FACILITIES & SAFETY SERVICES

Chemical Hygiene Plan

for

Florida Polytechnic University

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PART A:

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) 874-8426.

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. 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 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 Lab Standard requires 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 shown 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 12.16.14

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 or low value speed purchase order. F&SS receives copies of all orders and reviews them for potential problems. If a problem exists, F&SS will contact the purchaser and attempt to find resolution.

b) Quantity

To reduce waste disposal costs and minimize storage in overcrowded 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.

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

Whoever is 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.
- Plan positioning of equipment before beginning any new operation.

c) Housekeeping

- Work areas must be kept clean and orderly.
- 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:

1. No food and drinks in the laboratory.
2. Chemicals and chemical equipment must not be allowed in this area.
3. Laboratory glassware must never be used to store or serve food or beverages.
4. The storage, handling and consumption of food is prohibited in certain high-risk laboratories such as carcinogenic research labs, level III biological labs and labs containing highly toxic compounds.
5. 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". 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 a department stockroom (if possible) or disposed of through proper channels (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.
- 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

Stock quantities of carcinogens must be stored in a designated area that is posted with the appropriate warning sign. For example, a benzene storage area must be marked:

DANGER
BENZENE
CANCER HAZARD
AUTHORIZED PERSONNEL USE ONLY

d) Highly Toxic Chemicals

- Chemicals that are labeled as "highly toxic", or 4 on the NFPA Health Scale (See section VIII-3 for explanation), should be stored away from fire hazards, heat, moisture and isolated from corrosives and reactive chemicals.
- Special care should be taken to ensure that toxic chemicals are not released into the environment.
- Access to the storage area for highly toxic substances should be restricted and secured.
- Highly toxic chemicals should be stored in unbreakable containers.
- Cylinders of highly toxic gas should be stored in fume hoods.

e) Corrosives

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

f) 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 grounded and bonded together, by a suitable conductor to prevent static sparks.

g) Compressed Gases

- Cylinders must be stored in a secure, upright position with the valves closed and the protective cap in place.
- Cylinders should 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 should 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.

h) Incompatible Chemicals

Separate storage areas should be provided for chemicals that may react to each other and create a hazardous condition because of this reaction. The following table lists chemical classes and denotes incompatible combinations. Also included is a list of common chemicals in these classes.

Table 1: INCOMPATIBILITY CHEMICAL CLASSES (With specific listing)

Group 1: Inorganic Acids	
Chlorosulfonic acid	Nitric acid
Hydrochloric acid (aqueous)	Oleum
Hydrofluoric acid (aqueous)	Phosphoric acid
Hydrogen chloride (anhydrous)	Sulfuric acid
Hydrogen fluoride (anhydrous)	

Group 2: Organic Acids	
Acetic acid	Propionic acid
Butyric acid (n-)	Rosin oil
Formic acid	Tall oil

Group 3: Caustics	
Caustic potash solution	Caustic soda solution

Table 1: INCOMPATIBILITY CHEMICAL CLASSES (With specific listing) continued

Group 4: Amines & Alkanolamines	
Aminoethylethanolamine	Pyridine
Aniline	Triethanolamine
Diethanolamine	Trietylamine
Diethylamine	Dimethylamine
Diethylenetriamine	Ethylenediamine
Diisopropanolamine	Hexamethylenediamine
2-Methyl-5-ethylpyridine	Hexamethylenetetramine
Monoethanolamine	Triethylenetetramine
Monoisopropanolamine	Trimethylamine
Morpholine	

Group 5: Halogenated Compounds	
Allyl chloride	Dichloropropane
Carbon tetrachloride	Ethyl chloride
Chlorobenzene	Ethylene dibromide
Chloroform	Ethylene dichloride
Chlorohydrins, crude	1,1,1-Trichloroethane
Dichlorobenzene	Trichloroethylene
Dichlorodifluoromethane	Trichlorofluoromethane
Dichlorethyl ether	

Group 6: Alcohols, Glycols & Glycol Ethers	
Allyl alcohol	2-Ethylbutyl alcohol
Amyl alcohol	2-Ethylhexyl alcohol
1,4-Butanediol	Ethylene glycol
Butyl alcohols	Furfuryl alcohol
Butylene glycol	Glycerine
Corn syrup	Heptanol
Cyclohexyl alcohol	Hexanol
Decyl alcohols	Nonanol
Dextrose solution	Octanol
Diacetone alcohol	Polypropylene glycol methyl ether
Diethylene glycol	Propyl alcohols
Diisobutyl carbinol	Propylene glycol
Dipropylene glycol	Sorbitol
Dodecanol	Triethylene glycol
Ethyl alcohol	Undecanol
Ethyl butanol	

Table 1: INCOMPATIBILITY CHEMICAL CLASSES (With specific listing) continued

Group 7: Aldehydes	
Acetaldehyde	Hexamethylenetetramine
Acrolein (inhibited)	Isoctyl aldehyde
Butyraldehyde	Methyl butyraldehyde
Crotonaldehyde	Methyl formal
Decaldehyde	Propionaldehyde
Formaldehyde Solution	Valeraldehyde
Furfural	

Group 8: Ketones	
Acetone	Diisobutyl ketone
Acetophenone	Isophorone
Camphor oil	Mesityl oxide
Cyclohexanone	

Group 9: Saturated Hydrocarbons	
Butane	Paraffines
Cyclohexane	Pentane
Ethane	Petrolatum
Heptane	Petroleum
Hexanes	Ether
Isobutane	Propane
Methane	Propylene butylene polymer
Nonane	

