blood, other body fluids to which Universal Precautions apply, or potentially contaminated articles. Hands should always be washed after gloves are removed, even if the gloves appear to be intact.

Accident Report Form

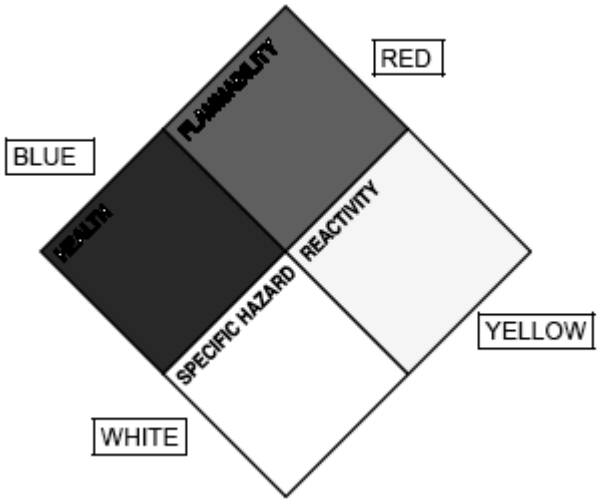
An Accident Report Form should be completed for each accident. The Accident Report Form (WSDOT Form 750-010) is located in Appendix 10.

4.13 NFPA Hazard Codes

NFPA Hazard Codes

Most manufacturers of hazardous materials use the standard National Fire Protection Association (NFPA) sign system. The sign is based on a simple color coding and numbering system (0 - 4) on a diamond-shaped placard.

NFPA Placard



Hazard Rating

The following is a description of the color coding (hazard category) and hazard rating:

Hazard Category	Hazard Rating
Health (Blue)	**4** Deadly: Even the slightest exposure to this substance could be life-threatening. Only specialized protective clothing, designed for these materials, should be worn. **3** Extreme Danger: Serious injury would result from exposure to this substance. Do not expose any body surface to these materials. Full protective measures should be taken. **2** Dangerous: Exposure to this substance would be hazardous to health. Protective measures are indicated. **1** Slight Hazard: Irritation or minor injury would result from exposure to this substance. Protective measures are indicated. **0** No Hazard: Exposure to this substance offers no significant risk to health.

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4.13 NFPA Hazard Codes, Continued

Hazard Rating (continued)

Hazard Category	Hazard Rating
Flammability (Red)	**4** Flashpoint Below 73 degree F: This substance is very flammable, volatile, or explosive depending on its state. Extreme caution should be used in handling or storing these materials. **3** Flashpoint Below 100 degree F: Flammable, volatile or explosive under almost all normal temperature conditions. Exercise great caution in storing or handling these materials. **2** Flashpoint Below 200 degree F: Moderately heated conditions may ignite this substance. Caution should be employed in handling. **1** Flashpoint Above 200 degree F: This substance must be preheated to ignite. Most combustible solids are in this category. **0** Will Not Burn: Substances that will not burn.
Reactivity (Yellow)	**4** May Detonate: Substances that are readily capable of detonation or explosion at normal temperatures and pressures. Evacuate area if material is exposed to heat or fire. **3** Explosive: Substances that are readily capable of detonation or explosion by a strong initiating source, such as heat, shock, or water. Monitor from behind explosion-resistant barriers. **2** Unstable: Violent chemical changes are possible at normal or elevated temperatures and pressures. Potentially violent or explosive reaction may occur when mixed with water. Monitor from a safe distance. **1** Normally Stable: Substances that may become unstable at elevated temperatures and pressures, or when mixed with water. Approach with caution. **0** Stable: Substances will remain stable when exposed to heat, pressure, or water.
Special Hazards (White)	This space is used to place codes or icons to identify additional hazards not covered by the three major categories above. **Examples may include:** **C** Chronic Health **W** Water-reactive **X** Oxidizer

Continued on next page

4.13 NFPA Hazard Codes, Continued

Signage

The NFPA system is used for posting in buildings and storage areas, including cabinets. Laboratory labels should:

- Be posted at the entrance to provide adequate warning for personnel entering the room. This is particularly important for emergency response personnel who need to have a knowledge of what is stored in the room.
- Indicate the basic PPE requirements.
- Refrigerators must have a label indicating whether they are approved for the storage of flammable materials.
- Locations of fire extinguishers must be clearly posted
- Exit door(s) must have a clear exit sign (with emergency power supply).

