UNIVERSITY OF CENTRAL FLORIDA

LABORATORY SAFETY MANUAL

Department of Environmental Health and Safety

2023

Table of Contents

Appendices

Introduction

The University of Central Florida (UCF) through the Department of Environmental Health and Safety (EHS) has designed this Laboratory Safety Manual (LSM) based on OSHA Occupational Exposure to Hazardous Chemicals in Laboratories: Final Rule commonly referred to as OSHA's Laboratory Standards (29 CFR 1910.1450) and Prudent Practices in the Laboratory Handling and Management of Chemical Hazards.

This Chemical Hygiene Plan identifies priorities for laboratory and field safety programs and promotes the use of safety procedures and guidelines in UCF research and teaching. The Laboratory Safety Coordinator (LSC) performs an annual review of the Laboratory Safety Manual to ensure currency and comprehensiveness.

This manual details the laboratory safety policies, procedures, and standards expected to be upheld at UCF. Implementation of this plan depends on the cooperation of university administration, department chairpersons, faculty, laboratory staff, students, and Environmental Health and Safety (EHS) staff. The Laboratory Safety Manual presents a broad outline of chemical safety procedures. It covers such topics as personal protective equipment, waste management procedures, proper use of safety equipment, chemical storage, and emergency response procedures. It also includes appendices and addenda on safety procedures that are more detailed in scope.

The goal of this LSM is to inform laboratory workers about the dangers associated with hazardous chemicals and how to best avoid harmful incidents. Laboratory personnel should minimize their exposure to all chemicals since few chemicals are without hazard. After reading the LSM, laboratory workers will have a better understanding of safe laboratory practices and an understanding of how to best handle hazardous chemicals inside and outside the laboratory.

Scope of this Plan

The LSM applies to all laboratories housed in UCF owned, operated or leased spaces, as well as the individuals working or studying in these laboratories. A laboratory for the purposes of the LSM is defined as any facility designated for use in teaching, research or clinical activity where chemical agents; including, but not limited to biological, radiological, etc., are used or stored. Examples of such facilities would be teaching laboratories that use or store chemicals; research laboratories that use or store chemicals; field laboratories that use or store chemicals; and clinical laboratories that use or store chemicals. If the activities in the room are not specifically named in this list, but similar activities occur, then the LSM applies.

The LSM addresses chemical safety on campus including receipt, use, storage and disposal of hazardous materials. Not all laboratory safety concerns deal with chemicals; therefore, it is important for laboratories to adhere to established University of Central Florida policies, practices, and programs regarding biological, radioactive, physical, laser, and electrical hazards.

See Appendix T: Table of Reference Standards for Various Activities for text of the Occupational Exposure to Hazardous Chemicals in Laboratories (Laboratory Standard), Hazard Communication Standard and Bloodborne Pathogens Standard.

Laboratory Safety Program

The following portion of the LSM is generalized and gives institutional guidance. Individual principal investigators and laboratory managers are responsible for tailoring this LSM to the specific needs of their areas. Contact EHS with questions about adapting this LSM to a laboratory area. See also Appendix P: Laboratory Standard Operating Procedures Guidelines and Template for more information.

Program Organization

The University has established a laboratory safety program describing how to achieve safe chemical operations and compliance with regulatory requirements. Responsibilities for the health and safety of the campus community extend to the highest administrative levels of UCF. The Director of Environmental Health and Safety is responsible for the implementation of UCF Environmental Health and Safety Policies at all facilities and properties under campus control. Deans and Department heads are responsible for establishing and maintaining health and safety programs in their areas and for providing a safe and healthy work environment.

This program is administrated by the Laboratory Safety Coordinator (LSC) who may be assisted by EHS support staff. UCF faculty with appropriate training and experience are designated as Principal Investigators (PIs). PIs are responsible for supervision of their laboratory personnel designated as laboratory workers.

The day to day responsibility for the management of laboratory safety and adherence to safe laboratory practices rests with the PI/Laboratory Manager within individual laboratory units and associated departments. All personnel, including PIs/Laboratory Managers, laboratory personnel, students, volunteers and visitors, have a duty to fulfill their obligations with respect to maintaining a safe work environment.

Although the Principal Investigator (PI) will bear the ultimate responsibility for the safety of their laboratory and the procedures performed within their laboratory, or under their

direct supervision, everyone who enters a laboratory is responsible for complying with standards put forth in the Laboratory Safety Manual (LSM). Our goal is to promote a healthy and safe working environment for all laboratory personnel and students.

Everyone that participates in laboratory activities has an obligation to safety and a responsibility to follow safe laboratory practices. Chemicals that are used improperly or without regard for safety could cause harm to laboratory workers, custodial staff, maintenance workers or students.

Documentation and Communication

Laboratory Safety Manual

The Laboratory Safety Manual is available on the EHS website for download and a copy of the UCF Laboratory Safety Manual shall be present in every teaching laboratory and each research laboratory location. Upon vacating a laboratory, the principal investigator shall comply with the requirements of Appendix E: Laboratory Close-out Procedures and shall return the copy of the Laboratory Safety Manual with the supporting documents and training records to the Laboratory Safety Coordinator or Laboratory Manager. The UCF Laboratory Safety Manual shall be updated annually to reflect any changes in regulations, University standard operating procedures or EHS policies.

It is the responsibility of each Laboratory Manager and Principal Investigator to assure that updates are made to his/her copy of the Laboratory Safety Manual as distributed by the Laboratory Safety Coordinator.

In addition to complying with the LSM, laboratories using radioactive materials (indicators, sealed or unsealed sources exceeding Florida Administrative Code 64E-5 Schedule A and B) and radiation producing devices (analytical X-ray equipment, X-ray diffractometers, particle accelerators, etc.) must follow the policies and procedures outlined in the UCF Radiation Safety Manual and instructions from UCF's Radiation Safety Officer (RSO). Laboratories where work involving human tissues, human blood or blood products, recombinant DNA or pathogenic agents is conducted must comply with the Biological Safety Manual and the Centers for Disease Control and National Institutes of Health Guidelines. Laboratories where lasers are in use must comply with the LASER Safety Guidelines from EHS. Contact EHS for details.

LSM Accessibility

Copies of the Laboratory Safety Manual will be maintained, and kept readily accessible in the following locations:

- Environmental Health and Safety

- Departmental Office
- Each laboratory (or laboratory suite) covered by this LSM will maintain the manual in the Laboratory Safety Notebook, a three-ring binder provided by EHS.

