FLORIDA POLYTECHNIC UNIVERSITY

FACILITIES & SAFETY SERVICES

Chemical Hygiene Plan

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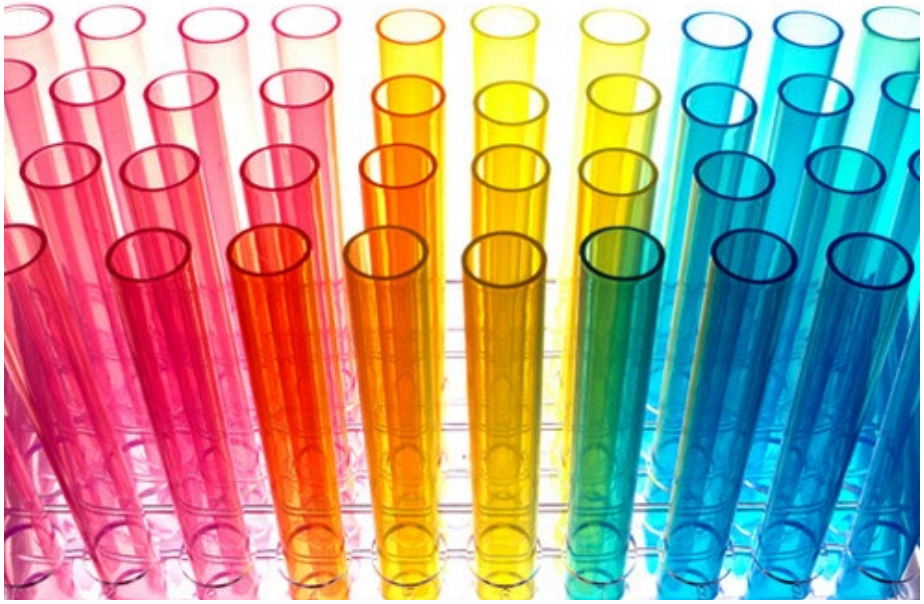
UNIVERSITY-WIDE

POLICIES AND PROCEDURES



PURPOSE:

1. To provide a written description of safety policies and procedures that all University laboratory personnel must follow.

2. To describe the services provided by Facilities and Safety Services to assist the University's laboratory operations.

I. INTRODUCTION

a) What is a Chemical Hygiene Plan?

A Chemical Hygiene Plan (CHP) is a document that summarizes policies and procedures that have been enacted to protect laboratory workers from, and inform them of, the hazards inherent to their work with chemicals. In other words, it is a safety manual for those who work with chemicals in laboratories. The Department of Labor's Occupational Safety and Health Administration (OSHA) has enacted a standard that requires such a written plan. This standard, Title 29 Code of Federal Regulations (CFR) 1910.1450: "Occupational exposure to hazardous chemicals in laboratories", or Lab Standard for short, became effective January 1991, and can be found in section B chapter XI of this document.

b) To Whom Does This Plan Apply?

Florida Poly's Chemical Hygiene Plan applies to all faculty, classified staff, paid graduate students, students, volunteers and work-study students who work in University laboratories. A laboratory is defined, by the OSHA Lab Standard, as a facility where chemical manipulations are carried out on a "laboratory scale", multiple chemical procedures are used, procedures are not part of a production process and practices and equipment exist to protect employees from exposure to hazardous chemicals. The term "laboratory scale" means that work is conducted in containers that are designed to be manipulated by a single person. The majority of Florida Poly's laboratories fit this OSHA definition and therefore are subject to the procedures and policies within this document. If you question whether or not your facility meets the criteria, call Facilities and Safety Services (F&SS), for a consultation.

Employees that work with chemicals in non-laboratory settings are covered by the OSHA Hazard Communication Standard and not the Lab Standard.

For information on Hazard Communication, contact F&SS at (863) 874-8691.

c) Structure of the Plan

Florida Poly's Chemical Hygiene Plan consists of two basic components:

1) **University-wide procedures**
   These are prepared by F&SS and they cover those safety policies and procedures that pertain to all University laboratories. This section also contains functions that F&SS provides to the University community.

2) **Laboratory-specific procedures**

The latter part of the CHP, which is to contain the laboratory-specific procedures, is to be compiled individually by each laboratory unit on campus. In Part B of this document, you will find an outline and skeletal structure for the individual portions. It is required that each laboratory unit on campus incorporate its own documentation directly into Part B of the CHP.

II. RESPONSIBILITIES

Laboratory safety is the responsibility of many individuals. In this section we discuss the roles and responsibilities of each party in the process. The OSHA Lab Standard mentions such terms as Chemical Hygiene Officer and Laboratory Workers. The following is the interpretation of how these terms apply to the diverse community we have at Florida Poly.

a) University President

This individual has ultimate legal responsibility for the University's compliance with the OSHA Laboratory Standard.

b) Chemical Hygiene Officer (CHO)

The OSHA Lab Standard requires that the employer designate someone to fill this role. The Chemical Hygiene Officer is responsible for drafting a written CHP, overseeing the implementation of the plan and reviewing and revising annually.

Florida Poly meets this requirement in a three-fold manner:

1. **University Chemical Hygiene Officer (UCHO)**
   Coordinator of Laboratory Safety Programs at Florida Poly F&SS. The roles of this individual are to write and revise Part A of the University plan; to provide the structure for Part B and oversee its implementation; and to coordinate the process of inspecting individual laboratories to ensure compliance with the OSHA Lab Standard.
2. **Laboratory Manager**
   Each laboratory unit must designate an individual to serve as the Lab Manager. A laboratory unit might be a single lab, a group of research labs all under the direction of the same Principal Investigator or a group of instructional laboratories within a single department. The Lab Managers shall be responsible for drafting and compiling documentation for Part B of the Plan. These individuals will also play a role in aspects of implementation, such as training and inspection coordination. For a detailed list of Lab Manager's duties, see **Part B: Summary of Duties.**
3. **University Safety Committee**
   This University committee oversees compliance with the Chemical Hygiene Plan. It will have among its functions annual review of Part A of the plan and assignment of disciplinary actions necessary to deal with noncompliance. Membership will consist of a Public Safety Officer, research faculty, laboratory staff and safety professionals.

c) Department Heads

Each department head has the responsibility for safety compliance for the laboratories in her/his department. This responsibility takes the form of ensuring that Principal Investigators are aware of the Chemical Hygiene Plan requirements and mandating lab unit participation in the program. Departmental safety officers or committees may serve in the delegation of this responsibility.

d) Principal Investigators

Research group leaders and instructional lab supervisors have the responsibility for appointing a Laboratory Chemical Hygiene Officer for their lab units. Principal Investigators shall approve all material to be included in the Laboratory-specific Procedures prior to their incorporation into Part B of the Chemical Hygiene Plan.

e) Laboratory Workers

Although the OSHA Lab Standard primarily speaks to the employers' responsibilities, once the employers have met compliance requirements it is the laboratory workers' responsibility to:

1. Plan and conduct each laboratory operation in accordance with the written Chemical Hygiene Plan procedures; and
2. Develop good personal chemical hygiene habits.

For a more specific listing of the responsibilities for laboratory workers, see **Part B: Summary of Duties.**

III. INFORMATION DISSEMINATION AND EMPLOYEE TRAINING

The OSHA Standards require employers to "provide employees with information and training to ensure that the employees are apprised of the hazards of chemicals present in their work area." Training schedules and components are also specified within the Standard. The following is designed to meet compliance with these specifications.

a) Training Schedules

Employees shall receive information and training:

1. At the time of initial assignment to a work area where hazardous chemicals are present
2. Prior to assignments involving new exposure situations, (e.g. prior to using a new hazard)
3. And at refresher safety seminars provided by F&SS.

b) Training Responsibilities

Laboratory Manager & Principal Investigator:

1. Ensure that each employee in that Lab Unit has been given the opportunity to review the CHP.
2. Point out the Training Documentation Form and required reading list.
3. Collect signed Training Documentation Forms and file in Part B.
4. Show employees where and how to obtain SDS forms.

University Chemical Hygiene Officer

1. Conduct safety-training seminars on a periodic basis.
2. Provide seminars to off-campus sites, on a request basis.
3. Consult with Lab Manager regarding training.

c) Requisite Components of Training.

During the training, the Lab Manager must provide all lab personnel with the following information, at a minimum:

1. The **C**hemical **H**ygiene **P**lan: The employees must be informed of the location of the **CHP** for that particular Lab Unit. As a significant part of the training process, the employees must read and become familiar with the contents of the Plan.
2. The OSHA Lab Standard: Employees must be provided access to the OSHA Lab Standard. This regulation is included at the end of each copy of the CHP.
3. Safety Data Sheets (SDS's): The Lab Manager shall instruct the workers on the departmental procedure for obtaining SDS's when needed. (See section VIII).

IV. CHEMICAL PROCUREMENT PROCEDURES

FPU-9.0041P - The Procurement, Use and Possession of Hazardous Materials & Radiation Producing Equipment 8.24.15

The safe handling of a hazardous chemical starts at the point of purchase and receipt. The following procedures should be adhered to when ordering and receiving chemicals for laboratories.

a) Procurement Methods

Most chemical purchases at Florida Poly are made by requisition and purchase order. F&SS receives copies of all new chemical orders and reviews them for potential problems. If a problem exists, F&SS will contact the purchaser and attempt to find resolution before a purchase can be approved.

b) Quantity

To reduce waste disposal costs and minimize storage in labs, chemicals should be ordered in the ***smallest possible quantities***.

c) Container Labels

No container shall be accepted without an adequate identifying label. Labels on chemical containers must state the chemical name, the manufacturer name and hazard information.

d) Safety Data Sheets (SDS's)

Chemical manufacturers are required to send a Safety Data Sheet when a chemical shipment is ordered. Most of the major chemical companies send the SDS's to F&SS. Others, such as Aldrich, mail the SDS's directly to the ordering department. It is essential that the end users have access to the SDS and become familiar with the chemical hazards prior to working with the substance. Departments must have a system for routing incoming SDS's to the chemical users or departmental files.

e) Approved Purchasing Agents

The requirements that impact the University pertain to the "Proof of Identity" section of the standard. According to this section, vendors of listed substances must identify each purchaser. The vendor is required by law to verify that authorized purchasing agents place orders. Each department must create a list of authorized purchasing agents, obtain their signatures and submit the document

to Florida Poly's Purchasing Department.