4.14 Procedures for Carcinogens, Reproductive Toxins, Substances with High Acute or Unknown Toxicity

Background

In accordance with the requirements of the Chemical Hygiene Plan (WAC 296-62-40009(h)), when performing laboratory work with carcinogen, reproductive toxin, substances that has a high degree of acute toxicity, or a chemical whose toxic properties are unknown, the following procedures apply. For the purpose of this document, these chemicals are referred to as "inimical" chemicals

Confirmed or Suspected Extremely Hazardous Substances

The following are the Occupational Safety and Health Administration (OSHA) -listed Confirmed or Suspected Extremely Hazardous Substances used by the Materials Lab.

Extremely Hazardous Substances	CAS #
Hydrofluoric Acid	7664-39-3

Control Measures

Inimical chemicals must be handled in a "designated area," which is defined by OSHA as a hood, portion of a laboratory, or the entire lab. Designated areas shall be posted and their boundaries clearly marked. Only those persons trained to work with inimical chemicals will work with those chemicals in a designated area. All such persons will:

- Use the smallest amount of the chemical that is consistent with the requirements of the work to be done.
- Use high-efficiency particulate air (HEPA) filters or high-efficiency scrubber systems to protect vacuum lines and pumps.
- Decontaminate the designated area when work is completed.

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4.14 Procedures for Carcinogens, Reproductive Toxins, Substances with High Acute or Unknown Toxicity, Continued

Control Measures (continued)

- Prepare wastes from work with inimical chemicals for waste disposal in accordance with specific disposal procedures consistent with the Resource Conservation and Recovery Act (RCRA) as determined by the Chemical Hygiene Plan. Refer to Chapter 3 for hazardous waste handling procedures.

Because the decontamination of jewelry may be difficult or impossible, jewelry on the hands or wrists cannot be worn when working in a designated area.

Long-sleeved clothing and gloves known to resist permeation by the chemicals will be worn when working in designated areas.

Store all inimical chemicals in locked and enclosed spaces with a slight negative pressure compared to the rest of the laboratory.

The user of these chemicals will keep a record of the chemicals removed from this storage area and check to make sure they are handled properly in the designated area.

Use commercially prepared standards that are below the threshold concentrations instead of preparing standards from neat chemicals.

Criteria for Select Carcinogens

A substance with more than 0.1% of a chemical which meets one of the following criteria.

- It has been evaluated by the International Agency for Research on Cancer (IARC), and found to be a carcinogen or potential carcinogen; or
- It is listed as a carcinogen or potential carcinogen in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or,
- It is regulated as a carcinogen by OSHA.

A list of carcinogens is included in Appendix 4.

Criteria for Reproductive Toxins

A mixture with greater than 1.0% of any substance described as a reproductive toxin in the applicable MSDS.

Criteria Substances with a High Degree of Acute Toxicity

A substance with more than 1.0% of a chemical which meets one of the following criteria

- A chemical that has a median lethal dose (LD50) of 50 mg or less per kg of body weight when administered orally to albino rats weighing between 200 and 300 gm each.

Continued on next page

4.14 Procedures for Carcinogens, Reproductive Toxins, Substances with High Acute or Unknown Toxicity, Continued

Criteria Substances with a High Degree of Acute Toxicity (continued)

- A chemical that has a median lethal dose (LD50) of 200 mg or less per kg 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 kg each.

A chemical that has a median lethal concentration (LC50) in air of 200 ppm by volume or less of gas or vapor, or 2 mg/L 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 gm each.

Criteria for Chemicals with Unknown Toxicity

A chemical for which there is no known statistically significant study conducted in accordance with established scientific principles that establishes its toxicity.