Group 10: Aromatic Hydrocarbons	
Benzene	Ethyl benzene
Cumene	Naphthalene
Coal tar pitch	Toluene
Diethylbenzene	Triethyl benzene
Dodecyl benzene	Xylene

Group 11: Olefins	
Butylene	Nonene
1-Decene	1-Octene
Dicyclopentadiene	1-Pentene
Ethylene	Polybutene
1-Heptene	Propylene
1-Hexene	Propylene butylene polymer
Isobutylene	

Group 12: Petroleum Oils	
Asphalt	Jet Fuels
Gasolines	

Group 13: Esters	
Amyl acetate	Ethyl acetate
Amyl tallate	Ethyl diacetate
Butyl acetates	Glycol diacetate
Butyl benzyl phthalate	Methyl acetate
Castor oil	Methyl amyl acetate
Cottonseed oil	Propyl acetates
Croton oil	Resin oil
Dibutyl phthalate	Tanner's oil
Epoxidized vegetable oils	Wax, carnauba

Group 14: Monomers & Polymerized Esters	
Acrylic acid	Propiolactone
Acrylonitrile	Styrene
Butadiene	Vinyl acetate
Butyl acrylate	Vinyl chloride
Ethyl acrylate	Vinylidene chloride
Isoprene	Vinyl toluene
Methyl acrylate	

Group 15: Phenols	
Carbolic oil	Nonylphenol
Creosote, coal tar	Phenol
Cresols	

Group 16: Alkylene Oxides	
Ethylene oxide	Propylene oxide

Group 17: Cyanohydrins	
Acetone cyanohydrin	Ethylene cyanohydrin

Group 18: Nitriles	
Acetonitrile	Adiponitrile

Group 19: Ammonia	
Ammonium hydroxide	

Group 20: Halogens	
Bromine	Chlorine

Group 21: Ethers	
Diethyl ether (ethyl ether)	Isoprophyl ether
1, 4-Dioxane	Tetrahydrofuran

Group 22: Phosphorous, elemental

Group 23: Sulfur, molten

Group 24: Acid anhydride	
Acetic anhydride	Propionic anhydride

Table 2: EXAMPLES OF INCOMPATIBLE CHEMICALS (from "Safety in Academic Chemistry Laboratories", American Chemical Society)

Chemical	Is Incompatible With
Acetic acid	Chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates
Acetylene	Chlorine, bromine, copper, fluorine, silver, mercury
Acetone	Concentrated nitric and sulfuric acid mixtures
Alkali and alkaline earth metals (such as powdered aluminum or magnesium, calcium, lithium, sodium, potassium)	Water, carbon tetrachloride or other chlorinated hydrocarbons, carbon dioxide, halogens
Ammonia (anhydrous)	Mercury (in manometers, for example), chlorine, calcium hypochlorite, iodine, bromine, hydrofluoric acid (anhydrous)
Ammonium nitrate	Acids, powdered metals, flammable liquids, chlorates, nitrites, sulfur, finely divided organic combustible materials
Aniline	Nitric acid, hydrogen peroxide
Arsenical materials	Any reducing agent
Azides	Acids
Bromine	See chlorine
Calcium oxide	Water
Carbon (activated)	Calcium hypochlorite, all oxidizing agents
Carbon tetrachloride	Sodium
Chlorates	Ammonium salts, acids, powdered metals, sulfur, finely divided organic or combustible materials
Chromic acid and chromium	Acetic acid, naphthalene, camphor, glycerol, alcohol, flammable liquids in general
Chlorine	Ammonia, acetylene, butadiene, butane, methane, propane (or other petroleum gases), hydrogen, sodium carbide, benzene, finely divided metals, turpentine
Chlorine dioxide	Ammonia, methane, phosphine, hydrogen sulfide
Copper	Acetylene, hydrogen peroxide
Cumene hydroperoxide	Acids (organic or inorganic)
Cyanides	Acids
Flammable liquids	Ammonium nitrate, chromic acid, hydrogen peroxide,
Fluorine	All other chemicals

Chemical	Is Incompatible With
Hydrocarbons (such as butane,propane, benzene)	Fluorine, chlorine, bromine, chromic acid, sodium peroxide
Hydrocyanic acid	Nitric acid, alkali
Hydrofluoric acid anhydrous)	Ammonia (aqueous or anhydrous)
Hydrogen peroxide	Copper, chromium, iron, most metals or their salts, alcohols, acetone, organic materials, aniline, nitromethane, combustible materials
Hydrogen sulfide	Fuming nitric acid, oxidizing gases
Hypochlorites	Acids, activated carbon
Iodine	Acetylene, ammonia (aqueous or anhydrous), hydrogen
Mercury	Acetylene, fulminic acid, ammonia
Nitrates	Sulfuric acid
Nitric acid (concentrated)	Acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulfide, flammable liquids, flammable gases, copper, brass, any heavy metals
Nitrites	Acids
Nitroparaffins	Inorganic bases, amines
Oxalic acid	Silver, mercury
Oxygen	Oils, grease, hydrogen: flammable liquids, solids or gases
Perchloric acid	Acetic anhydride, bismuth and its alloys, alcohol, paper, wood, grease, oils
Peroxides, organic	Acids (organic or mineral), avoid friction, store cold
Phosphorus (white)	Air, oxygen, alkalies, reducing agents
Potassium	Carbon tetrachloride, carbon dioxide, water
Potassium chlorate	Sulfuric and other acids
Potassium perchlorate (see also chlorates)	Sulfuric and other acids
Potassium permanganate	Glycerol, ethylene glycol, benzaldehyde, sulfuric acid