V. WORKING WITH CHEMICALS:

a) Minimization of all chemical exposures

Because all substances are potentially hazardous given the right dose and exposure, general precautions for handling all laboratory chemicals should be adopted. Even for substances of no known significant hazard, exposure should be minimized. At the very least proper hand washing techniques shall be followed after glove removal and before leaving the lab.

Avoid skin contact:

- Use any and all appropriate personal protective apparel and equipment.
- Inspect gloves, confinement boxes, hoods, aprons, etc. for contamination or holes that might compromise their ability to protect you before using them.

Avoid inhalation exposure:

- Conduct work inside a properly functioning fume hood (see Fume Hoods, section XIV).
- Do not smell (sniff) chemicals.
- If the chemical presents an airborne hazard, (Gases, dusts or fumes) use a respirator when unable to work in a fume hood. (See Respiratory Protection, section XII).

Avoid ingestion:

- Do not taste chemicals.
- NEVER pipette by mouth suction.
- Do not eat/drink in chemical work areas.
- Do not store food/drink near chemicals.

b) Planning

Personnel responsible for establishing new research protocols in the lab should carefully review all operations for potential risks or hazards.

- Seek information and advice about the hazards.
- Plan appropriate protective procedures.
- Ensure the lab space and equipment is compatible with the process and or chemicals being introduced.
- Plan positioning of equipment before beginning any new operation.

c) Housekeeping

- Work areas must be kept clean and orderly.
- DO NOT use the sinks in the labs to dispose of any chemical.
- Equipment and chemicals must be properly stored. (See Chemical Storage, section VI)
- **All chemical containers must be labeled**, including secondary (or working) vessels that contain chemicals for longer than a single work period & are not constantly attended (e.g. beakers, flasks).
- Chemical containers should be capped and returned to normal storage location after use.
- Chemicals that are no longer needed should be disposed of properly. (See Disposal of

Chemical Waste, section VII)

d) In-house Transportation

- Containers of flammable liquids or corrosives should be safety coated or inserted into a safety- carrying container during transportation within your facility.
- Gas cylinders must be secured to a cart manufactured for that purpose.

e) Eating and Drinking

Many of the chemicals in our laboratories are extremely dangerous if ingested. Contamination of food and drink is a potential route of exposure. Chemical vapors may be absorbed by food. For this reason, the policy on food and drink in laboratories is as follows:

- No food and drinks in the laboratory.
- Laboratory glassware must never be used to store or serve food or beverages.
- Food must never be stored in the same refrigerator as chemicals or biological samples. A refrigerator designated for food storage should be labeled "FOOD ONLY" and not stored in the lab. All other lab refrigerators should be labeled: "THIS REFRIGERATOR IS FOR CHEMICAL STORAGE ONLY. NO FOOD OR DRINK IS ALLOWED.

f) Working Alone

Work with chemicals that may be immediately dangerous to life and health (IDLH) shall not be conducted alone. It is recommended that ALL work be conducted in proximity to others, in case of emergency.

g) Smoking

Smoking is not allowed in any of the laboratories or chemical storage areas.

h) Personal Protection

See section XI for information on Personal Protective Equipment (PPE) requirements and recommendations.

VI. CHEMICAL STORAGE

Proper storage of chemicals is an important part of Chemical Hygiene. Accidents and hazardous situations can be avoided by careful planning and by adhering to the following guidelines.

a) General

- Every attempt should be made to minimize chemical storage in individual laboratories. When chemicals are no longer needed, they should be returned to Chemical Storage and Distribution Facility if possible and/or disposed of according to the hazardous waste procedures (see section VII).
- Chemical containers should be regularly inspected to ensure that labels are legible and intact, containers are not leaking or rusting, and that chemicals have not dangerously deteriorated or peroxidized. Those chemicals that are time-sensitive must be date marked when the original seal is removed the first time.
- Containers must always be kept tightly sealed: stoppers and other loosely fitting lids are not acceptable for permanent storage.

b) Location

- Chemicals should be housed in a defined storage area and returned to that location after each use.
- The containers shall be stored on sturdy shelves, preferably with a retaining lip and chemical- resistant coating.
- Chemicals should not be stored on laboratory bench tops.
- Routine chemical storage in fume hoods is discouraged. However, there are certain highly toxic materials that MUST be stored in a fume hood. (e.g. toxic gases)
- Storage areas should be cool, dry, well ventilated, and out of direct sunlight.
- The storage location should be out of the emergency exit path.
- Flammable storage outside of an approved flammable cabinet must be out of the emergency exit path.

c) Carcinogens

If any of the 13 listed carcinogens in 29 CFR 1910.1003 are manufactured, processed, repackaged, released, handled, or stored, that Standard shall be followed except as exempted under 1910.1003(a)(2).

d) Nanoparticles and Nanomaterials

Nanoparticles and nanomaterials have different reactivities and interactions with biological systems than bulk materials and understanding and exploiting these differences is an active area of research. However, these differences also mean that the risks and hazards associated with exposure to engineered nanomaterials are not well known. Because this is an area of ongoing research, consult trusted sources for the most up to date information available. Note that the higher reactivity of many nanoscale materials suggests that they should be treated as potential sources of ignition, accelerants, and fuel that could result in fire or explosion. Easily dispersed dry nanomaterials may pose the greatest health hazard because of the risk of inhalation. Operations involving these nanomaterials deserve more attention and more stringent controls than those where the nanomaterials are embedded in solid or suspended in liquid matrixes.

Consideration should be given to all possible routes of exposure to nanomaterials including inhalation, ingestion, injection, and dermal contact (including eye and mucous membranes). Avoid handling nanomaterials in the open air in a free-particle state. Whenever possible, handle and store dispersible nanomaterials, whether suspended in liquids or in a dry particle form, in closed (tightly sealed) containers. Unless cutting or grinding occurs, nanomaterials that are not in a free form (encapsulated in a solid or a nanocomposite) typically will not require engineering controls. If a synthesis is being performed to create nanomaterials, it is not enough to only consider the final material in the risk assessment but consider the hazardous properties of the precursor materials as well.

To minimize laboratory personnel exposure, conduct any work that could generate engineered nanoparticles in an enclosure that operates at a negative pressure differential compared to the laboratory personnel breathing zone. Limited data exist regarding the efficacy of PPE and ventilation systems against exposure to nanoparticles. However, until further information is available, it is prudent to follow standard chemical hygiene practices. Conduct a hazard evaluation to determine PPE appropriate for the level of hazard according to the requirements

set forth in OSHA's Personal Protective Equipment standard (29 CFR 1910.132).

e) Highly Toxic and Explosive/Reactive Chemicals/Materials

The use of highly toxic and explosive/ reactive chemicals and materials has been an area of growing concern. The frequency of academic laboratory incidents in the U.S. is an area of significant concern for the Chemical Safety Board (CSB). The CSB issued a case study on an explosion at Texas Tech University in Lubbock, Texas, which severely injured a graduate student handling a high-energy metal compound. Since 2001, the CSB has gathered preliminary information on 120 different university laboratory incidents that resulted in 87 evacuations, 96 injuries, and three deaths.

It is recommended that each facility keep a detailed inventory of highly toxic chemicals and explosive/reactive materials. There should be a record of the date of receipt, amount, location, and responsible individual for all acquisitions, syntheses, and disposal of these chemicals. A physical inventory should be performed annually to verify active inventory records. There should be a procedure in place to report security breaches, inventory discrepancies, losses, diversions, or suspected thefts.

Procedures for disposal of highly toxic materials should be established before any experiments begin, possibly even before the chemicals are ordered. The procedures should address methods for decontamination of any laboratory equipment that comes into contact with highly toxic chemicals. All waste should be accumulated in clearly labeled impervious containers that are stored in unbreakable secondary containment.

Highly reactive and explosive materials that may be used in the laboratory require appropriate procedures and training. An explosion can occur when a material undergoes a rapid reaction that results in a violent release of energy. Such reactions can happen spontaneously and can produce pressures, gases, and fumes that are hazardous. Some reagents pose a risk on contact with the atmosphere. It is prudent laboratory practice to use a safer alternative whenever possible.

If at all possible, substitutes for highly acute, chronic, explosive, or reactive chemicals should be considered prior to beginning work and used whenever possible.

f) Corrosives

- Corrosive chemicals should be stored in safety-coated containers, on shelves below eye-level.
- Acids and bases must not be stored together.

g) Flammable Liquids

Chemicals that have a Flashpoint below 100º F (37.8 ºC) are considered to be flammable.

- These liquids must be stored in approved safety cans, storage cabinets or storage rooms.
- However, a maximum of 25 gallons of contained flammable liquids is permitted to be located outside an approved area at any one time, in any given lab. Adjoining rooms that are not separated by a closed fire door are considered to be one lab.
- Proper storage cabinets are those that have been approved by Underwriters Laboratories or Factory Mutual.