The LSM can also be accessed directly on the EHS web site at www.ehs.ucf.edu. Having the LSM available in these locations will most effectively ensure that laboratory personnel have access to pertinent safety information. It will also provide a template for new investigators or laboratory managers to use when new laboratories are brought on-line.

Recordkeeping

Required documentation and records are kept to demonstrate compliance with applicable laboratory standard mandates. EHS uses LSM directives to collect all applicable information regarding these mandates. This information is used to complete reports, questionnaires and permits to various federal, state and local agencies. Copies of these reports and the associated information collected through inspections and submittals by laboratories are kept on file by EHS.

Laboratories must maintain records required by this plan. Records of inspections conducted by the Department or self-inspections should be sent to EHS and include the name of the inspector, date, any unsafe conditions found and any corrective actions taken. Laboratories should document all training activities whether conducted in classes, safety meetings or one-on-one job safety training sessions. Laboratories should keep records of who was trained, who conducted the training, when the training occurred and what type of training occurred. (Appendix B: Employee Laboratory Safety Training Record).

EHS maintains records detailing laboratory personnel exposure monitoring. These confidential records provide an accurate account of measurements taken to monitor laboratory personnel exposures if the laboratory personnel are exposed to any chemical contaminant above the action level. These records must be kept for 30 years past the date the laboratory personnel cease work at UCF.

Communication

Each Department and laboratory should establish a system of communicating health and safety issues to laboratory personnel. Copies of the health and safety issues should be kept in the laboratory safety notebook in the information tab.

On a regular basis EHS will publish Safety Alerts or Concerns on the EHS website. Please check the EHS website often so that you can have the most up-to-date information for your laboratory personnel.

Laboratory Workers' Rights

Students and other personnel who work in laboratories have the right to be informed about the potential health hazards of the chemicals in their work areas and to be properly trained to work safely with these substances. This includes custodial staff and other personnel who work to clean and maintain laboratories.

All students and personnel working with potentially hazardous chemicals are encouraged to report (anonymously, if preferred) any concerns about unsafe work conditions to the EHS Laboratory Safety Coordinator (407)823-5498.

Roles

EHS and the Laboratory Safety Coordinator (LSC)

EHS is responsible for administering and overseeing institutional implementation of the Laboratory Safety Program. The Laboratory Safety Coordinator (LSC) has the primary responsibility of ensuring the implementation of all components. In case of imminent danger to life or health, the Director of EHS or designee has the authority to order the cessation of the activity until the hazardous condition is abated.

The Laboratory Safety Coordinator is responsible for preparing a written annual review of the Laboratory Safety Manual. The review process will utilize such resources as results of internal and external audits, accident reports, notices of laboratory inspection findings, customer satisfaction surveys, tracking reports and other information which may become available. The focus of the annual review is to evaluate program effectiveness and to identify strengths and weaknesses which may be used to improve the program. The written annual review will be made available to the Laboratory Safety Committee for inclusion in the annual report of that Committee.

EHS provides technical guidance to personnel at all levels of responsibility on matters pertaining to laboratory use of hazardous materials. The LSC, with support from other EHS personnel, is responsible for:

- Informing PIs/Laboratory Managers of all health and safety requirements and assisting with the selection of appropriate safety controls, including laboratory and other workplace practices, personal protective equipment, engineering controls, training, etc.;

- Conducting periodic inspections and immediately taking steps to abate hazards that may pose a risk to life or safety upon discovery of such hazards;
- Performing hazard assessments upon request;
- Maintaining area and personal exposure-monitoring records for chemical exposures;
- Helping to develop and implement appropriate chemical hygiene policies and practices;
- Having working knowledge of current health and safety rules and regulations, training, reporting requirements and standard operating procedures associated with regulated substances. Such knowledge may be supplemented and developed through research and training materials;
- Working with Departmental Safety Committees to review existing and develop new SOPs for handling hazardous chemicals;
- Providing technical guidance and investigation, as appropriate, for laboratory and other types of accidents and injuries;
- Helping to determine medical surveillance requirements for potentially exposed personnel;
- Reviewing plans for installation of engineering controls and new facility construction/renovation as requested;
- Reviewing and evaluating the effectiveness of the LSM at least annually and updating it as appropriate; and
- Providing management oversight and assistance with environmental compliance, transport and disposal of hazardous waste, and spill clean-up.

Laboratory Safety Committee

The Laboratory Safety Committee is responsible for advising management on matters pertaining to safe work practices in laboratories covered by this manual and the University Hazardous Materials Policy 3-107. The committee will review trends in laboratory safety inspection deficiencies and accidents and make recommendations to the LSC for updates to policy and procedures to minimize safety and compliance issues.

The UCF Laboratory Safety Committee shall consist of the LSC, an administrative representative, and faculty members representing each of the departments or centers covered by this manual. The committee will meet at least bi-annually and may conduct business via e-mail correspondence.

PIs, Laboratory Managers

The PI or Laboratory Manager has responsibility for the health and safety of all personnel

working in his or her laboratory who handle hazardous chemicals. The PI/Laboratory Manager may delegate safety duties, but remains responsible for ensuring that delegated safety duties are adequately performed.

Laboratory Manager Appointment: Each department shall assign a departmental laboratory manager or require principal investigators to assign a dedicated laboratory manager for their individual lab(s). (Chairs or PI's shall assign roles under their permit in EHSA).

The PI/Laboratory Manager is responsible for:

- Knowing all applicable health and safety rules and regulations, training and reporting requirements and standard operating procedures associated with chemical safety for regulated substances;
- Identifying hazardous conditions or operations in the laboratory or other facilities containing hazardous chemicals, determining safe procedures and controls, and implementing and enforcing standard safety procedures;
- Registration via the laboratory hazard assessment tool (LHAT), part of the EHSA online software
- Establishing standard safety operating procedures (general and protocol specific) and performing literature searches relevant to health and safety for laboratory-specific work, including but not limited to:
    - Providing prior-approval for the use of hazardous chemicals in the laboratory
    - Supervising laboratory or other facility with hazardous chemicals;
- Consulting with EHS and/or Departmental Safety Committee on:
    - use of high(er) risk materials, such as the use of particularly hazardous substances as defined by EHS, or
    - conducting higher risk experimental procedures so that special safety precautions may be taken;
- Maintaining an updated chemical inventory for the laboratory or facility;
- Ensuring laboratory or other personnel under his/her supervision have access to and are familiar with the appropriate Safety Manual(s);
- Training all laboratory or other personnel he/she supervises to work safely with hazardous materials and maintaining written records of laboratory-specific or specialized training in the Laboratory Safety Notebook (LSN). Electronic records of training are encouraged. Training must include information of the location and availability of hazard information;
- Promptly notifying EHS, Facilities Operations or Property Management when work place engineering controls (e.g., fume hoods) or safety equipment (e.g., emergency showers/eyewashes, fire extinguishers, etc.) become non-operational;