Chemical	Is Incompatible With
Selenides	Reducing agents
Silver	Acetylene, oxalic acid, tartaric acid, ammonium compounds, fulminic acid
Sodium	Carbon tetrachloride, carbon dioxide, water
Sodium nitrite	Ammonium nitrate and other ammonium salts
Sodium peroxide	Ethyl or methyl alcohol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerin, ethylene glycol, ethyl acetate, methyl acetate, furfural
Sulfides	Acids
Sulfuric acid	Potassium chlorate, potassium perchlorate, potassium permanganate (similar compounds of light metals, such as sodium, lithium)
Tellurides	Reducing agents

VII. DISPOSAL OF CHEMICAL WASTE

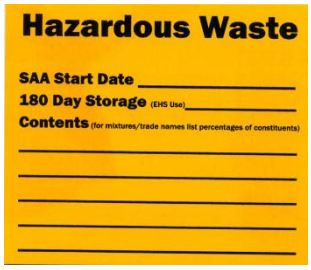
All chemical waste must be disposed of through Facilities and Safety Services according to the following procedures.

A) Waste Packing Requirements.

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

B) Waste Labeling Requirements.

1. Each waste container or lab pack must have a University waste label attached.
2. Labels can be obtained from F&SS.
3. Information on label forms must be complete.
4. Each chemical component in the waste container must be identified by NAME, not formula, nickname, acronym or structure.
5. The approximate percentage of each component must be listed.
6. Containers must be labeled with the accumulation start date.
7. 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 F&SS.
- When transporting wastes in-house, make sure that incompatibles are not transported together. (See Tables 1 and 2 outlining incompatible classes and chemicals on pages 11-18)

- 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.
- F&SS 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. 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. These are extremely important: Failure to follow the rules may result in citations and/or fines!

1. 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:
   a. Write the date the limit was exceeded on container.
   b. Write the words "Hazardous Waste" on the container.
   c. Call F&SS immediately to arrange for disposal.

2. 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 the F&SS.

3. Containers must be in good condition.

4. Container material must be compatible with the waste it contains.

5. 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 and makes representatives of the FDEP and EPA very upset. Don't do it.

6. The label's list of contents MUST be updated whenever waste is added!!

Table 3: P-LISTED WASTES

acetaldehyde, chloro	aziridine	endothall
1,2,3-propanetriol, trinitrate (R)	barium cyanide	endrin
1,2-benzenediol,	benzenamine, 4-chloro-	endrin and metabolites
1,2-propylenimine	benzenamine, 4-nitro-	epinephrine
(o-chlorophenyl)thiourea	benzene, (chloromethyl)-	ethanedinitrile
1-acetyl-2-thiourea	benzeneethanamine, alpha,	ethanimidothioic acid
2,4-dinitrophenol	benzenethiol	ethyl cyanide
2-cyclohexyl-4,6-dinitrophenol	benzyl chloride	ethyleneimine
2-methyllactonitrile	beryllium dust	famphur
2-propenal	bis(chloromethyl) ether	fluorine
2-propyn-1-ol	bromoacetone	fluoroacetamide
2H-1-benzopyran-2-one, 4-hydroxy-3-(3- oxo-1-	brucine	fluoroacetic acid, sodium salt
3-chloropropionitrile	calcium cyanide	fulminic acid, mercury (2+) salt (R,T)
4,6-dinitro-o-cresol and salts	carbon bisulfide	heptachlor
4-alpha-aminopyridine	carbon disulfide	hexaethyl tetraphosphate
4-pyridinamine	carbonic dichloride	hydrazine, methyl-
(aminomethyl)-3-isozazolol	chloroacetaldehyde	hydrazinecarbothioamide
7-oxabicyclo(2.2.1)heptane-2,3 dicarboxylic acid	chloroaniline, p-	hydrocyanic acid
a,a-dimethylphenethylamine	copper cyanide	hydrogen cyanide
acetamide, 2-fluoro-	copper cyanide Cu (CN)	potassium silver cyanide
acetamide, N-	cyanides (soluble cyanide salts)	propanal, 2-methyl-2-(methylthio)
acetic acid, fluoro-, sodium salt	cyanogen	propanenitrile, 2-hydroxy-2-methyl-
acetimidic acid, N-((methylcarbamoyl)oxy)thio-, methly ester	cyanogen chloride	propanenitrile, 3-chloro-
acrolein	dichloromethyl ether	pyridine, 3-(1-methyl-2-pyrrolidinyl)-
aldicarb	dichlorophenylarsine	selenious acid, dithallium(1+) salt
aldrin	dieldrin	selenourea
allyl alcohol	diethyl-p-nitrophenyl phosphate	silver cyanide
alpha-naphthylthiourea	diethylarsine	silver cyanide Ag(CN)
aluminum phosphide (R,T)	diisopropylfluorophosphate	strontium sulfide SrS
ammonium picrate (R)	dimthoate	Strychnidin and salts
ammonium vanadate	dinoseb	sulfuric acid, dithallium (1+) salt
arsenic acid	diphosphoramide, octamethyl-	tetraethyl lead
arsenic oxide	diphosphoric acid, tetraethyl	tetraethyl pyrophosphate
arsenic pentoxide	disulfoton	tetraethyldithiopyrophosphate
arsenic trixid	dithiobiuret	tetranitromethane (R)
arsine, diethyl	endosulfan	tetraphosphoric acid, hexaethyl ester