- Storage rooms should have suitable fire protection, ventilation, spill-containment and electrical systems that do not pose an ignition hazard.
- Storage of flammable liquids shall not be near exits, sources of heat, ignition, strong oxidizing agents, explosives or reactives.
- Appropriate fire extinguishers shall be readily available. (See section XV.)
- Smoking is prohibited in storage areas.
- Metal dispensing and receiving containers (drums) must be in a suitable containment apparatus and grounded and bonded together, by a suitable conductor to prevent static sparks.

h) Compressed Gases

- Cylinders that are not in current use shall be stored in a secure, upright position with the valves closed and the protective cap in place.
- Cylinders shall be secured in a way that prevents them from falling. Products available for securing cylinders include wall brackets and chains, bench brackets, supports stands, base stands and cabinets and are available from most safety or scientific products companies.
- When multiple cylinders are stored with the same restraint, cylinders must be "nested" in a fashion that provides each cylinder with three points of support contact (a wall, the restraining device, other cylinders.
- Cylinders shall be stored away from sources of heat and ignition.
- A distance of 20 feet must separate flammables and oxidizers or by a five-foot high firewall that has a minimum ½ hour rating.
- Empty cylinders are to be stored apart from full cylinders. The empties are to be clearly labeled as such and stored in the same fashion as the full cylinders.

i) Incompatible Chemicals

Separate storage areas should be provided for chemicals that may react with each other and create a hazardous condition because of this reaction. Safety Data Sheets are an invaluable resource in determining a chemical's compatibility with another. The following table lists chemical classes and denotes incompatible combinations. Also included is a list of common chemicals in these classes.

Chemical Compatibility Chart

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	Inorganic Acids																								
2	Organic acids	X																							
3	Caustics	X	X																						
4	Amines & Alkanolamines	X	X																						
5	Halogenated Compounds	X		X	X																				
6	Alcohols, Glycols & Glycol Ethers	X																							
7	Aldehydes	X	X	X	X		X																		
8	Ketone	X		X	X			X																	
9	Saturated Hydrocarbons																								
10	Aromatic Hydrocarbons	X																							
11	Olefins	X				X																			
12	Petrolum Oils																								
13	Esters	X		X	X																				
14	Monomers & Polymerizable Esters	X	X	X	X	X	X																		
15	Phenols			X	X			X							X										
16	Alkylene Oxides	X	X	X	X		X	X							X	X									
17	Cyanohydrins	X	X	X	X	X		X									X								
18	Nitriles	X	X	X	X												X								
19	Ammonia	X	X					X	X					X	X	X	X	X							
20	Halogens			X			X	X	X	X	X	X	X	X	X	X					X				
21	Ethers	X													X						X				
22	Phosphorus, Elemental	X	X	X																	X				
23	Sulfur, Molten									X	X	X	X				X								
24	Acid Anhydrides	X		X	X		X	X							X		X	X	X	X					

X Represents Unsafe Combinations

Represents Safe Combinations

j) Safety Recommendations—Physical Hazards

Physical hazards in the laboratory include combustible liquids, compressed gases, reactives, explosives and flammable chemicals, as well as high pressure/energy procedures, sharp objects and moving equipment. Injuries can result from bodily contact with rotating or moving objects, including mechanical equipment, parts, and devices. Personnel should not wear loose fitting clothing, jewelry, or unrestrained long hair around machinery with moving parts.

The Chemical Safety Board has identified the following key lessons for laboratories that address both physical and other hazards:

- Ensure that research-specific hazards are evaluated and then controlled by developing specific written protocols and training.
- Expand existing laboratory safety plans to ensure that all safety hazards, including physical hazards of chemicals, are addressed.
- Ensure that the organization's EHS office reports directly to an identified individual/office with organizational authority to implement safety improvements.
- Develop a verification program that ensures that the safety provisions of the CHP are communicated, followed, and enforced at all levels within the organization.

- Document and communicate all laboratory near-misses and previous incidents to track safety, provide opportunities for education and improvement to drive safety changes at the University.
- Manage the hazards unique to laboratory chemical research in the academic environment. Utilize available practice guidance that identifies and describes methodologies to assess and control hazards.
- Written safety protocols and training are necessary to manage laboratory risk.

Chemical Compatibility

VII. DISPOSAL OF CHEMICAL WASTE

All chemical waste must be disposed of through Facilities and Safety Services according to the following procedures.

A) Waste Packing Requirements.

- Chemical waste must be in a sealed container that shows no sign of leakage or damage.
- Broken caps or stoppers are not allowed.
- Corrosives must be in glass or plastic containers.
- Halogenated solvent waste must be collected and stored in separate containers from other solvent waste.
- Container size must not exceed 5 gallons (20 liters), unless approved by EHS.

B) Waste Labeling Requirements.

- Each waste container or lab pack must have a University waste label attached.
- Labels can be obtained from EHS.
- Information on label forms must be complete.
- Each chemical component in the waste container must be identified by NAME, not formula, nickname, acronym, or structure.
- The approximate percentage of each component must be listed.
- Containers must be labeled with the accumulation start date.
- Email your hazardous waste pickups to safetyservices@floridapoly.edu.

C) Transportation of Hazardous Waste.

- Hazardous waste is not to be transported outside of a building except by licensed transport individuals, EHS personnel, or the custodian of the chemical inventory.
- When transporting wastes in-house, make sure that incompatibles are not transported together. Check the SDS for each chemical for incompatibilities.
- Minimize the chance of container breakage: use safety containers such as rubber carriers and carts with containment lips.

D) Disposal of Unknowns

- Chemical wastes with no identification (unknowns) present a particularly dangerous threat due to their unknown composition and characteristics. Unknown waste should not be transported, treated or disposed of until

chemical analysis has been completed to determine hazardous properties. Under no circumstances should an unknown waste be placed in a shipping container with properly labeled and manifested wastes.

- EHS will accept unknowns only during scheduled campus pickups by our hazardous waste contractors. If unknowns are listed in the email request, you will be notified when the contractor will be on campus. When labeling unknowns for disposal, list as much information about the chemical as possible and store them separately from other wastes. Information may be obtained by querying colleagues or neighboring lab personnel who may have knowledge of the types of chemicals that were used in that area.

E) Waste Storage in Labs.

The Environmental Protection Agency (EPA) and the Florida Department of Environmental Protection (FDEP) have regulations governing the accumulation and storage of hazardous waste in laboratories. For more information on the EPA Resource Conservation and Recovery Act waste lists go to https://www.epa.gov/hw. These rules are extremely important: Failure to follow the rules may result in citations and/or fines.

- A laboratory may accumulate up to 55 gallons of hazardous waste or one quart of "P-listed" waste. If a lab accumulates more than these limits, it has **THREE DAYS** to have the excess removed to the F&SS Hazardous Waste Accumulation Area.

  If the limits are exceeded, lab workers must do the following:
  - Write the date the limit was exceeded on container.
  - Write the words "Hazardous Waste" on the container.
  - Call Safety Services immediately to arrange for disposal.

- Hazardous wastes may be accumulated in labs as long as they are collected in containers near the point of generation. This area must be under the control of the lab workers and Lab Manager. Waste containers must then remain in the lab where they were filled until collected by authorized personnel. "Authorized personnel" generally means a member of Safety Services.
- Containers must be in good condition.
- Container material must be compatible with the waste it contains.

Containers must be **CLOSED**, except when adding waste. Failure to close the waste containers may constitute an effort to evaporate the waste. This is considered illegal on-site treatment of waste. The label's list of contents MUST be updated whenever waste is added.

F) Special Problems.

1. Mercury:

Elemental mercury should never be added to another chemical for disposal. Waste disposal firms will not accept waste contaminated with mercury. Therefore, elemental mercury should be placed in a sealed container by itself for collection by the licensed contractor.

2. **Peroxide Formers:**
   Some chemicals form explosive concentrations of peroxides with age. See page 22 for a **l**ist of examples of common peroxide forming chemicals**.** When peroxides become concentrated by evaporation or distillation and are disturbed by heat, shock or friction, they may explode with extreme violence. These substances must not be housed in labs for long periods of time. To minimize the hazard of peroxide formation, strictly observe the following safetyguidelines:

** Opened containers must not be kept for more than 12 months and should be tested for peroxides at 6 months.

** Containers should be dated upon receipt and again upon opening. Laboratory workers must remain aware of these dates and arrange for disposal before expiration.

** Never attempt to force open a rusted or stuck cap on a container of peroxide forming chemical.

** For Your Information: Mallinckrodt has a line of ethers that contain a preservative that extends the shelf life. The expiration date of these preserved ethers is two years from the date of receipt.

** Keep only a minimal working inventory of peroxide-forming chemicals in the lab.

** Test strips for determining the presence of peroxides are available from scientific supply companies.

** Never distill potential peroxide-formers to dryness. Always leave 10% of the original liquid volume. When preparing to distill or evaporate compounds listed below, always test for peroxides first.

** Immediately dispose of, through F&SS, any rusted, damaged, undated, or suspicious- appearing containers of peroxide-forming chemicals.

** Do not use any peroxide-forming chemical if a precipitate has formed or an oily viscous layer has appeared. Contact F&SS immediately.

EXAMPLES OF PEROXIDE FORMERS:

Acrylonitrile	Methyl isobutyl ketone
Butadiene	Methyl methacrylate
Chloroprene	Potassium metal
Chlorotrifluoroethylene	Sodium amide
Cyclohexene	Tetrahydrofuran
Diethyl ether	Vinyl acetate
Dioxane	Vinyl chloride
Divinyl acetylene	Vinyl ethers
Ethyl ether	Vinylidene chloride
Isopropyl ethers	Vinyl pyridine
Methyl acetylene	

3. **Picric Acid:**
   When these chemicals become desiccated, they become explosion hazards. Dry picric acid is classified as a class "A" explosive. It is shock sensitive and can explode when moved. If you suspect that you have dry picric acid on hand:
   - **Do not touch the container! The act of moving the container may be enough to detonate the material.**
   - Prevent any personnel from entering the area or disturbing the picric acid container.
   - Contact Safety Services immediately.