- Ensuring the availability of all appropriate personal protective equipment (PPE) (e.g., laboratory coats, gloves, eye protection, etc.), and ensuring the PPE is maintained in working order and properly used;
- Conducting periodic self-inspections of laboratory or facility and maintaining records of inspections, as required;
- Promptly reporting of accidents and injuries to EHS. Serious injuries MUST be reported to EHS immediately to allow for compliance with reporting time frame. Any doubt as to whether an injury is serious should favor reporting;
- Provide funding for medical surveillance and medical consultation and examination for laboratory and other personnel, as required;
- Informing facilities personnel, other non-laboratory personnel, and any outside contractors of potential laboratory-related hazards when they are required to work in the laboratory environment; and
- Providing a safe environment for previously scheduled repairs and renovations by identifying and minimizing potential hazards, decontamination must be completed before work can begin.

Laboratory Workers

All lab workers (paid staff, students, volunteers, and visitors) in research or teaching laboratories that use, handle or store potentially hazardous chemicals are responsible for:

- Completing all required health, safety, and environmental training as well as providing written documentation to their supervisor;
- Reviewing and following requirements of the LSM and all appropriate Safety Manuals and Policies;
- Following all verbal and written laboratory safety rules, regulations, and standard operating procedures required for the tasks assigned;
- Developing good personal chemical hygiene habits, including but not limited to, keeping the work areas safe and uncluttered;
- Planning, reviewing, and understanding the hazards of materials and processes in their laboratory research or other work procedures prior to conducting work;
- Utilizing appropriate measures to control identified hazards, including consistent and proper use of engineering controls, personal protective equipment (PPE), and administrative controls;
- Understanding the capabilities and limitations of PPE issued to them;
- Gaining prior approval from the PI/Laboratory Manager for the use of restricted chemicals and other materials;
- Consulting with PI/Laboratory Manager before using the following

particularly hazardous substances (PHS), explosives, highly hazardous materials or conducting certain higher risk experimental procedures;

- Immediately reporting all accidents and unsafe conditions to the PI/Laboratory Manager;
- Participating in the medical surveillance program, when required;
- Informing the PI/Laboratory Manager of any work modifications ordered by a physician as a result of medical surveillance, occupational injury, or exposure;
- When working autonomously or performing independent research/work, review the plan or scope of work for their proposed research with the PI/Laboratory Manager
- Notifying in writing and consulting with the PI/Laboratory Manager in advance if they intend to significantly deviate from previously reviewed procedures (Note: Significant change may include, but is not limited to; change in the objectives, change in PI, change in the duration, quantity, frequency, temperature or location, increase or change in PPE, and reduction or elimination of engineering controls.)
- Preparing SOPs and performing literature searches relevant to safety and health that are appropriate for their work.

Chemical Safety Training Program

Handling and use of hazardous materials at UCF is restricted to trained personnel.

Departments must provide laboratory personnel with laboratory specific information and training to ensure that they are apprised of the hazards of chemicals present in their work area and the steps they should take to protect themselves from these hazards. Training may take the form of individual instruction, group seminars, audio-visual presentations, handout material, or any combination of the above. However, the training must include the specific hazards associated with the chemicals in the work area when generic training is insufficient (e.g., extremely toxic materials, carcinogens, reproductive hazards, pyrophoric materials) to address specific hazards. A variety of training aids are available from the Department of Environmental Health and Safety.

Such information must be provided at the time of a laboratory worker's initial assignment to a work area where hazardous chemicals are present and prior to assignment involving new exposure situations. Laboratory personnel should receive periodic refresher information and training.

Note: Although the length of training is not specified in the OSHA regulations, effective information and training generally will take at least 2 hours for most laboratory scale

operations. The frequency of periodic refresher information and training will vary with the hazard; however, the length of time between training sessions should not exceed one year.

The University's EHS laboratory safety training program has initial and refresher training sessions to cover UCF procedures and standard laboratory safety principles, radiation safety, and biological safety topics. In addition, hazmat personnel training is provided to any worker with job functions related to the shipment, transportation, or receipt of hazardous materials packages. Key personal (i.e., departmental laboratory managers, building coordinators, safety officers) must also take the first responder awareness training. (Note: Laboratory Safety training program provided by EHS is general awareness and practices, specific training on job functions and hazards must be completed in the work area by a supervisor and documented in the LSM)

All laboratory personnel and others working with potentially hazardous chemicals have the responsibility to participate in training seminars on general laboratory safety and be familiar with the contents of the Laboratory Safety Manual (LSM). Those working with chemicals are responsible for staying informed about the chemicals in their work areas, safe work practices and proper personal protective equipment (PPE) required for the safe performance of their job. Failure to comply with these requirements will result in progressive disciplinary action in accordance with university policy and may result in temporary suspension of laboratory activities until corrective action is implemented. Personnel who work in areas where potentially hazardous chemicals are present must read and comply with the document entitled General Rules for Laboratory Work with Chemicals found in Appendix O: General Laboratory Safety Rules.

Initial Laboratory Safety Training

Completion of initial Laboratory Safety training is a prerequisite for working with hazardous chemicals in UCF laboratories. The training covers the topics which are summarized below.

- The contents of the OSHA standard 29 CFR 1910.1450 and its appendices, which shall be available to laboratory personnel (through EHS);
- The location and availability of the University of Central Florida Laboratory Safety Manual;
- The permissible exposure limits for OSHA regulated substances or published exposure limits for other hazardous chemicals where there is no applicable OSHA standard;
- Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory (available on container labels and Safety Data Sheets);
- The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory

(see other applicable sections of this document; also available from EHS) including, but not limited to Safety Data Sheets (formally know as Material Safety Data Sheets or MSDSs) received from the supplier;

- Methods and observations that may be used to detect the presence or release of a hazardous chemical (such as monitoring conducted by the University, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);
- The physical and health hazards of chemicals in the work area;
- The measures laboratory personnel can take to protect themselves from these hazards, including specific procedures the University or Department has implemented to protect laboratory personnel from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used;
- The applicable details of the University of Central Florida Laboratory Safety Manual in the context of worker safety in the laboratory.