Table 5: P-LISTED WASTES (continued)

thallic oxide	phenol, 2-cyclohexly-4,6-dinitro- and salts
thallium oxide	phenol, 2,4-dinitro-
thallium(I) selenite	phenol, 2-methyl-4,6-dinitro-
thallium(I) sulfate	phenol,2,4,6-trinitro-, ammonium salt ®
thiodiphosphoric acid, tetraethyl ester	vanadic acid, ammonium salt
thiofanox	vanadium oxide
thiophenol	vanadium pentoxide
thiosemicarbazide	vinylamine, N-methyl-N-nitroso-
thiourea, (2-chlorophenyl)-	warfarin and salts
thiourea, 1-naphthalenyl-	zinc cyanide
thiourea, phenyl-	zinc cyanide Zn(CN)2
toxaphene	zinc phosphide, when present in concentrations > 10% (R,T)
trichloromethanethiol	

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 F&SS staff.

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, through F&SS, of 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.

Table 4. 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 F&SS 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) 874-8426**

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 sink 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 National Fire Protection Association (NFPA) labeling system.

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);or
   - Has an LC50 of 200 - 2000 ppm (inhalationexposure).

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 SDSfor 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 IDLH characteristic.

   MSDSOnline - The main software that is used to store and retrieved a Safety Data Sheet. Safety Data Sheets are available 24 hours on the F&SS website.

   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 MSDS.
   - 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).

3. <u>The NFPA Label System</u>

In the 1950's the National Fire Protection Association developed a label for containers or areas containing hazardous materials. Several safety companies have duplicated the label system concept and all share the same basic features. All these systems involve a label divided into sections that are color-coded and positioned in a pattern (diamond, triangle or rectangle). Each section then contains a number from 0 to 4. The colors and numbers have specific meanings, as shown:

1. SUBSTANCES CONSIDERED CARCINOGENIC BY OSHA

Based on National Toxicological Report KNOWN CARCINOGENS, 7th ANNUAL REPORT ON CARCINOGENS 1994

Table 5: SUBSTANCES OR GROUPS OF SUBSTANCES THAT ARE KNOWN TO BE CARCINOGENIC.

- AFLATOXINS (CAS No. 1402-68-2)
- AMINOBIPHENYL (CAS No. 92-67-1)
- ANALGESIC MIXTURES CONTAINING PHENACETIN
- ARSENIC and CERTAIN ARSENIC COMPOUNDS
- ASBESTOS (CAS No. 1332-21-4)
- AZATHIOPRINE (CAS No. 446-86-6)
- BENZENE (CAS No. 71-43-2)
- BENZIDINE (CAS No. 92-87-5)
- BIS(CHLOROMETHYL) ETHER and TECH-GRADE CHLOROMETHYL METHYL
- CHROMIUM AND CERTAIN CHROMIUM COMPOUNDS
- CONJUGATED ESTROGENS
- CYCLOPHOSPHAMIDE (CAS No. 50- 18-0)
- DIETHYLSTILBESTROL (CAS No. 56- 53-1)
- ERIONITE (CAS No. 66733-21-9)
- ETHER (CAS Nos. 542-88-1 and 107-30- 2)
- 1,4-BUTANEDIOL DIMETHYL- SULFONATE (MYLERAN) (CAS No. 55- 98-1)
- 1,4-BUTANEDIOL DIMETHYL- SULFONATE (MYLERAN) (CAS No. 55- 98-1)
- CHLORAMBUCIL (CAS No. 305-03-3)
- (2-CHLOROETHYL)-3-(4- METHYLCYCLOHEXYL)-1- NITROSOUREA (MeCCNU)(CAS No. 13909-09-6)
- MELPHALAN (CAS No. 148-82-3)
- METHOXSALEN WITH ULTRAVIOLET A THERAPY (PUVA)
- MUSTARD GAS (CAS No. 505-60-2)
- 2-NAPHTHYLAMINE (CAS No. 91-59-8)
- RADON (CAS No. 10043-92-2)
- THORIUM DIOXIDE (CAS No. 1314-20- 1)
- VINYL CHLORIDE (CAS No. 75-01-4)

2. SUBSTANCES REASONABLY ANTICIPATED TO BE CARCINOGENS 7th ANNUAL REPORT ON CARCINOGENS

Table 6: SUBSTANCES OR GROUPS THAT MAY REASONABLY ANTICIPATED TO BE CARCINOGENS.