Note: Private contractors, at very high cost to the University, do the care and handling of desiccated picric acid and other explosive materials that are accidentally produced or discovered in the laboratory. Please monitor your chemical inventory to prevent such occurrences.

4. **Special Wastes**
   The following categories of waste are handled differently than described above. Please contact the appropriate office to dispose of these.

   - **Radioactive Waste & Biohazardous Waste (863) 874-8722**

5. **Perchloric Acid:**
   Recommendations for the Safe Handling of Perchloric Acid: (From the CRC Handbook of Laboratory Safety 4th Edition)

   - **Floors -** Perchloric acid should be handled in a masonry building with concrete or tile floors. Handling acid on wooden floors is dangerous, especially after the acid has dried. The wooden floor will then become sensitive to ignition by friction.
   - **Laboratory benches -** Laboratory benches should be constructed of resistant materials and not wood to prevent acid absorption, especially at the bottom surface that rests on the floor and would be subject to the greatest exposure from acid spills. Bench tops of resistant and nonabsorbent materials such as chemical stoneware, tile, epoxy composites and polyethylene are recommended.
   - **Shelves and cabinets -** Shelves and cabinets of epoxy-painted steel are highly recommended over wood.
   - **Heating source -** Hot plates (electric), electrically or steam-heated sand baths or steam baths are recommended for heating perchloric acid. Direct flame heating or oil baths should not be used.
   - **Glassware -** The hazards that may ensue if an apparatus cracks or breaks due to thermal or mechanical shock are sufficient to make it desirable that quartz apparatus be considered, especially as it is necessary in many experiments to chill rapidly from the boiling point. Rubber stoppers, tubes or stopcocks should not be used with perchloric acid due to incompatibility.

Handling 73% or Less Perchloric Acid in the Laboratory

- Use chemical splash and impact-rated goggles for eye protection whenever the acid is handled.
- Always transfer acid over a compatible container in order to catch any spills and afford a ready means of disposal.
- In wet combustions with perchloric acid, treat the sample first with nitric acid to destroy easily oxidizable matter.
- Any procedure involving heating of perchloric acid must be conducted in a perchloric acid fume hood, with the sash down.
- No organic materials should be stored in the perchloric acid hood.
- Do not allow perchloric acid to come into contact with strong dehydrating agents (concentrated sulfuric acid, anhydrous phosphorous pentoxide, etc.).
- Perchloric acid should be used only in standard analytical procedures from well-recognized analytical texts. (This does not apply to analytical research workers.)
- Keep the quantities of perchloric acid handled at the bare minimum for safety.

Handling 73 - 85% Perchloric Acid in the Laboratory

Use the same precautions as above.

Handling Anhydrous Perchloric Acid (Greater than 85%)

- Only experienced research workers should handle anhydrous perchloric acid. These workers must be thoroughly familiar with the literature on the acid.
- A safety shield must be used to protect against a possible explosion and the acid must be used in an appropriate hood with a minimum of equipment present. No extraneous chemicals should be present in the hood.
- A second person should be informed of the intended use of anhydrous acid and be in the same room with the research worker using this extremely strong oxidizer.
- Safety goggles, face shield, thick gauntlets and a rubber apron must be worn.
- Only freshly prepared acid should be used.
- Do not make any more anhydrous perchloric acid than is required for a single day's work.
- Dispose of any unused anhydrous acid at the end of each day by dilution and neutralization.
- Contact of the anhydrous acid with organic materials will usually result in an explosion.

  Any discoloration of the anhydrous acid requires immediate disposal.

VIII. HAZARD IDENTIFICATION: CLASSIFICATION & COMMUNICATION

The first part of this section lists definitions of classes of health hazards. The definitions are taken from the OSHA Hazard Communication standard, 1910.1200. A chemical that meets any of the

definitions is legally considered to be a health hazard.

The second part of this section describes the various systems of communicating the hazards of substances. Specifically: Container labels, Safety Data Sheets (SDS) and the Globally Harmonized System (GHS).

Following the "methods of communicating hazard information" section are some lists of hazardous chemicals: OSHA Regulated Carcinogens, Common Explosive Materials and Properties of Common Laboratory Flammable Liquids. These lists are provided to assist laboratory workers in recognizing certain, well documented hazardous substances.

A) HAZARD CLASSES: Definitions.

1. Carcinogen
   A chemical is legally considered to be a carcinogen (cancer-causing agent) if:
   - It has been evaluated by the International Agency for Research on Cancer (IARC) and found to be a carcinogen or potential carcinogen
   - It is listed as a carcinogen or potential carcinogen in the Annual Report on Carcinogens, published by the National Toxicology Program (NTP)
   - OSHA regulates it as a carcinogen.

2. Reproductive Toxin
   A chemical that affects reproductive capabilities through chromosomal damage (mutation) or fetal effects (teratogenesis).

3. Corrosive
   A chemical that causes visible destruction of, or irreversible alterations in, *living tissue* by chemical action at the site of contact. This term, as it defines health hazard, shall not refer to action on non- living tissue.

4. Highly Toxic
   A chemical that falls into any of these categories:
   - Has a median lethal dose (LD50) of 50 mg or less per kg of body weight when administered orally
   - Has an LD50 of 200 mg, or less, per kg of body weight when in continuous skin contact or
   - Has a lethal concentration (LC50) of 200 ppm, or less, of volume air on continuous inhalation.

5. Irritant
   A chemical, which is not corrosive, but which causes a reversible inflammatory effect on living tissue bychemical action at the site of contact.

6. Sensitizer
   A chemical that causes a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure.

7. Toxic
   A chemical that falls into one of the following categories:
   - Has an LD50 of 50 - 500 mg per kg body weight (oral exposure)
   - Has an LD50 of 200 - 1000 mg/kg (skin exposure)
   - Has an LC50 of 200 - 2000 ppm (inhalation exposure).

8. Target Organ Effects
   Chemicals that affect the liver, kidney, nervous system, blood, lungs, reproductive system (including fetuses), skin or eyes.

Quick Glossary of terms:
LC_{50} - The concentration of a material in air that will kill 50% of a group of test animals with a single exposure (usually 1 to 4 hours). The **LC_{50}** expressed as parts per million (ppm) of air, by volume for gases and vapors. It is expressed as micrograms of material per cubic meter of air (mg/m3) for dusts and mists.

LD_{50} - A single dose of a material expected to kill 50% of a group of test animals. The LD_{50} dose is usually expressed as milligrams or grams of material per kilogram of animal body weight (mg/kg or g/kg). The materials may be administered by mouth or applied to the skin.

B) METHODS OF COMMUNICATING HAZARD INFORMATION

1. Container Labels
   Chemical manufacturers differ in their presentations of safety information on containers. Companies such as Fisher Scientific and Baker provide most of the crucial data on the label, while others, such as Aldrich, provide little safety information. Always consult the SDS for additional information but look on the label for a quick reference.
   A good manufacturer's label will contain the following:

Chemical Identification	First Aid
Routes of Exposure	Personal Protective Equipment
Storage Information (code)	Physical Properties
Spill Clean-up Procedures	Hazard Classification
NFPA Code	Health Effects
Target Organs	

2. **S**afety **D**ata **S**heet (**SDS's**)
   Each laboratory worker should consult the Safety Data Sheet file prior to using any chemical for the first time. The SDS for a chemical supplies important information for working with the chemical. The chemical's physical properties, toxicological properties and reactivity data can be used to assess the potential health and safety hazards. The SDS lists appropriate personal safety equipment and spill response procedures. Clearly, it is useful to have this information before working with a substance.

   Employees at Florida Poly must have access to SDS's within the standard work shift period:

8:00 am - 5:00 pm, Monday - Friday. Ideally, each lab will have a file of all MSDS's for the chemicals used in that work area that have an IDLH characteristic.

MSDSOnline - The main software that is used to store and retrieve a Safety Data Sheet.

Every SDS received by your laboratory must have the following information:

- The identity of substance designated on the container label
- Emergency and first aid procedures
- Name, address and phone number of the party responsible for preparing and distributing the SDS.
- Mixtures tested as a whole -- chemical and common names of all ingredients which are health hazards, in concentrations of 1% or greater.
- Mixtures untested as a whole -- chemical and common names of all ingredients which are health hazards, and which are in concentrations of 1% or greater; carcinogens in concentration of 0.1% or greater.
- Physical and chemical characteristics of the hazardous chemicals.
- Physical hazards (potential for fire, explosion, etc.).
- Known acute and chronic health effects and related health information.
- Primary routes of entry into the body.
- Information on exposure limits.
- Whether OSHA, the International Agency for Research on Cancer or the National Toxicology Program considers a hazardous chemical a carcinogen.
- Precautions for safe handling.
- Generally acceptable control measures (engineering controls, work practices, personal protective equipment).

2. FLAMMABLE CHEMICALS

PROPERTIES OF COMMON LABORATORY FLAMMABLE LIQUIDS

CHEMICAL NAME	FLASH POINT ºF	IGNITION TEMP. ºF	FLAMMABILITY LIMITS	
			Lower (%)	Upper (%)
Acetaldehyde	-39	175	4	60
Acetone	-20	465	2	13
Acetonitrile	6	524	3	16
Benzene	-11	498	1	8
Butanol	37	343	1	11

Carbon Disulfide	-30	90	1	50
Cyclohexane	-20	245	1	8
Diethyl Ether	-45	160	2	36
p-Dioxane	12	180	2	22
Ethyl Acetate	-4	426	2	12
Ethyl Alcohol	13	363	3	19
n-Heptane	-4	204	1	7
n-Hexane	-22	223	1	8
Isooctane	4	418	1	4
Isopropyl Alcohol	12	399	2	13
Methyl Alcohol	11	385	6	37
Methyl Ethyl Ketone	-9	404	1	11
Pentane	-40	260	2	8
Petroleum Ether	-18	288	1	6
Styrene	31	490	1	7
Tetrahydrofuran	-14	321	2	12
Toluene	4	480	1	7
p-Xylene	27	528	1	7

IX. ENVIRONMENTAL MONITORING

a) OSHA Requirement

For laboratory uses of chemicals in general and OSHA regulated substances (see below) in particular, the employer shall assure that laboratory employees' exposures to such substances do not exceed the permissible exposure limits specified in Title 29 CFR 1910. Florida Poly must follow "initial monitoring" requirements for each OSHA regulated substance, IF there is reason to believe that exposure levels for that substance exceed the action level or Permissible Exposure Limit. Action Level is defined as an airborne concentration, calculated as an 8-hour average, at which the employer must take corrective action to reduce exposure. Permissible Exposure Limits (PEL) are time- weighted average concentrations that are calculated over either 8-hour periods or 15-minute periods. The 15-minute limit is referred to as the Short-Term Exposure Limit (STEL). The employees must not be exposed to airborne concentrations that exceed these exposure limits. Action levels and Permissible Exposure Limits are specified in 29 CFR 1910.