The University sponsored training provided by EHS is two part series with web courses followed by an in person lab practical generally, class times may vary based on needs and availability/ attendance. A question and answer session is held at the end of the training period, and attendees are encouraged to request clarification as necessary during the presentation.

Annual Refresher Training

Laboratory workers are required to complete refresher training annually per the EHS training policy. This training may be completed on-line via web courses. Topics are updated annually and may include common deficiencies found during laboratory inspections, new additions to laboratory inspection, new policies, exposures, new subject material and concerns from laboratory personnel. Alternately, this training may be completed, during faculty meetings for PI's and laboratory managers.

Laboratory Specific On-the-Job Training

PIs/Laboratory Managers must provide OJT and explain to their laboratory personnel about topics such as:

- Training requirements expected of each laboratory personnel
- General safety procedures such as:
    - What type of PPE to use (e.g., proper gloves for the products that will be used see Appendix N: Glove Selection Chart for assistance)
    - Any restricted activities (e.g., no food or drink in the laboratories)

- Safe practices specific to the activities being performed and applicable safety protocol (e.g., review processes, applicable safety measures and precautions)
- Knowing the location of emergency features and response equipment such as spill kits, emergency drench showers/eye washes, emergency exits and evacuation routes*
- What to do in the event of an emergency (fire, spill, etc.) and how to report emergencies and accidents/injuries

• Location of spill kit/response materials and how to respond to specific chemical spills associated with their work. Provide guidance on what type of spill would require evacuation of the area and/or building
• Security issues associated with the proper handling of hazardous, bio/infectious, and/or radioactive materials
• General knowledge of chemical inventories, hazards posting, requirements for proper transport of chemicals across campus, and medical surveillance program availability
• Sink disposal regulations, labeling and management of chemical waste containers, general reporting requirements, and disposal procedures for chemical waste, broken glassware, bio-hazardous materials, sharps and radiological waste

* The supervisor must ensure that the new laboratory worker has walked to at least two general evacuation routes out of their work areas/floor (to include all the different areas related to their new responsibilities), which do not include use of an elevator. The laboratory worker should be provided with the fire response and evacuation policy/procedure for the University. The supervisor must ensure that they develop special procedures for individuals with disabilities which could hinder their safe evacuation.

Never assume a new laboratory worker understands the purpose of audible alarms, evacuation alarms, etc. and remember that verbal instructions provided over the intercom system will be in English.

Hazmat Personnel Training

In accordance with U.S. Department of Transportation (DOT) regulations (49 CFR Part 172, Subpart H), workers with job functions that directly affect hazardous material transportation safety must complete hazmat training prior to performing such work. Exception: personnel can work for 90 days without the training, provided a hazmat-trained worker directly supervises them. Refresher hazmat training is provided at least once every 3 years. Most UCF personnel are not designated as hazmat workers; typically, the designation is limited to the LSC, and other Environmental Health and Safety staff, environmental and chemical safety staff, and to personnel in the shipping/receiving department. For more information please reference university hazardous materials shipping policy.

Hazmat training includes the following topics: general awareness/familiarization, function specific, safety, and security awareness training. It is provided by EHS or by a qualified third party, and may be conducted concurrently with other safety training. Documentation of hazmat training includes the following:

- Person's name and date of most recent training completed.
- Description, copy or location of training materials used.
- Name and address of the person providing the training.
- Certification that the worker has been trained and tested as required.

Training Records

The central administrative location for LSM training records will be maintained by EHS in the EHSA software. LSM training records belonging to a Department will be maintained in the individual Laboratory Safety Notebook(s), organized in a convenient manner to provide the training record(s) for an individual, research group, or department immediately during any inspection.

OJT must be documented by the PI/Laboratory Manager through the use of the training records tab in the Laboratory Safety Notebook. See Laboratory Safety Orientation Training & Biological Safety Orientation Training Checklist and Appendix B: Employee Laboratory Safety Training Record for record-keeping.

INSPECTIONS AND COMPLIANCE

Inspections

EHS will conduct laboratory inspections to determine individual laboratory compliance with the LSM as identified in Appendix C: Laboratory Inspection Checklist. Provisions for additional laboratory personnel protection for work with particularly hazardous substances including "select carcinogens," reproductive toxins and substances which have a high degree of acute toxicity will be addressed during the Laboratory Hazard Assessment Tool (LHAT) process discussed later in this manual.

Inspections may be performed in conjunction with other EHS audits conducted by Fire Safety, Biological Safety, Radiation Safety, and Laser Safety members dependent on the hazards present. Inspection reports will document inconsistencies per the LSM and opportunities for improvement.

A report identifying laboratory deficiencies and areas for improvement will be directed to the laboratory's Principal Investigator and any applicable Department designee. These items must be corrected within 30 days of receipt of the laboratory inspection report. If the items cannot be corrected in that timeframe, the Principal Investigator must submit a

written corrective action plan detailing the expected corrections and estimated date of completion within the same 30 days. The Principal Investigator may designate a responsible party to submit the report.

Any inspection finding that poses eminent danger (likely to cause a serious hazard, injury, disability or death) must be corrected immediately.

Note: Identical deficiencies noted on subsequent inspections of the same area will be reviewed by the LSC for review and possible follow-up with the Dean, Director or Chair of the department.

Inspection Follow up and Corrective Actions

Laboratory inspection findings listings will be available online for PI, Laboratory Manager and Director or Chair of the Department review and response after the inspection via the Environmental Health and Safety Assistant (EHSA) software. EHS will send a formal laboratory safety inspection report to the PI within seven calendar days of the completion of all rooms on an inspection. A response from the PI with a corrective action for the deficiencies noted therein will be required within 30 days via the EHSA software. EHS will conduct a follow-up inspection within 30 business days to ensure corrective actions are implemented.

Electronic notification to the Chair or Director of the department requesting a correction plan and expected completion date if deficiencies are not corrected will be sent. A second re-inspection will be conducted within 15 business days to ensure corrective actions are implemented.

If no response is received or items are not corrected notification will be sent to the Dean or Vice President of the Department requesting a correction plan and expected completion date if the deficiencies are not corrected. A third re-inspection will be conducted within 15 business days to ensure corrective actions are implemented.

If corrective actions have still failed to be completed a letter of noncompliance and a list of the findings with request for corrective actions will be sent to the Provost and the Safety Council for additional action.