- 2-ACETYLAMINOFLUORENE (CAS No. 53-96-3)
- ACRYLAMIDE (CAS No. 79-06-1)
- ACRYLONITRILE (CAS No. 107-13-1)
- 2-AMINOANTHRAQUINONE (CAS No. 117-79-3)
- o-AMINOAZOTOLUENE (CAS No. 97- 56-3)
- 1-AMINO-2- METHYLANTHRAQUINONE (CAS No. 82-28-0)
- AMITROLE (CAS No. 61-82-5)
- o-ANISIDINE HYDROCHLORIDE (CAS No. 134-29-2)
- BENZOTRICHLORIDE (CAS No. 98-07- 7)
- BERYLLIUM AND CERTAIN BERYLLIUM COMPOUNDS
- BISCHLOROETHYL NITROSOUREA (CAS No. 154-93-8)
- BROMODICHLOROMETHANE (CAS No. 75-27-4)
- 1,3-BUTADIENE (CAS No. 106-99-0)
- BUTYLATED HYDROXYANISOLE (CAS No. 25013-16-5)
- CADMIUM AND CERTAIN CADMIUM COMPOUNDS
- CARBON TETRACHLORIDE (CAS No. 56-23-5)
- CERAMIC FIBERS (respirable size)
- CHLORENDIC ACID (CAS No. 115-28-6)
- CHLORINATED PARAFFINS (C12, 60% CHLORINE) (CAS No. 108171-26-2)
- 1-(2-CHLOROETHYL)-3- CYCLOHEXYL-1-NITROSOUREA (CCNU) (CAS No. 13010-47-4)
- CHLOROFORM (CAS No. 67-66-3)
- 3-CHLORO-2-METHYLPROPENE (CAS No. 563-47-3)
- 4-CHLORO-o-PHENYLENEDIAMINE (CAS No. 95-83-0)
- C.I. BASIC RED 9 MONOHYDROCHLORIDE (CAS No. 569-61-9)
- CISPLATIN (CAS No. 15663-27-1)
- p-CRESIDINE (CAS No. 120-71-8)
- CUPFERRON (CAS No. 135-20-6)
- DDT (CAS No. 50-29-3)
- 2,4-DIAMINOANISOLE SULFATE (CAS No. 39156-41-7)
- 2,4-DIAMINOTOLUENE (CAS No. 95-80- 7)
- 1,2-DIBROMO-3-CHLOROPROPANE (CAS No. 96-12-8)
- 1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)(CAS No. 106-93-4)
- 1,4-DICHLOROBENZENE (CAS No. 106- 46-7)
- 3,3'-DICHLOROBENZIDINE AND 3,3'- DICHLOROBENZIDINE 2HCl (CAS Nos.91-94-1)
- 1,1-DIMETHYLHYDRAZINE (CAS No. 57- 14-7)
- DIMETHYL SULFATE (CAS No. 77-78-1)
- DIMETHYLVINYL CHLORIDE (CAS No. 513-37-1)
- 1,4-DIOXANE (CAS No. 123-91-1)
- DIRECT BLACK 38 (CAS No. 1937-37-7)
- DIRECT BLUE 6 (CAS No. 2602-46-2)
- DIMETHYLCARBAMOYL CHLORIDE (CAS No. 79-44-7)

- EPICHLOROHYDRIN (CAS No. 106-89-8)
- ESTROGENS (NOT CONJUGATED):ESTRADIOL-17beta (CAS No. 50-28-2)
- ESTROGENS (NOT CONJUGATED) ESTRONE: (CAS No. 53-16-7)
- ESTROGENS (NOT CONJUGATED): ETHINYLESTRADIOL (CAS No. 57-63-6)
- ESTROGENS (NOT CONJUGATED): MESTRANOL (CAS No. 72-33-3)
- ETHYL ACRYLATE (CAS No. 140-88-5)
- ETHYLENE OXIDE (CAS No. 75-21-8)
- ETHYLENE THIOUREA (CAS No. 96-45-7)
- ETHYL METHANESULFONATE (CAS No. 62-50-0)
- FORMALDEHYDE (GAS) (CAS No. 50-00- 0)
- GLASSWOOL (Respirable Size)
- GLYCIDOL (CAS No. 556-52-5)
- HEXACHLOROBENZENE (CAS No. 118- 74-1)
- HEXACHLOROETHANE (CAS No. 67- 72-1)
- HEXAMETHYL-PHOSPHORAMIDE (CAS No. 680-31-9)
- HYDRAZINE AND HYDRAZINE SULFATE (CAS Nos. 302-01-2 and 10034- 93-2)
- HYDRAZOBENZENE (CAS No. 122-66- 7)
- IRON DEXTRAN COMPLEX (CAS No. 9004-66-4)
- KEPONE¨ (CHLORDECONE) (CAS No. 143-50-0)
- LEAD ACETATE AND LEAD PHOSPHATE (CAS Nos. 301-04-2 and 7446-27-7)
- LINDANE AND OTHER HEXACHLOROCYCLOHEXANE ISOMERS
- 2-METHYLAZIRIDINE (PROPYLENEIMINE) (CAS No. 75-55-8)
- 4,4'-METHYLENEBIS(2- CHLOROANILINE) (MBOCA) (CAS No. 101-14-4)
- 4,4'-METHYLENEBIS(N,N- DIMETHYLBENZENAMINE) (CAS No. 101-61-1)
- 4,4'-METHYLENEDIANILINE AND ITS DIHYDROCHLORIDE (CAS Nos. 101-77- 9 and 13552-44-8)
- METHYL METHANESULFONATE (CAS No. 66-27-3)
- N-METHYL-N'-NITRO-N- NITROSOGUANIDINE (CAS No. 70-25- 7)
- METRONIDAZOLE (CAS No. 443-48-1)
- MICHLER'S KETONE (CAS No. 90-94-8)
- MIREX (CAS No. 2385-85-5)
- NICKEL AND CERTAIN NICKEL COMPOUNDS
- N-NITROSOPYRROLIDINE (CAS No. 930- 55-2)
- N-NITROSOSARCOSINE (CAS No. 13256- 22-9)
- NORETHISTERONE (CAS No. 68-22-4)
- NITRILOTRIACETIC ACID (CAS No. 139-13-9)
- NITROFEN (CAS No. 1836-75-5)
- NITROGEN MUSTARD HYDROCHLORIDE (CAS No. 55-86-7)
- 2-NITROPROPANE (CAS No. 79-46-9)
- N-NITROSODI-N-BUTYLAMINE (CAS No. 924-16-3)
- N-NITROSODIETHYLAMINE (CAS No. 55-18-5)
- N-NITROSODIMETHYLAMINE (CAS No. 62-75-9)
- N-NITROSODI-N-PROPYLAMINE (CAS No. 621-64-7)
- N-NITROSO-N-ETHYLUREA (CAS No. 759-73-9)
- 4-(N-NITROSOMETHYL-AMINO)-1-(3- PYRIDYL)-1-BUTANONE (NNK) (CAS No. 64091-91-4)
- N-NITROSO-N-METHYLUREA (CAS No. 684-93-5)
- N-NITROSOMETHYL-VINYLAMINE (CAS No. 4549-40-0)