For work being conducted in a properly functioning fume hood, there is no reason to believe that

exposure levels are in excess of action levels. See below, for a description of possible exposure situations. If initial monitoring reveals that levels are being exceeded, then Florida Poly must follow the requirements of the standard for the particular substance.

b) OSHA Regulated Substances

- OSHA's listing of toxic and reactive highly hazardous substances can be found at **osha.gov/laws-regs/standardnumber/1910/s910.119AppA**

c) Potential Exposure Situations

If engineering controls are in effect, then employee exposure should not occur. For example, if work is conducted within a properly functioning fume hood or glove box, then there is no reason to suspect employee exposure. If, however, it is suspected that the engineering controls are not functioning properly, then monitoring is warranted. Also, if a known exposure, such as a liquid spill or gas leak, has occurred, then monitoring is needed. The employee shall contact their supervisor to arrange employee exposure monitoring.

Again, possible exposure situations are as follows:

Fume Hood Failure
Glove Failure
Glove Box Failure
Chemical Spill
Gas Leak
Explosion or Fire

d) Medical Consultation and Examination

The employer must provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations that the examining physician determines to be necessary, whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory. If an employee encounters a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure, the affected employee must be provided an opportunity for a medical consultation by a licensed physician. All medical examinations and consultations must be performed by or under the direct supervision of a licensed physician and must be provided without cost to the employee, without loss of pay and at a reasonable time and place. The identity of the hazardous chemical, a description of the incident, and any signs and symptoms that the employee may experience must be relayed to the physician. Human Resources will arrange medical monitoring when exposure is suspected. The Laboratory Chemical Hygiene Officer (lab manager), or designee, must contact F&SS in the event of a possible exposure situation.

e) Records

All accident, fatality, illness, injury, and medical records and exposure monitoring records must be retained by the University in accordance with the requirements of state and federal regulations (see 29 CFR part 1904 and 1910.1450(j)). Any exposure monitoring results must be provided to affected laboratory staff within 15 working days after receipt of the results (29 CFR

1910.1450(d)(4)).

X. PERSONAL PROTECTIVE EQUIPMENT: PROCUREMENT AND USE

a) Introduction

According to OSHA, the employer must take steps to correct situations that endanger the health and safety of workers. The most reliable method is to eliminate hazards through engineering controls (e.g. localized exhaust systems to reduce chemical vapors). Administrative controls may also be implemented to reduce exposure (e.g. selection of less toxic substances, limiting the length of time an employee can work with a substance). However, when hazards cannot be controlled by these means, the use of personal protective equipment is required.

b) Classes of Personal Protective Equipment (PPE)

Eye Protection
Gloves
Protective Clothing (lab coat)
Respiratory Protection

c) PPE Procurement:

F&SS will assist you in selecting proper PPE and must give approval prior to purchase.

d) PPE Proper Use:

1. Eye Protection.

   In chemical labs, flying glass, splattering liquids and powder chemical dusts are among the hazards that represent serious accident potential to the eyes. The type of protection required depends on the hazards involved. The available options include safety glasses, splash goggles and face shields. Some notes on the proper use of these options follow:

   i. Safety Glasses are designed for protection from projectile impact and, even with side shields, provide minimal protection from the hazards of the chemical lab.

   ii. Splash Goggles provide considerably more protection from liquid and powder hazards and superior protection from impact. F&SS strongly recommends the use of these goggles, rather than safety glasses, for all employees that work with laboratory chemicals or human body fluids.

   iii. Face Shields should be worn when maximum protection is needed from highly toxic or corrosive materials. These shields are not designed to provide full eye protection and must be used in conjunction with goggles.

   iv. Prescription Safety Glasses should be made available to employees in need by the workers' home departments.

2. Gloves

   If engineering or administrative controls are not possible to reduce exposure, then protective gloves must be worn when there is a potential for skin contact with toxic or corrosive chemicals.

Misuse of gloves in the laboratory is a common problem. The following information may be useful in avoiding misuse.

Because no single type is impermeable to all chemicals, glove material must be selected to match the specific application. Common glove materials are natural rubber, polyvinyl alcohol (PVA), polyvinyl chloride (PVC), nitrile, neoprene, butyl rubber, Silver Shield® and Viton®. Most safety supply catalogues have tables of information on permeation rates and degradation times for various common laboratory chemicals and glove materials. Consider, the glove material thickness, length, fit and cuff style when selecting a type for your particular work. It is often advantageous to select two different types of gloves and wear one pair over the other, thus increasing the range of protection.

Once the appropriate glove type has been selected, it is important that proper procedures are followed during use. Gloves should be inspected prior to use for discoloration, punctures, or tears. Soiled gloves must be removed before leaving the immediate workstation. (Before the worker touches telephones, doorknobs, desk surfaces, etc.)

3. Protective Clothing

Protective clothing is recommended for most types of chemical work in the laboratory.

- Protective clothing is required for work with highly toxic chemicals, biological hazards and carcinogens.
- Protective clothing is designed to prevent vapors, dusts, and toxic or corrosive spills from coming in contact with the skin of the worker.
- Protective clothing should have appropriate resistance factors, be relatively comfortable and allow free movement for the execution of tasks.

To select protective clothing, determine the hazards of the chemicals being used, evaluate the potential for body exposure and determine the degree of protection desired.
The effects of skin contact with chemicals can range from relatively minor diseases like dermatitis, to systemic poisoning, to cancer risk and death.

The list of available products includes lab coats, aprons, disposable garments (Tyvek or PVC coated), chemically resistant splash suits and chemically impervious suits. Product catalogs may be reviewed at F&SS. Information regarding the resistance factors of the available materials may be obtained from the manufacturers' catalogs or from F&SS.

The minimum clothing for work in labs on campus includes closed-toe shoes, long pants, and safety glasses.

XI. RESPIRATORY PROTECTION PROGRAM

According to OSHA regulation 1910.134, the employer must attempt to control occupational illnesses caused by the breathing of air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays or vapors. The primary objective must be to make attempts to prevent atmospheric contamination. This shall be accomplished as far as is feasible by accepted administrative and engineering control measures. For example, enclosure or confinement of the operation, general and local ventilation and substitution of less toxic materials.

Under no circumstances, should employees use respiratory protection without Safety Services approval.

XII. EYE-WASH STATIONS AND DELUGE SHOWERS

Introduction

Suitable eyewash facilities and deluge showers must be available to all chemical laboratories. A University policy has been established to meet the regulatory requirements regarding these safety devices.

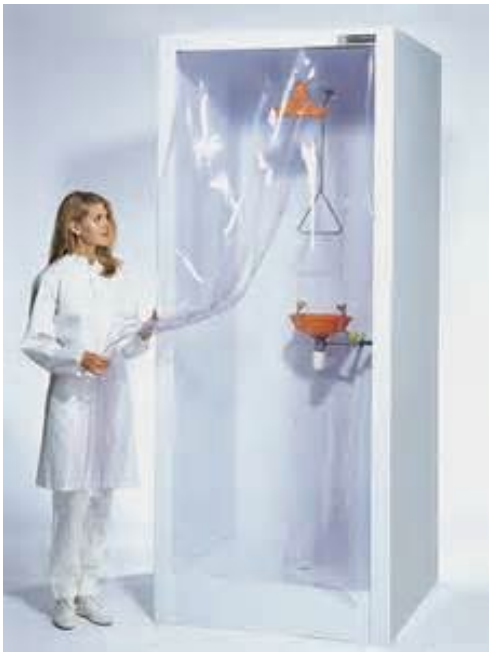
- Employees in a chemical lab must have access to eyewash and safety shower facilities within a distance of 50 unobstructed feet of their work areas. These safety devices are necessary for halting the damage incurred from a chemical splash to the eyes or spill on the body. Deluge showers can also serve an important function in extinguishing clothing fires and cooling burns incurred from laboratory accidents.
- The area around the shower must be kept clear of all storage for a minimum of a 16-inch radius around the showerhead.

Procurement

F&SS must be contacted before any purchase or installation of eye wash fountains or deluge showers. This will ensure that the appropriate types (Which meet the ANSI standard Z3581-1990) are purchased and installed. Call (863) 874-8691 for a consultation.

Maintenance

- In order to prevent rust accumulation and harmful microorganism proliferation in the system, Eyewash stations are to be flushed weekly. This is the responsibility of the Lab Manager.
- The Laboratory Manager will conduct weekly inspections of all eyewash stations and deluge showers. The location, accessibility, flow rate and hygiene will be evaluated.
- If a unit is discovered to be out of service at some point between inspections, the Lab Manager



should contact F&SS.