Self-Inspections

Safety inspections generate information regarding laboratory health and safety matters. All laboratories will be required to complete one self-inspection per month using the EHSA software provided by EHS. A copy of this inspection can be found in Appendix D: Laboratory Self-Inspection Checklist. The self-inspection notices will be emailed once a month to different members of the laboratory group for completion. These inspections

should be done with safety in mind and the understanding that this is a self-assessment of the overall safety and compliance of the laboratory.

Laboratory Safety Manual Policies and Procedures

Laboratory Registration

Laboratory registration is the process the University uses to maintain laboratory emergency contacts, identify special hazards or concerns, develop and maintain laboratory chemical inventories, and establish laboratory safety inspections for ensuring compliance with the UCF Laboratory Safety Manual and other laboratory safety programs.

The laboratory registration process requires the Principal Investigator of the laboratory or her/his designee (laboratory manager/supervisor, coordinator, manager, etc.) to complete and submit a current Chemical Inventory, Emergency Contact list and Laboratory Hazard Assessment Tool (LHAT) to EHS.

A. General guidelines on registering traditional laboratory space:

Individual rooms should be registered if:

1. The room is entered from any public access or entrance area (corridor, hallway, etc.)

2. The room is accessed through an adjoining area or room and contains special hazards

(BSL2, BSL3, OSHA regulated carcinogens, lasers, x-rays, radiation, noise hazards, dust hazards etc.)

If the room is part of a series of rooms (i.e., 123, 123A, 123B etc.), only the primary room needs to be registered, as long as the other rooms do not contain special hazards or conditions.

Example: Room 123 includes rooms 123A and 123B. Only 123 needs to be registered unless 123A and 123B contain special hazards or conditions. If 123A or 123B contains special hazards or conditions, then that room will need to be registered separately and in addition to room 123.

B. General guidelines on registering open shared laboratory space:

An open shared laboratory is a large laboratory room shared by multiple research groups.

1. Each Principal Investigator(s) or designee must complete a separate LHAT for their group.

2. Principal Investigator(s) or designee can collaborate and submit a cumulative chemical inventory for the open laboratory (preferred method). Alternately, each researcher can submit their chemical inventory separately.

Sub rooms in the open shared laboratory space must be registered separately if they contain special hazards or conditions, or if the room has its own entrance from a public access or entrance area (corridor, hallway, etc.) (See item A., above.)

Laboratory Hazard Assessment Tool (LHAT) Survey and Analysis

In order to obtain laboratory registration, and be issued a chemical permit the Principal Investigator or designee must complete a Laboratory Hazard Assessment Tool survey and have entered a current Chemical Inventory into the online software provided by EHS.

The LHAT survey identifies emergency contacts, locations of emergency equipment, and any hazards or special concerns specific to each laboratory. EHS will maintain this information in a database and on laboratory safety signs posted outside each laboratory which are used by emergency response personnel.

This hazard analysis is a step-by-step review of the laboratory and it functions to predict hazards and risks to personnel, property and the environment. The hazard analysis also assists in defining control methods needed in the laboratory to prevent exposures to hazards.

LHAT should take place during the laboratory registration process and then is verified annually. When physical conditions, personnel, or processes change in the registered space the PI is responsible for updating the laboratory registration.

EHS is available to assist with registration and completion of the LHAT if questions or concerns arise. The LHAT shall be reviewed by EHS prior to chemical permits being issued or renewed.

Laboratory Safety Signs

Once the registration process is complete and a sign request has been submitted, EHS will issue and mount a laboratory safety sign for posting on the entrance door to the laboratory or immediately adjacent to the door. Multiple signs may be requested where several entrances to a laboratory exist. The registration placard displays the laboratory contact personnel, PPE requirements, hazards located in the laboratory, and displays the "diamond shaped" National Fire Protection Association (NFPA) 704 hazard ratings.

Chemical Permits

A chemical use permit is issued on completion of the LHAT and chemical inventory submittal, and will have the expiration date that signifies the date to verify permit information for the laboratory. EHS will send reminder notices related to updating the laboratories permit annually, but the annual update is the responsibility of the PI or their designee. The laboratory's annual registration review and update provides each laboratory the opportunity to perform a self-evaluation of their laboratory safety using the laboratory safety inspection checklist in Appendix D: Laboratory Self-Inspection Checklist.

Additional permits for radioactive materials, biohazardous materials, controlled substances or laser use are required.

Start-up and Close-Out Procedures

EHS will conduct a laboratory safety PI orientation and check-in assessment to offer assistance on setting up a new laboratory, using the laboratory registration and chemical inventory software. Safety training requirements will be discussed, along with a discussion of rules, regulations, hazard communication/SDS, physical and health hazards, storage and housekeeping, safety equipment, PPE, hazardous waste management, and spill/emergency response plans. This allows EHS to: maintain information on all laboratories and chemicals used, ensure that hazard assessments are completed, and that equipment issues are addressed.

EHS policy requires that each Principal Investigator that sets-up, moves, extensively remodels or vacates a laboratory space contact EHS to ensure the proper decontamination, transportation, and disposal of hazardous materials and to ensure chemicals, hazardous waste, biological waste and other materials are not left behind in the laboratory. See Appendices E and F for more information.

Depending on the renovation, the laboratory may need to repeat the laboratory registration process. Please contact the Laboratory Safety Coordinator at EHS for additional information. Note that renovation to existing laboratory space that includes changes to the building equipment or design (ventilation, electrical, structural) will require a Facilities Improvement Request Form; see http://www.fp.ucf.edu/.

Chemicals no longer needed, but still useable, can be offered to other laboratories within the Department by transferring them in the inventory management software to prevent

them from becoming hazardous waste. They can also be added to the University's surplus chemical redistribution, ReChem, program at EHS where laboratories can request chemicals in the ReChem inventory minimizing the ordering of chemicals and waste generation at the University. The Environmental Protection Agency (EPA) requires that all chemicals must be properly identified and all waste disposed of correctly.

Any unused or unwanted chemicals should be submitted for disposal or recycling using the EHSA software accessed through the EHS website (www.ehs.ucf.edu).

Each department is responsible for making certain that hazards are removed from the laboratory prior to any principal investigator's departure from the laboratory. The PI should review the laboratory close out inspection paperwork in Appendix E: Laboratory Close-out Procedures prior to requesting the close out inspection and signing-off on any laboratory transfer.

Following these procedures will ensure environmental compliance and that the incoming faculty member has a clean, healthy environment in which to work.