- N-NITROSOMORPHOLINE (CAS No. 59- 89-2)
- N-NITROSONORNICOTINE (CAS No. 16543-55-8)
- N-NITROSOPIPERIDINE (CAS No. 100- 75-4)
- OCHRATOXIN A (CAS No. 303-47-9)
- 4,4'-OXYDIANILINE (CAS No. 101-80-4)
- OXYMETHOLONE (CAS No. 434-07-1)
- PHENACETIN (CAS No. 62-44-2)
- PHENAZOPYRIDINE HYDROCHLORIDE (CAS No. 136-40-3)
- PHENOXYBENZAMINE HYDROCHLORIDE (CAS No. 63-92-3)
- PHENYTOIN (CAS No. 57-41-0)
- POLYBROMINATED BIPHENYLS
- POLYCHLORINATED BIPHENYLS
- POLYCYCLIC AROMATIC HYDROCARBONS, 15 LISTINGS
- PROCARBAZINE HYDROCHLORIDE (CAS No. 366-70-1)
- PROGESTERONE (CAS No. 57-83-0)
- 1,3-PROPANE SULTONE (CAS No. 1120- 71-4)
- BETA-PROPIOLACTONE (CAS No. 57-57- 8)
- PROPYLTHIOURACIL (CAS No. 51-52-5)
- RESERPINE (CAS No. 50-55-5)
- SACCHARIN (CAS No. 128-44-9)
- SAFROLE (CAS No. 94-59-7)
- SELENIUM SULFIDE (CAS No. 7446-34-6)
- SILICA, CRYSTALLINE (RESPIRABLE SIZE)
- STREPTOZOTOCIN (CAS No. 18883-66-4)
- SULFALLATE (CAS No. 95-06-7)
- 2,3,7,8-TETRACHLORODIBENZO-p- DIOXIN (TCDD) (CAS No. 1746-01-6)
- TETRACHLOROETHYLENE (PERCHLOROETHYLENE) (CAS No. 127- 18-4)
- TETRANITROMETHANE (CAS No. 509-14- 8)
- THIOACETAMIDE (CAS No. 62-55-5)
- THIOUREA (CAS No. 62-56-6)
- TOLUENE DIISOCYANATE (CAS No. 26471-62-5)
- o-TOLUIDINE and o-TOLUIDINE HYDROCHLORIDE (CAS Nos. 95-53-4 and 636-21-5)
- TOXAPHENE (CAS No. 8001-35-2)
- 2,4,6-TRICHLOROPHENOL (CAS No. 88- 06-2)
- TRIS(1-AZIRIDINYL)PHOSPHINE SULFIDE (THIOTEPA) (CAS No. 52-24-4)
- TRIS(2,3-DIBROMOPROPYL) PHOSPHATE (CAS No. 126-72-7)
- URETHANE (CAS No. 51-79-6)
- 4-VINYL-1-CYCLOHEXENE DIEPOXIDE (CAS No. 106-87-6)

3. EXPLOSIVE AND SHOCK-SENSITIVE MATERIALS

Table 7: COMMON EXPLOSIVE AND SHOCK-SENSITIVE MATERIALS

Acetylides of heavy metals	Hexogen	Potassium nitroaminotetrazole
Aluminum ophorite explosive	Hydrazinium nitrate	Silver acetylide
Amatol	Hydrazoic acid	Silver azide
Ammonal	Lead azide	Silver styphnate
Ammonium picrate	Lead mannite	Silver tetrazene
Ammonium salt lattice	Lead mononitroresorcinate	Sodatol
Butyl tetryl	Lead picrate	Sodium amatol
Calcium nitrate	Lead salts	Sodium dinitro-ortho- cresolate
Copper acetylide	Lead styphnate	Sodium nitrate-potassium nitrate
Cyanuric triazide	Trimethylolethane	Sodium picramate
Cyclotrimethylenetrinitramine	Magnesium ophorite	Syphnic acid
Cyclotetramethylenetetranitramine	Mannitol hexanitrate	Tetrazene
Dinitroethyleneurea	Mercury oxalate	Tetranitrocarbazole
Dinitroglycerine	Mercury tartrate	Tetrytol
Dinitrophenol	Mononitrotoluene	Trimonite
Dinitrophenolates	Nitrated carbohydrate	Trinitroznisole
Dinitrophenyl hydrazine	Nitrated glucoside	Trinitrobenzene
Dinitoresorcinol	Nitrated polyhydric alcohol	Brinitrobenzoic acid
Dinitrotoluene	Nitroglycerine	Trinitrocresol
Dipicrylamine	Nitroglycide	Trinitro-metal-cresol
Erythritol tetranitrate	Nitroglycol	Trinitronaphthalene
Erythritol tetranitrate	Nitroguanidine	Trinitrohpenetol
Fulminate of Mercury	Nitroparaffins	Trinitrophloroglucinal
Fulminate of silver	Nitronium perchlorate	Trinitroresorcinol
Fulminating gold	Nitrourea	Trinotrotoluene
Fulminating mercury	Organic amine nitrates	Tritonal
Fulminating platinum	Organic nitramines	Urea nitrate
Fulminating silver	Organic Peroxides	
Gelatinized nitrocellulose	Picramic acid	
Guanyl nitrosamino guanyl etrazene	Picramide	
Guanysnitrosaminic guanylidene hydrazine	Picratol	
Heavy metal azides	Picric acid	
Hexanite	Picryl fluoride/chloride	
Hexanitrodiphenylamine	Perchloric acid	
Hexanitrostilbene	Polynitro aliphatic	