XIII. FUME HOODS

a) General Information

Laboratory fume hoods are ventilated enclosures, designed to protect laboratory personnel from inhalation exposure to chemical vapors and dusts. In order for a hood to be effective, it must be properly selected, installed and utilized. Some variables that impact the effectiveness of a hood are sash opening height, amount of storage within the hood, air velocity and hood location within the lab. F&SS will assess the air velocity (termed face velocity), proper sash position and storage limitations during certification visits. Lab Managers should consult with F&SS personnel prior to fume hood acquisition, to receive guidance on proper selection, installation and location. Compatibility with the chemical vapors/fumes that are to be used in the hood will also need to be carefully considered.

b) Certification

F&SS arranges for fume hood certification, which includes a general inspection, measurement of air/face velocity and determination of proper sash height positioning.
Certification occurs at the following times:

- Following installation of a hood
- Following any maintenance
- Bi-annually

A hood that has passed will bear the "Hood Certification" sticker, which will indicate the testing date, tester name and average face velocity. The hood will be marked with adhesive arrows that indicate the proper sash height position. See following page, for examples of certification signage. A hood that has failed will be tagged indicating that the hood is not performing adequately, and a work order will be submitted for repair.

XIV. FIRE EXTINGUISHERS

a) General

- Each laboratory shall have an appropriate, functional fire extinguisher.
- The appropriate type should be selected according to materials present within the lab.
- The extinguisher should be mounted at a three to four foot height on the wall.
- Nothing should obstruct the path from the work area to the extinguisher mount. (This means that filing cabinets, etc. cannot block the extinguisher.)

b) Types of Extinguishers.

There are four basic classes of fire. All fire extinguishers are labeled with standard symbols for the classes of fire they can put out. A red slash through any of the symbols indicates that the extinguisher cannot be used on that class of fire. A missing symbol indicates that the extinguisher has not been tested for used on that class of fire.

CLASS	SYMBOL	FIRE TYPE
A	Green Triangle Containing Letter A	Ordinary Combustibles: wood, cloth, paper, rubber, and many plastics
B	Red Square Containing Letter B	Flammable Liquids: (see section VIII for more detail)
C	Blue Circle Containing Letter C	Energized Electrical Equipment: wiring, fuse boxes, circuit breaker panels, appliances.
D	Yellow Five-point Star Containing Letter D	Reactive/Combustible Metals: sodium, potassium, magnesium, etc.

c) Training.

Safety Services offers training on how to properly handle fire extinguisher and use. It is recommended that all laboratory personnel attend this class. To register, contact Safety Services

XV. EMERGENCY RESPONSE

a) Introduction

- It is important that all laboratory employees know proper response procedures to emergency situations.
- It is required that each laboratory have an "emergency contacts" sign posted on the main exterior door.
- This sign shall include the names and phone numbers of the research director, laboratory manager or any other pertinent authority.

b) Emergency Phone Numbers

Emergency Number **..... .....911**
University Police..... (**863) 874-8472 (prompt 2)**
Florida Poly Health Clinic.....(**863) 603-6504 or (863) 603-6505**
Facilities.....(**863) 874-8691**
Safety Services.....**(863) 874-8691**

Clinic Hours of Operation

Medical and nursing services are available in the Florida Poly Health Clinic, Monday through Friday, 1:00 pm to 5:00 pm. Walk-ins are welcome and no appointment is necessary. To speak with a nurse call (863) 603-6504 or (863) 603-6505.

For Health Care services Monday through Friday, 8:00 am to 1:00 pm, as well as Saturday and Sunday, 8:00 am to 5:00 pm, contact Lakeland Regional Gateway Clinic at (863) 284-6900, Ext.

3402. The address is: 2815 Lakeland Hills Blvd., Lakeland, FL 33805.

c) Procedures

1. Injury
   - In the event of injury to laboratory personnel, act immediately, keep calm and assist the injured persons by removing them from the hazard, if necessary.
   - Do not move seriously injured personnel unless they are in danger of further injury.
   - First Aid principles should be applied and, if warranted, the rescue squad should be called (see phone numbers above).
   - When possible, in tending minor injuries, have individuals apply their own bandages.
   - When this is not possible, first responders must don gloves prior to assisting bleeding wounded.
   - Be prepared to give the following information to rescue personnel: nature of injury, location of the victim, identity and hazard of any chemicals involved and your phone number.

2. Chemical Exposure
   - In the event of chemical exposure through inhalation, remove the exposed person from the area to an area with a fresh air source if you can do so without harm to yourself.
   - In cases of exposure through contact with the eyes or skin, immediate use of the eyewash station, sink or deluge shower is in order. Flush the affected area for at least 15 minutes. Remove clothing if necessary. 911 should be called in all cases of contact with the eyes.

3. Fire
   - Always use good judgment. Immediate action of some type is necessary.
   - Immediately alert all personnel in the laboratory.
   - Before attempting to put out a fire, ask these three questions:
     1) Is this fire small enough for me to fight?
     2) Do I know the materials and or chemicals that may be burning in this fire?
     3) Do I have the proper type of extinguisher to fight this fire?

   If you can't answer yes to each of these questions, confine the fire by closing doors and windows call 911 and leave the building. It is important to communicate the exact location of the fire to the fire department, so remain on the scene after evacuation to assist in the process. Part B of this plan shall contain an emergency evacuation route specific to each lab.

4. Chemical Spill

   Minor chemical spills in the laboratory should be cleaned up according to the procedures in Part B of this plan. As required by this plan, each lab will maintain, or have access to, a stock of spill cleanup supplies appropriate to the types of chemicals in the facility. Small amounts of solvents from lab glassware are examples of minor spills that should be manageable for lab personnel. Once the material has been absorbed or neutralized according to procedure, the entire material must be packaged and labeled as hazardous waste. This will then be handled according to the Waste Disposal procedures outlined in

section VII.

Each Department has assigned one person as Lab Manager. This person has been through training and will assist you in planning your spill clean-up approach.

Major chemical spills are defined as those involving chemicals with high associated risk, such as carcinogens or highly toxic materials; or any large quantity (greater than 4L) of a hazardous chemical. **Do not attempt to clean up major hazardous chemical spills**! Evacuate the area and contact the Lab Manager in your department. If there is any question about whether the spill is major or minor, assume the worst and proceed as if it were major, then contact Safety Services.

XVI. SAFETY INSPECTIONS

Safety Services is responsible for conducting safety inspections of all University laboratories, research stations and chemical storage areas. The goal of these inspections is to emulate the audit procedures of the Florida Division of Safety office of the Department of Labor and of the Florida Department of Environmental Protection (DEP). These state agencies enforce compliance with the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency, respectively. By conducting these internal audits, Safety Services hopes to promote compliance with all regulations, thereby protecting University personnel from health hazards and regulatory citations.

These inspection visits also allow Safety Services to monitor compliance with the University Chemical Hygiene Plan and to identify any problems inherent to the plan itself. The following items will be emphasized during the lab visits:

The CHP

- Completed checklist for Part B of the Plan
- A written Emergency Response Plan
- Written Standard Operating Procedures for safety
- Training documentation forms

General Laboratory Practices

- Chemical storage
- Hazardous Waste storage and treatment
- Compressed Gas storage
- General housekeeping
- Presence and condition of safety equipment
- Presence and condition of fume hoods
- Special chemical problems and/or hazards

FLORIDA POLYTECHNIC UNIVERSITY

FACILITIES & SAFETY SERVICES

4700 Research Way ● Lakeland, FL., 33199 ● Tel (863)874-8722 ● Fax (863)874-3574 ● http://www.floridapoly.edu

Laboratory Safety Inspection Checklist

☐ **Annual** ☐ **Quarterly**

Note: Items checked No (not in compliance with safety regulations and standard practices) must be corrected within 30 days from the date of inspection, or as otherwise specifically noted in the comments section.

Department: _____ **Bldg/Room:** _____ **Inspection Date:** _____

Principal Investigator or Lab Manager: _____

	Yes	No	NA	GENERAL
1.	☐	☐	☐	The entrance door is labeled with the names & telephone numbers of the PI/Lab Manager & alternates.
2.	☐	☐	☐	P.I./Lab Manager confirms that all personnel have been appropriately trained.
3.	☐	☐	☐	Laboratory personnel training records are available for inspection.
4.	☐	☐	☐	The FPU Laboratory Safety Manual is accessible.
5.	☐	☐	☐	The chemical inventory is current and accessible.
6.	☐	☐	☐	MSDS or SDS are accessible.
7.	☐	☐	☐	Hydrostatic testing & records for pressurized vessels are available for review.
8.	☐	☐	☐	Signage is appropriate (biohazard, corrosive, carcinogen, flammable, controlled access, etc.)
9.	☐	☐	☐	Proper and separate containers are available for disposal of broken glass, sharps, and biohaz. materials.
10.	☐	☐	☐	Lab is free of evidence of food and drink consumption.
11.	☐	☐	☐	Refrigerator storage is labeled for contents (chemical/sample).
12.	☐	☐	☐	Refrigerators used for flammable storage are explosion-proof.
13.	☐	☐	☐	Employees are wearing the appropriate personal protective equipment.
14.	☐	☐	☐	Personal protective equipment available and in good condition.
15.	☐	☐	☐	Users of lasers are provided with the appropriate eye protection.
16.	☐	☐	☐	Flexible tubing is in good condition (no cracks, cuts, holes) and tightly secured to equipment.
17.	☐	☐	☐	Flexible neoprene tubing used for gas burners is in good condition. (as above)
18.	☐	☐	☐	Safety shower(s) are available/accessible and show current inspection tags.
19.	☐	☐	☐	Eyewash station(s) are available/accessible and show current inspection tags.
20.	☐	☐	☐	Lab is free of tripping/slipping hazards.
21.	☐	☐	☐	Area is adequately lit.
22.	☐	☐	☐	Work area is clean and uncluttered.
23.	☐	☐	☐	Protection from existing or potential extreme temperature hazards is adequate.
24.	☐	☐	☐	Noise levels from equipment are moderate enough to allow communication.
25.	☐	☐	☐	Laboratory safety rules are clearly posted.
	Yes	No	NA	**LOCAL VENTILATION (HOODS, BIOLOGICAL SAFETY CABINETS, ETC)**
1.	☐	☐	☐	Hoods show proof of inspection within the last 12 months or in accordance with stated frequency.
2.	☐	☐	☐	Hoods are clear of excessive storage.
3.	☐	☐	☐	Hood valves are working properly.
4.	☐	☐	☐	Biosafety cabinets show proof of inspection & certification within the last 12 months.
5.	☐	☐	☐	Biosafety cabinets are clear of excessive storage.
6.	☐	☐	☐	Local exhaust is provided for slot hoods, canopy hoods for autoclaves/atomic absorption units, etc.
7.	☐	☐	☐	Local exhaust hoods are marked with approved threshold values for optimal efficiency.
8.	☐	☐	☐	Lab is operating under negative pressure relative to general use areas.
	Yes	No	NA	**GASES**
1.	☐	☐	☐	All gas cylinders are properly secured in an upright position.
2.	☐	☐	☐	Gas cylinders that are not currently in use are capped and properly secured.
3.	☐	☐	☐	Cylinders are clearly labeled.
4.	☐	☐	☐	Leak test routinely performed on cylinders.
5.	☐	☐	☐	Tubing is tightly connected to equipment.
6.	☐	☐	☐	Only cylinders currently needed are located in the lab.
7.	☐	☐	☐	Empty cylinders are separated from full cylinders.
8.	☐	☐	☐	Cylinders are stored away from doors and emergency exits.
9.	☐	☐	☐	Emergency gas shut-off valves are accessible and clearly labeled.