Hazardous Chemical Identification

Hazardous substances include, but are not limited to, those chemicals listed in the following:

1. Toxic and Hazardous Substances OSHA 29 CFR 1910;

2. "Threshold Limit Values for Chemical Substances in the Work Environment", ACGIH, 2004;

3. "Sixth Annual Report on Carcinogens", NTP, 1991;

4. "Monographs", IARC, WHO (http://www.iarc.fr/en/publications/list/monographs);

5. SDSs for reproductive toxins and cancer causing substances;

6. Under NFPA 704 NFPA Diamonds and hazard rating any chemical that has a 2 or greater in any category

The Laboratory Standard defines a hazardous chemical as any element, chemical compound, or mixture of elements and/or compounds which is a physical or health hazard.

A chemical is a physical hazard if there is scientifically valid evidence that it is:

- flammable
- combustible liquid

- compressed gas
- organic peroxide
- pyrophoric
- water-reactive
- explosive
- oxidizer
- unstable material (reactive)

A chemical is a health hazard if there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed laboratory personnel. Included are:

- carcinogens
- reproductive toxins
- sensitizers
- neurotoxins (nerve)
- hepatotoxins (liver)
- agents that act on the hematopoietic system (blood)
- irritants
- corrosives
- radioactive material
- biohazards
- nephrotoxins (kidney)
- agents that damage the lungs, skin, eyes, or mucous membranes

In most cases, the label will indicate if the chemical is hazardous. Look for key words like caution, hazardous, toxic, dangerous, corrosive, irritant, carcinogen, etc. Old containers of hazardous chemicals (before 1985) may not contain hazard warnings. Any chemical with an NFPA rating of 2 or higher in any category poses significant hazards.

If you are not sure a chemical you are using is hazardous, review the Safety Data Sheet (SDS) or contact your supervisor, instructor, or the Department of Environmental Health and Safety.

Examples of substances with acute health or physical hazards are listed in Appendices G, H, I, J, and K

Hazardous Chemical Inventory

All laboratories are required to keep an updated copy of their chemical inventory on file with EHS via the university's inventory management software, EHSA. For each hazardous substance in inventory, specific information on any associated health or safety hazards must be made readily available to all laboratory personnel.

Each Principal Investigator (PI) or Laboratory Manager will annually (at a minimum) conduct and document a physical inventory of all hazardous chemicals. This annual verification will be submitted via the database software provided by EHS. The University uses a barcode system for the entire chemical inventory. The inventory must be updated when new containers come in and as containers are consumed.

The chemical inventory must include chemicals used or stored in the work area or laboratory with a *NFPA rating of 2 or greater in any category; flammables, corrosives, compressed gases, toxic, paints, oils, insecticides, herbicides, fertilizers, aquarium products etc.*

See Appendix X: Chemical Inventory Policy for UCF's Chemical Inventory Policy.

Safety Data Sheets

A Safety Data Sheet (SDS) (formally known as Material Safety Data Sheets or MSDSs) is a document containing chemical hazard and safe handling information prepared in accordance with the OSHA Hazard Communication Standard.

Chemical manufacturers and distributors must provide an SDS the first time a hazardous chemical/product is shipped to a facility.

Only SDSs received with the shipment must be retained and made available to laboratory workers. However, you can request an SDS for any laboratory chemical from the manufacturer or distributor.

SDSs must be readily available to laboratory personnel for each hazardous chemical used in the work area. The SDS must contain the following information:

- Chemical and common name
- If a mixture:
    - Chemical and common name of ingredients that are health hazards
    - Chemical and common name of ingredients that are physical hazards
- Physical and chemical characteristics (vapor, pressure, flash point and color)
- Physical hazards, including potential for fire, explosion, and reactivity
- Health hazards, including signs and symptoms of exposure and medical conditions recognized as being aggravated by exposure

• Primary routes of entry into the body

• OSHA Permissible Exposure Limit (PEL), the Threshold Limit Value (TLV), and any other exposure limit used or recommended by the manufacturer

• Indication if the chemical is a carcinogen or potential carcinogen

• Handling procedures including hygienic practices and recommended protective measures during release clean-up

• Personal protective equipment, engineering controls, and work practices

• Emergency and first aid procedures

• SDS preparation date

• Name, address, and telephone number of the SDS preparer

All of the above categories must be completed even if no relevant information is found. The same SDS may be used for several chemicals if they contain similar hazards and ingredients. If additional information concerning a chemical becomes available, it must be added to the SDS within three months.

The responsible party for the laboratory or their designee must maintain a collection of SDSs for all chemicals in the laboratory and ensure that they are readily accessible to all laboratory personnel. The location of the collection must be recorded in the Laboratory Safety Notebook. The location and availability of the collection must be shared with the laboratory personnel. The collection can either be maintained as an electronic or paper copy. The collection should include the laboratory's current chemical inventory and SDSs arranged alphabetically or other manner suitable to locating an SDS readily.

Note: When SDSs are made available electronically, laboratory personnel must be able to access the SDS without requesting them directly from another laboratory worker and there must be a backup system available in the event of power failure or computer network connection failure. An example of a failure would be: SDSonline.com has a network error or power failure. The solution is a battery backup on the computer and an external USB drive that contains all the SDSs. Note EHS pays for a subscription to a SDS database called MSDSonline. Contact EHS at 3-6300 for log in information.

Container Labeling

Manufacturer Containers

Each container of a hazardous chemical received from the manufacturer with a label must have information that gives appropriate identification and hazards of that chemical. The

name and address of the chemical manufacturer or distributor must also be on the label. If a container arrives without the manufacturer's label an appropriate label must be affixed to it. Any secondary container that will be stored over night or out of the users control at any time must also be labeled with the same information that is required on manufacturer's bottles along with the name of the person who prepared it, and the date it was prepared.

Labels must not be removed, except under the following conditions:

- Container is immediately relabeled.

- Chemical in the container is removed, a new type of chemical is placed in the container and the container relabeled with the identity of the new chemical.

Laboratory Samples, Stock Solutions and In-Process Containers

All containers intended for immediate use by the person filling the container must be labeled to identify contents. A rule of thumb is for the container to be labeled by the end of the person's work shift. Best practice is to immediately label containers upon transfer of chemical or after preparation. This requirement includes hazardous and non-hazardous chemicals, biohazardous materials, radioactive materials and wastes generated from the use of these materials.

Hazardous chemicals in the laboratory must be properly and adequately labeled. PIs and/or Laboratory Managers must assure that all chemicals have labels with legible writing that indicate the name(s) of the container's contents and the type of hazard(s). The label must be written in English using chemical names; trade names or chemical formulas are not acceptable as the only identifier on a label.