4. FLAMMABLE CHEMICALS

Table 8: 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

Currently in inventory

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 requirements of the standard for the particular substance.

b) OSHA Regulated Substances

Table 9: OSHA REGULATED SUBSTANCES

2-Acetylaminofluorene	4-Dimethylaminoazobenzene
Acrylonitrile	Ethyleneimine
Air Contaminants (over 1,000, listed in 1910.1000)	Ethylene Oxide
4-Aminodiphenyl	Formaldehyde
Arsenic, inorganic	Lead
Asbestos	Naphthylamine (alpha- & beta-)
Benzene	4-Nitrobiphenyl
Benzidine	N-Nitrosodimethylamine
Chloromethyl ether, (bis- & methyl-)	beta-Propiolactone
1,2-Dibromo-3-chloropropane	Vinyl Chloride
3,3-Dichlorobenzidine & salts	

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. Contact the F&SS to arrange employee exposure monitoring.

Again, possible exposure situations are as follows:

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

d) How to Obtain Air Monitoring

The F&SS office will conduct 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. **Call F&SS.** F&SS shall notify the employee(s) of the results. The notification must be in writing and must be presented to the employee within 15 working days after F&SS receives the results. If many employees have been affected, the notification requirement may be met by posting the results in an appropriate area.

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 chemicallab.

   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), vitrile, neoprene, butyl, 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. Gloves should be cleaned or replaced periodically, depending on frequency of use and permeability of the chemicals. 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 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 or the Chemistry Stockroom. Information regarding the resistance factors of the available materials may be obtained from the manufacturers' catalogs or from F&SS.

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 engineering control measures. For example, enclosure or confinement of the operation, general and local ventilation and substitution of less toxic materials. When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used.

Florida Poly has implemented a Respiratory Protection Program in order to ensure the safety of any employee that may be required to wear respiratory protection. The program is designed to assist the employees in determining the proper respiratory and filtering media, to ensure that the equipment fits the employees and to conduct training on the proper care and storage of equipment. All Florida Poly personnel who wear respiratory protection must be enrolled in both the Respiratory Protection. Call F&SS to receive information.

Under no circumstances, should employees use respiratory protection without F&SS approval. University personnel shall not use disposable respiratory protection. The F&SS staff will select the appropriate equipment, fit-test the end-user and provide training on the proper use and care of equipment.

Prior to using a respirator, an employee must become enrolled in the Occupational Health Program. This program will serve two functions for the respirator wearer: pulmonary function testing and physician approval prior to respirator use and regular monitoring to ensure that the equipment is preventing exposure.

When hiring for a position that requires the use of a respirator, supervisors must specify that a pre-employment physical will be required. Supervisors need to mention the respiratory protection requirement to the Personnel Services professional who is handling the job advertisement. After interviews have been completed and the top candidate selected, the hiring authority should send a letter to the candidate extending an offer that is conditional upon the successful completion of the medical examination. These medical services will be provided under the Occupational Health Program.

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) 874-8673 for a consultation.

Maintenance

- In order to prevent rust accumulation and harmful microorganism proliferation in the system, Eyewash stations are to be flushed monthly. This is the responsibility of the Lab Manager.
- Laboratory Chemical Hygiene Officer will conduct quarterly 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 quarterly inspections, the Lab CHO 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.

b) Certification

F&SS conducts 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. If a hood has been tagged by F&SS as having failed certification, a work order will be submitted by the Lab Manager facilities@floridapoly.edu.

XIV. FIRE EXTINGUISHERS

a) General

- Each laboratory should 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.

F&SS will offer offers training in the near future on how to properly handle fire extinguisher and use. It is recommended that all laboratory personnel attend this class. To register, call F&SS.

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**
Department of Public Safety & Police..... (**863) 874-8472 (prompt 2)**
Florida Poly Health Clinic.....(**863) 603-6504 or (863) 603-6505**
Facilities.....(**863) 874-8691**
Safety Services.....**(863) 874-8426**

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 byremoving them from the hazard, if necessary.
   - Do not move seriously injured personnel unless they are in danger of furtherinjury.
   - 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.
   - 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, sound the building alarm 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. Mercury from a broken thermometer or 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 Emergency Responder. This person has been through extensive 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 Emergency Responder 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 F&SS.

XVI. SAFETY INSPECTIONS

The F&SS office 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, F&SS hopes to promote compliance with all regulations, thereby protecting University personnel from health hazards and regulatory citations.