SPECIAL ISSUES REQUIRING CORRECTIVE ACTION/COMMENTS:

	Yes	No	NA	HAZARDOUS WASTE
1.	☐	☐	☐	Hazardous waste containers are properly labeled as HAZARDOUS WASTE.
2.	☐	☐	☐	Hazardous waste labels identify waste, type of hazard and accumulation start date.
3.	☐	☐	☐	Signs are posted regarding discarding wastes.
4.	☐	☐	☐	Hazardous waste manifests for the last three years are available for inspection.
5.	☐	☐	☐	Waste containers are kept closed when not in use.
6.	☐	☐	☐	Waste is compatible with the container.
7.	☐	☐	☐	Secondary containment is provided for waste.
8.	☐	☐	☐	Only compatible wastes are being stored next to each other.
9.	☐	☐	☐	Incompatible wastes are separated from each other by separate secondary containment.
10.	☐	☐	☐	Bottles are filled to a safe level.
11.	☐	☐	☐	Integrity of storage containers is intact.
12.	☐	☐	☐	Containers are clean on the outside.
13.	☐	☐	☐	Accumulation period is within acceptable time period.
14.	☐	☐	☐	Stickers restricting chemical discharge are displayed by sinks.
	Yes	No	NA	**CHEMICALS**
1.	☐	☐	☐	Chemicals are stored in appropriate containers.
2.	☐	☐	☐	Chemical containers are properly labeled.
3.	☐	☐	☐	Chemicals are stored according to classification (not alphabetically).
4.	☐	☐	☐	Flammable liquids are properly stored - volume is appropriate to the type of lab per NFPA 45.
5.	☐	☐	☐	Chemical carcinogens are clearly labeled as such.
6.	☐	☐	☐	Peroxidizable compounds are dated to show when received and opened.
7.	☐	☐	☐	Peroxidizable compounds are checked for peroxides or disposed of at least every 6 months.
8.	☐	☐	☐	Waste minimization practices implemented.
9.	☐	☐	☐	Emergency spill response supplies are available and appropriate to the type of materials handled.
	Yes	No	NA	**FIRE**
1.	☐	☐	☐	Aisle/corridors are in compliance with Fire Code requirements (minimum 30" clearance).
2.	☐	☐	☐	Lab fire doors comply with Life Safety Code requirements (identifiable as fire doors, close properly,
3.	☐	☐	☐	Flammable materials and gas cylinders stored at least 48" from the exits (fume hoods, flam. storage
4.	☐	☐	☐	Fire extinguisher(s) of proper class (Class "BC" [CO_2or Halon] for electrical and flammable liquid.
5.	☐	☐	☐	Fire extinguisher(s) of proper class (Class "ABC" [dry chemical] for general protection) are present.
6.	☐	☐	☐	Fire extinguisher mounted on wall or in cabinet.
7.	☐	☐	☐	Fire extinguishers are easily accessible & unobstructed.
8.	☐	☐	☐	Fire extinguisher mounted: Floor to Bottom - No less than 4"/Floor to Top - No greater than 5'.
9.	☐	☐	☐	Sprinklers – Not obstructed, painted, dusty or being used to suspend items from the ceiling.
10.	☐	☐	☐	Penetrations in the walls, floor or ceiling are properly sealed to provide fire and/or smoke containment.
11.	☐	☐	☐	Fire alarm devices (horns, strobes, detectors, pull stations) unobstructed.
	Yes	No	NA	**EQUIPMENT**
1.	☐	☐	☐	Telephone is readily accessible for emergency use.
2.	☐	☐	☐	Emergency procedures are available or posted (Radiation Safety, Spill, Biohazard).
3.	☐	☐	☐	Emergency shut down procedures available and posted.
4.	☐	☐	☐	Local utility emergency shutoffs labeled, operating and accessible.
5.	☐	☐	☐	Equipment with moveable parts and belts are guarded with screens having less than ¼" opening.
	Yes	No	NA	**ELECTRICAL**
1.	☐	☐	☐	There is a 36" area clearance around electrical control panels.
2.	☐	☐	☐	Breakers properly labeled for current circuit assignments.
3.	☐	☐	☐	Heat generating devices (water baths, refrigerators, etc.) plugged directly into outlets-No extension cords.
4.	☐	☐	☐	Electrical cords are free of visible defects (no bare wires, frayed wires).
5.	☐	☐	☐	Prongs fit snugly in the outlet.
6.	☐	☐	☐	Receptacles in good condition (no cracks or chips present), face plates in place.
7.	☐	☐	☐	Flammable liquids stored more than 36" from electrical equipment.
8.	☐	☐	☐	Cords away from doors, walkways and metal furniture.
9.	☐	☐	☐	Temporary power devices are UL listed (less than 6 feet in length, 3 prong plug, no cheater plugs).
10.	☐	☐	☐	Electrical outlets are at least 6' away from sink border (GFCI type within 6').
	Yes	No	NA	**BIOLOGICAL SAFETY**
1.	☐	☐	☐	Biohazardous signs are posted.
2.	☐	☐	☐	Employees subject to the BBP Regulation have attended training within the last 12 months.
3.	☐	☐	☐	Employees subject to the BBP Regulation have received the Hepatitis B vaccine or have signed declination statement available on file for review.
4.	☐	☐	☐	Employees subject to the BBP Regulation are familiar with the Exposure Control Plan for the Dept.
5.	☐	☐	☐	Biohazardous waste containers are properly labeled.
6.	☐	☐	☐	Needles and sharps are properly disposed of in puncture resistant, leak-proof containers.
7.	☐	☐	☐	Biohazardous waste is disposed of properly - manifests are available for inspection.
				SPECIAL ISSUES REQUIRING CORRECTIVE ACTION/COMMENTS:

Safety Inspector: _____ **Date:** ___ / ___ / _____

Inspection Report was provided to: _____

XVII. REFERENCES

Literature Available at F&SS:

CRC Handbook of Laboratory Safety: 4th Edition
A. Keith Furr; Boca Raton, Florida; (CRC Publishers, 1995)

Flammable and Combustible Liquids Code Handbook
National Fire Protection Association; (NFPA No. SPP-58, 1981).

Fundamentals of Industrial Hygiene, Third Edition
National Safety Council; Barbara A. Plog, ed; Chicago; (NSC, 1988).

NIOSH Pocket Guide to Chemical Hazards
U.S. Department of Health and Human Services; (Superintendent of Documents, 9/10); Public Health Service; National Institute for Occupational Safety and Health.

Prudent Practices for Handling Hazardous Chemicals in Laboratories
National Research Council; Washington, D.C.; (National Academy Press, 1995).

Sixth Annual Report on Carcinogens, 1991 Summary
U.S. Department of Health and Human Services; (Superintendent of Documents, 1991); Public Health Service; National Toxicology Program.

XVIII. AVAILABLE CLASSES

Safety Services offers the following online safety courses, contact them to arrange access.

Bloodborne Pathogens (60 minutes)
Content: bloodborne diseases, occupational exposure risks, exposure control measures, vaccination program and accident reporting procedures. This is designed to meet training requirements of the OSHA Bloodborne Pathogens standard. Employees exposed to human body fluids must attend.

Confined Space Entry - Awareness Level (30 minutes)
Content: An overview of what is meant by "confined spaces", why these spaces may be hazardous to persons that need to enter them and the procedures that are used to enter them safely.

Ergonomics (60 minutes)
Content: How to reduce repetitive motion injuries and physiologic stressors in an office environment.

Fire Extinguisher Training (30 minutes)
Content: What causes building fires and what occupants can do to reduce fire hazards; how to

respond to a fire-related emergency; when and how to properly use fire extinguishers.

Hazard Communication (30 minutes)
Content: safety data sheet use, container labeling, regulatory requirements.

Hazardous and Infectious Waste (60 minutes)
Content: packaging, transporting and disposing of laboratory chemicals and infectious waste.