Labels must include any applicable physical and health hazard warnings, concentration and date of last peroxide test if the material is a peroxide former after exposure to oxygen such as with ethyl ether. See Appendix J: Shock Sensitive and Explosive Materials List and Appendix K: Peroxide Forming Chemical List, Detection and Removal Guidelines for more details.

*Special Labeling Practices:**

- If it is not practical to label a container due to its small size or ongoing use in label-unfriendly condition (oil bath, water bath, furnace, oven, etc.) appropriate information may be placed on a sign next to the container(s) or the container(s) can be placed in labeled tray or other secondary containment.

• Laboratories with large numbers of non-hazardous containers can develop an identification system such as color coded labels for these types of materials.

• Common abbreviations can be listed on a document in the Laboratory Safety Notebook. The document must include the full chemical name represented by the abbreviations.

• Laboratory notebook numbers are acceptable on labels only if the laboratory maintains the notebooks in a clearly visible and accessible location with a posted key that outlines the notebook numbering conventions for that laboratory.

• Chemicals that are time-sensitive or that produce peroxides must be dated indicating the date storage began. See Appendix K: Peroxide Forming Chemical List, Detection and Removal Guidelines of this document for information on common peroxide crystal forming compounds and how to handle them.

*Special Labeling still requires the container identification sheet to have all of the applicable physical and health hazard warnings, concentration and date of last peroxide test if the material is a peroxide former.

Chemicals Developed In the Laboratory

The following requirements apply to chemical substances developed in the laboratory:

If the composition of the chemical substance which is produced exclusively for the laboratory's use is known, the principal investigator must determine if it is a hazardous chemical (e.g., by literature search). If the chemical is determined to be hazardous, the principal investigator must provide appropriate training to protect laboratory personnel.

This does not require the principal investigator to conduct toxicological testing. However, if a Safety Data Sheet or hazard information is available for the chemical, the information must be made available to laboratory personnel.

If the chemical produced is a by-product whose composition is not known, the principal investigator must assume that the substance is hazardous and must comply with the requirements of the LSM.

If the chemical substance is produced for another user outside of the laboratory, the principal investigator must verify whether the substance is hazardous and subject to the requirements of the Hazard Communication Standard (29 CFR 1910.1200) including the requirements for preparation of Safety Data Sheets and labeling.

Chemical Storage

Information from SDSs and container labels shall be evaluated and reviewed with laboratory workers and others affected in order to determine appropriate storage.

The following general guidelines will help with the proper storage of chemicals.

1) Make sure containers are in good condition, capped and properly labeled. DO NOT store unlabeled chemical containers.

2) Store incompatible chemicals separately. Segregate chemicals according to hazard class. Refer to Appendix M: Chemical Compatibility Table.

3) Ensure storage areas are dry, adequately ventilated and properly illuminated.

4) Store highly reactive or corrosive liquids on spill trays.

5) Store 18 inches away from fire sprinkler heads.

6) Do not store chemicals directly on the floor, in hallways, or next to fire exits.

7) Whenever chemicals are transferred from one container to another, observe manufacturer's recommendation for storage and labeling condition. (Note the type of container – glass, plastic, light occluding, etc.).

8) Store gas cylinders away from heat sources. Make sure cylinders are not leaking and label is in good readable condition. Check cylinders for stamped hydrostatic test date (testing should have been done within the past 5 years). Cylinders must be stored securely, strapped in an upright position, valve stem caps in place and no more than one of all necessary gasses for the operation of each instrument and one replacement. No more than 5 cylinders can be strapped in a gang.

9) All containers of hazardous liquids must be stored at a height of no more than 60 inches from the floor. Storage height of hazardous liquids should not exceed 60 inches from floor level.

10) See Biological Safety Manual/ Radiological Safety Manual for storage requirements for biological agents and radioisotopes.

Particularly Hazardous Substances

OSHA requires each employer to identify those activities which the employer believes to be of a sufficiently hazardous nature to warrant prior "employer approval" before implementation. The Laboratory Safety Manual identifies activities which involve extremely toxic chemicals, select carcinogens and reproductive hazards, as well as those activities with a high potential for personal injury and property damage. Supervisors will need to determine if any other existing activities are subject to the requirements of this section. The Laboratory Safety Coordinator is available for assistance.

Prior approval involves the identification of hazards when using highly dangerous materials, the management of risk and the evaluation of pollution prevention/waste minimization. This process is accomplished by completing the LHAT survey in the EHSA and submitting it to EHS for evaluation. Copies of the completed forms should be kept in the laboratory for review by the Laboratory Safety Coordinator or EHS safety inspectors. Laboratory specific SOP's should be created and maintained for particularly hazardous substances.

Below are types of materials where processes need to be evaluated before use. Many are materials that are highly dangerous.

Highly dangerous materials include:

- Reactive, peroxide forming, explosive, select carcinogens, reproductive toxins, acutely toxic materials, and sensitizers.

Specific examples of these chemicals can be found in Appendix G: Hazardous Substances & Particularly Hazardous Substances List, Appendix H: Carcinogen List, Appendix I: Reproductive Hazards List, Appendix J: Shock Sensitive and Explosive Materials List, and Appendix K: Peroxide Forming Chemical List, Detection and Removal Guidelines. Considerations for health and safety should include:

- Use of specific containment devices such as fume hoods or inert atmosphere glove boxes
- Procedures for safe removal of waste materials
- Decontamination procedures
- Specific training for personnel

• Establishment of a designated work area

Designated areas must be established and posted for work with certain chemicals and mixtures which include select carcinogens, reproductive toxins, and/or substances which have a high degree of acute toxicity. A designated area may be the entire laboratory, an area of a laboratory or a device such as a laboratory hood. Designated area labels are available from EHS.

• Additional specific considerations for designated areas may include locking doors, buffer zones, and special authorizations

If you have additional questions regarding this process please contact the Laboratory Safety Coordinator at the EHS office 407-823-5498.

Laboratory Design and Safety Equipment

The considerations below shall be incorporated into all new and renovated laboratory designs in addition to the requirements outlined University Design, Construction, and Renovation Standards. Existing laboratories shall adjust their operations where at all possible to meet the intent of the practices outlined below.

Walls/ Doors/Security

1. The laboratory shall be completely separated from non-laboratory areas. (Indoor research areas must be bound by walls and secured with doors). Exterior research areas must be able to be secured against unauthorized entry.

Having enclosed laboratories will help contain spills, keep unauthorized personnel from entering areas where hazardous operations are performed, etc.