These inspection visits also allow F&SS 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

LABORATORY INSPECTION WORKSHEET

By:_____ Date_____/_____/_____

CHEMICAL STORAGE			
INCOMPATIBLES STORED SEPARATELY	Y	N	N/A
CHEMICALS PROPERLY LABELED	Y	N	N/A
SECONDARY CONTAINERS PROPERLY LABELED	Y	N	N/A
CONTAINERS CLOSED EXCEPT WHEN IN USE (STORAGE/WASTE)	Y	N	N/A
CHEMICALS STORED OFF OF FLOOR	Y	N	N/A
WASTE PROPERLY LABELED AND STORED	Y	N	N/A
CHEMICALS AND FOOD STORED SEPARATELY	Y	N	N/A
AMOUNT OF OLD CHEMICALS ACCEPTABLE	Y	N	N/A
COPY OF CHP AVAILABLE	Y	N	N/A
CHP PART B FILLED OUT	Y	N	N/A

COMMENTS:

FLAMMABLE LIQUIDS			
STORAGE UNIT ACCEPTABLE	Y	N	N/A
QUANTITY OUTSIDE STORAGE IS APPROVED (< = 25 GALLONS)	Y	N	N/A
STORED AWAY FROM REACTIVE METALS	Y	N	N/A
STORED AWAY FROM EXITS	Y	N	N/A
STORED AWAY FROM IGNITION SOURCES	Y	N	N/A

COMMENTS:

GENERAL FACILITY MAINTENANCE			
FIRST AID KIT PRESENT AND STOCKED	Y	N	N/A
ENTRANCES POSTED WITH EMERGENCY CONTACTS	Y	N	N/A
EXITS AND AISLES UNOBSTRUCTED	Y	N	N/A
AISLES HAVE MINIMUM 28” CLEARANCE	Y	N	N/A
GENERAL HOUSEKEEPING IS SATISFACTORY	Y	N	N/A
SEPARATE EATING/DRINKING AREA	Y	N	N/A
SEPARATE FOOD STORAGE	Y	N	N/A
APPROPRIATE FIRE EXTINGUISHER IS PRESENT, MOUNTED AND ACCESSIBLE	Y	N	N/A
PERSONNEL WEAR APPROPRIATE PROTECTIVE EQUIPMENT	Y	N	N/A

COMMENTS:

EYE WASH/DELUGE SHOWER			
EYE WASH PRESENT AND FUNCTIONING	Y	N	N/A
DELUGE SHOWER PRESENT	Y	N	N/A
EYE WASH IS FLUSHED	Y	N	N/A
DELUGE SHOWER LOCATED AWAY FROM ELECTRICAL EQUIPMENT	Y	N	N/A
DELUGE SHOWER AND EYE WASH ARE CLEARLY LABELED	Y	N	N/A
DELUGE SHOWER AND EYE WASH WITHIN 50 FEET OF WORK AREA	Y	N	N/A
PATHWAYS ARE UNOBSTRUCTED	Y	N	N/A

COMMENTS:

GAS CYLINDERS			
PROPERLY LABELED STORED AND SECURED (HIGHLY TOXIC, OXIDIZERS, FLAMMABLES)	Y	N	N/A

COMMENTS:

SPECIAL CHEMICAL PROBLEMS			
WATER REACTIVES STORED AWAY FROM SINKS AND PIPES	Y	N	N/A
ETHERS HAVE RECEIPT AND OPENING DATE	Y	N	N/A
ETHERS WITHIN EXPIRATION DATE	Y	N	N/A
PICRIC ACID IS HYDRATED	Y	N	N/A
REACTIVE METALS STORED PROPERLY	Y	N	N/A

COMMENTS:

FUME HOODS			
FUME HOODS CERTIFIED OR TAGGED OUT	Y	N	N/A
HOODS ARE UNCLUTTERED	Y	N	N/A
STORAGE IS TO THE REAR OF THE HOOD	Y	N	N/A
FUME HOODS ARE PROPERLY VENTED	Y	N	N/A
FLAMMABLE CHEMICALS ARE REMOVED FROM HOOD DURING HOT PROCESSES	Y	N	N/A

COMMENTS:

ELECTRICAL/MECHANICAL CONCERNS			
ELECTRICAL EQUIPMENT PROPERLY COVERED	Y	N	N/A
FANS, PUMPS AND MOTORS HAVE GUARDS	Y	N	N/A
MULTIPLE PLUG ADAPTERS NOT IN USE	Y	N	N/A
BREAKER PANEL ACCESSIBLE	Y	N	N/A
ELECTRICAL CORDS OUT OF AISLES	Y	N	N/A
ELECTRICAL CORDS INTACT	Y	N	N/A

COMMENTS:

XVII. REFERENCES

Literature Available at F&SS:

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

Florida Polytechnic University Bloodborne Pathogen Training
Prepared By: Renee Michel, Facilities and Safety Services, Florida Polytechnic University

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, 6/90); 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).

Respiratory Protection Program
Prepared By: Renee Michel, Facilities and Safety Services, Florida Polytechnic University

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 F&SS CLASSES

F&SS offers the following safety courses. Contact F&SS to arrange.

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 (TBD)
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: material 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.

Respiratory Protection (60 minutes)
Designed for people enrolled in the Respiratory Protection Program: Contents: regulatory requirements, types of respiratory protective equipment, proper use, purchasing procedures and University program.

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