Hearing Conservation (60 minutes)
Designed for people enrolled in the Hearing Conservation Program. Contents: effects of noise, how noise is measured, hearing protection, hearing tests, OSHA requirements

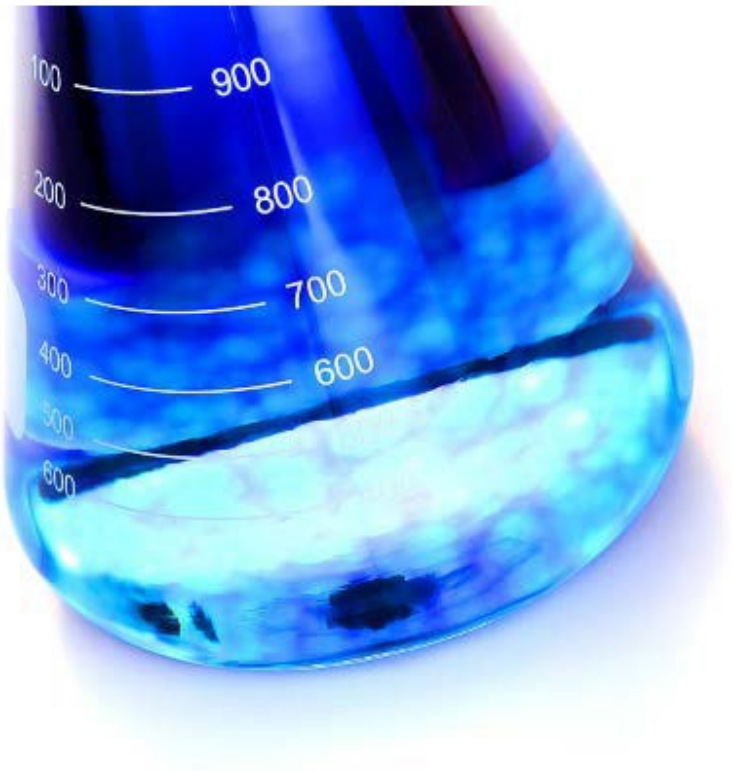
Hot Work Permit System (Worker Level, 30 minutes; Supervisor Level, 2 hours) Lab Safety (2 hours)
Contents: Chemical Hygiene Plan, University inspection checklist, general laboratory safety, proper fume hood use, biohazard exposure prevention.

Radiation Safety Awareness (60 minutes)
Contents: what radiation is, history of radiation use, potential risks, examples of sources, dose reduction, radiation uses at the University, general safe work practices.

PART B:

LABORATORY-SPECIFIC

POLICIES AND PROCEDURES



PURPOSE:

1. To outline procedures for safety and chemical hygiene that are specific to each laboratory or facility.

2. To compile all documentation in a single manual.

I. INTRODUCTION

This is the "laboratory specific" part of the Chemical Hygiene Plan. Each section requires documentation to be written or inserted in the binder. It is the responsibility of the Laboratory Chemical Hygiene Officer (Lab Manager) to compile and insert this information. F&SS will verify the completeness of this section during its inspection visit.

Principal Investigator:

Name:_____ Office #:_____ Phone:_____

Laboratory Manager (if different from above):

Name: _____

Title: _____

Work "Address": _____ _____
Building Room #

Work Phone Number: _____

II. CHECKLIST

Laboratory Manager: Place a check beside each line item after you have incorporated all required information into that section of Part B.

____ Evacuation Route

____ Spill Cleanup Information

____ Safety Data Sheet (MSDSonline)

____ Standard Operating Procedures

____ Training Documentation

III. SUMMARY OF DUTIES

Principal Investigator & Lab Manager:

1. Read Part A of the CHP.

2. Compile all information listed on the "Checklist" (Part B, section I) and insert in binder.

3. Review and update the inserted information on annual basis.

4. Present the CHP binder (after inserting your information) to personnel in your lab and ask them to read it and become familiar with the "Required Reading" sections. Do this at the following times:

   * Whenever a new revision of Part A is received from F&SS
   * Whenever a new person is assigned to the lab

5. Training Documentation:

   A. Remove and photocopy the "Training Documentation" form.
   B. Ask each employee to sign a copy after reading the CHP manual.
   C. File all signed and blank forms in the CHP binder.

   Note: Since the OSHA Lab Standard applies to every paid employee (Grad student, post-Doc, paid work-study or other wage or salaried personnel) in the laboratory, everyone must have read and signed off on the Chemical Hygiene Plan.

6. Write, or assign someone to write, safety Standard Operating Procedures (S.O.P.s) for any procedures in your lab that are not adequately addressed in Part A of the CHP. Insert these in the binder.

Laboratory Workers:

1. Read, at a minimum, all parts of the CHP that are listed on the "Training Documentation" form.

2. Check off all sections from the "Required Reading List", after reading them.

3. Sign the "Training Documentation" form.

4. Abide by all policies and procedures described in Parts A and B of the University Chemical Hygiene Plan.

IV. EMERGENCY RESPONSE

Map of Evacuation Route:

Produce a map that details the building/floor where your facility is located. Highlight the route a person would take to leave the lab in an emergency and exit the nearest emergency door. Attach that map behind this page.

Spill Cleanup Information:

Each laboratory must have ready access to supplies appropriate to cleaning up any chemicals found in that lab. Chemical spill cleanup materials can be purchased from most scientific and safety supply

vendors. A typical stock for a lab might include:

Mercury
Absorb Sponges
Sorbents (appropriate for your lab)
Neutralizers

Accident/ Injuries Reporting Information:

Call 911 during a life threating emergency; all other injuries call **AmeriSys** at **800-455-2079** (available 24 hours) to report a worker's compensation claim. Report all injuries, however minor, to Human Resources and F&SS.

The Florida Poly Main Campus location # is: 0272

Florida Industrial and Phosphate Research Institute location #: 0273

Principal Investigator/ Laboratory Manager, fill in the blanks: Spill cleanup supplies are located:

_____

Types available:

_____

Usage Information:

_____

_____

_____

_____

V. SAFETY DATA SHEETS (SDS's)

On the bottom of this page, write information on how to locate the SDS's for the chemicals in your laboratory. For small labs, a binder containing the SDS's should be kept in a central location near this document. For large labs, a departmental file might be accessed. If so, give detailed information about the location of this file. Alternatively, F&SS has provided an MSDSOnline as a resource to view your SDS's electronically. In this case, list the appropriate phone numbers and procedures.
SDS's for our chemicals can be found: (check one)

___ In this laboratory, located _____

__ In the departmental file, located _____

__ At the F&SS Office: _____

__ On personal computer, located _____

VI. STANDARD OPERATING PROCEDURES (SOP)

- You must attach Standard Operating Procedures (SOP) in this section.
- Write SOP's for any hazardous procedures or uses of extremely hazardous material that apply to your lab unless the information overlaps with the General Standard Operating Procedures in Part A.
- These specific SOP's are only needed to describe protocol in using equipment or materials that pose unique hazards.
- Labs that contain laser equipment should write an SOP for the safe use of that equipment.
- Labs that use radioactive materials, biohazards or reproductive toxins should write SOP's for the safe use of these materials. SOP's for working with the above mentioned hazards might include provisions for establishing a "designated work area", for using containment devices and for decontamination.

The SOP's should be written according to the following outline:

A) Title
B) Purpose
C) Responsibility & Accountability
D) Equipment and/or hazards involved
E) Personal Protective Equipment & Engineering Controls
F) Procedure
G) Emergency Procedure (including spill cleanup if applicable)
   a. Emergency contact names & phone numbers
   b. Communications during an emergency—what to expect, how to report, where to call or look for information;
   c. Decontamination of Spill Procedures
   d. Accident/Injury Procedure & Reporting
   e. Location of AED fire blankets, first-aid equipment, fire alarms and telephones are available and accessible
   f. Emergency Shutdown procedures - equipment shutdown and materials that should be stored safely;
   g. How and when to use a fire extinguisher
H) Contingency plans. All laboratories should have long-term contingency plans in place (e.g., for pandemics). Scheduling, workload, utilities and alternate work sites may need to be considered.
I) Hazardous Waste Disposal Procedure
J) Laboratory Security
   a. Loss or release of sensitive information; and

b. Prevention of theft or diversion of chemicals, biologicals and radioactive or proprietary materials, mission-critical or high-value equipment;

K) Revision Dates and Approval

L) Attachments:

- Risk Assessment/ Job Safety Assessment conducted by F&SS and Principal Investigator

Please include pictures of the equipment and map of evacuation routes.

VII. TRAINING DOCUMENTATION

Retain a copy of this form and have each employee in your laboratory/facility sign it.

I have received information and training on the subject of Chemical Hygiene, including the following:

☐ I have read the Chemical Hygiene Plan for Florida Polytechnic University and my laboratory Standard Operating Procedures (Parts A & B).

☐ I have been given the opportunity to read the OSHA Lab Standard 1910.1450.

☐ I have been instructed on how to locate important reference materials, such as those containing hazard information about chemicals, permissible exposure limits and hygiene practices.

☐ I know how to access MSDSOnline to locate Safety Data Sheets.

I am/This is: (check one)

____ New employee/ Student/ Volunteer

____ New task

____ Annual review of the revised edition of the CHP

Date: _____

Print Name: _____

Signature: _____

Signature of Principal Investigator or authorized representative:_____

Lab Worker:

Name: _____

Position: _____

Required Reading: (Place an initial beside the sections that you have read)

PART A

____ "IV: Chemical Procurement Procedures"
(Required for those who place chemical orders)

____ "V: Working With Chemicals"

____ "VI: Chemical Storage"

____ "VII: Disposal of Chemical Waste"

____ "VIII: Hazard Identification"

____ "IX: Environmental Monitoring"

____ "XI: Personal Protective Equipment"

____ "XV: Emergency Response"

PART B

____ All Sections

I certify that I have been provided a copy of the Chemical Hygiene Plan and that I read the above sections of Part A and all of Part B:

_____ _____
Signature Date