2. The laboratory shall have means of securing specifically regulated materials such as DEA (Drug Enforcement Administration) controlled substances and CDC (Centers for Disease Control) select agents and radioactive materials (i.e., lockable doors, lockable cabinets, etc.).

Having secured hazardous materials storage will keep unauthorized personnel from gaining access to them.

3. The laboratory doors shall be automatically self-closing and provided with vision panels. Such self-closing doors are to be able to be opened with a minimum of effort as to allow access and egress for physically challenged individuals. Be sure to account for the effects of suction forces due to HVAC exhaust.

Windows

1. Operable windows are not permitted by University construction standards. This includes laboratory research areas.

Laboratory areas are carefully balanced for proper air flow. Operable windows would disrupt this balance and place added burden on the HVAC system.

Flooring

1. New construction and laboratory renovations must install flooring that is non-pervious, one piece, and with covings to the wall. This can be achieved by use of glue, heat welded chemical resistant vinyl flooring, sealed and epoxy coated concrete slab, etc.

**Note to laboratories with existing VCT tile flooring it is very important to clean all chemical spills on the flooring immediately, even short term floor exposure can damage VCT tile flooring.*

Floors should be sealed to ensure spills cannot penetrate underneath floors/cabinets. Tiles and wooden planks are not appropriate because liquids can seep through the small gaps between them.

2. Floors in storage areas for corrosive liquids shall be of liquid tight and chemical resistant construction.

Chemical/Waste Storage

1. Chemical storage shelves shall not be placed above laboratory sinks.

2. All shelves must have a passive restraining system such as shelf lips (3/4 inch or greater). The shelves themselves must be firmly fixed so they cannot be vibrated out of place and allow shelf contents to fall.
Installation of lips on shelving areas will prevent stored items from falling.

3. Sufficient space or facilities (e.g., storage cabinets with partitions) shall be provided so that incompatible chemicals/gases (waste and non-waste) can be physically separated and stored with secondary containment as needed. Fume hoods are not approved for long term storage. Floor storage should be avoided where at all possible.

This will be based on the chemical inventory and use projection provided by the Principal Investigator to the project and EHS. If the project scope cannot provide sufficient storage the user must develop a written management control plan to include as part of their local Laboratory Safety Manual.

Materials which in combination with other substances may cause a fire or explosion, or may liberate a flammable or poisonous gas, must be kept separate. When designing the shelves, it is important to factor in enough space for secondary containers. It is

recommended that solvent storage not be located under the laboratory fume hood, as this is a location where fires are most likely to occur in laboratories.

All laboratories should be designed to conveniently and safely accommodate the temporary storage of biological, radiological, and chemicals (non-waste and waste) based on laboratory use projections. Wastes are generally stored in the laboratory in which they are generated.

4. Cabinets must be equipped with positive locking door latches.

Examples include barrel bolts, safety hasps, and child-proof locks. These latches will not allow the cabinet door to open unless the locking mechanism is triggered. Magnetic or pinch-grip catches are not considered "positive locking" and hence should not be used.

For sliding glass doors, affix decals near handles stating "Keep Doors Closed".

Furniture Design, Location and Exit Paths

1. All furniture must be sturdy. All work surfaces (e.g., bench tops, counters and chairs) must be impervious and resistant to the chemicals used. The counter top should incorporate a lip to help prevent run-off onto the floor. Particle board construction is not recommended in areas where dampness or spills may be present such as hoods, sinks, safety showers, etc.

For example, many microbiological manipulations involve concurrent use of chemical solvents such as formaldehyde, phenol and ethanol as well as corrosives. The laboratory bench must be resistant to the chemical actions of these substances and disinfectants. Wooden bench tops are not appropriate because unfinished wood surfaces can absorb liquids. Also, wood burns rapidly in the event of a fire. Fiberglass is inappropriate since it can degrade when strong disinfectants are applied. Fiberglass also releases toxic smoke when burned.

2. Vented cabinets with electrical receptacles and sound insulation should be provided for the placement of individual vacuum pumps, where their use is anticipated. A one- to two-inch hole for the vacuum line hose from the cabinet to the bench top should be provided.

3. The laboratory shall have a minimum aisle clearance of 36 inches between fixed equipment and furnishings with allowances for stools where seating is allowed. Main aisles used for emergency egress must have a full clearance width of at least 36 inches with increases as dictated by ADA and building codes.

Clearing aisles and exits are necessary to facilitate departure in the event of an emergency. In practice, laboratory aisles must be designed wider than 36 inches so that even with the presence of laboratory stools and other miscellaneous items, a clearance of 36 inches is always maintained.

4. A pathway clearance of 36 inches with increases as required for ADA and building codes must be maintained at the face of the access/exit door.

Laboratory benches must not impede emergency access to an exit. This is also applicable to placement of other furniture and appliances such as chairs, stools, refrigerators, compressed gasses, etc.

5. Designated storage space should be provided for lab carts. Storage of loose rolling carts and chairs are not permitted in exit corridors. Locations in laboratory workspaces must not reduce width of aisles to less than code-required widths.

6. Furniture design must comply with basic ergonomics and UCF Standards.

7. Laboratory shelving should NOT be installed at a height greater than 2 meters and distances which require workers to reach 30 centimeters above shoulder height and extend arms greater than 30 centimeters while holding objects 16 kg or less when standing on the floor or on a 12 inch step stool.

8. The space between adjacent workstations and laboratory benches should be 5 ft. or greater to provide ease of access. In a teaching laboratory, the desired spacing is 6 ft. Bench spacing shall be considered and included in specifications and plans.

9. Laboratory desks should be located near exit ways and in the path of fresh supply air. Hoods and chemical and gas storage areas should be located remotely from the room exit door. Additional exits may be required based on laboratory size and layout. This will ensure that in the event of an emergency, laboratory personnel working in “clean” areas (i.e., their desk) do not have to pass through more hazardous areas to exit the laboratory.

Maintainability

1. The laboratory shall be designed so that it can be easily cleaned. Bench tops must be a seamless one-piece design to prevent contamination and be in compliance with University Standards. Laminated bench tops are not suitable. Penetrations for electrical, plumbing, and other considerations must be completely and permanently sealed. If the bench abuts a wall, it must be coved or have a backsplash against the wall. Walls should be painted with washable, hard, non-porous paints.

2. Spaces between benches, cabinets and equipment must be accessible for cleaning and allow for servicing of equipment.

Laboratory furniture must have smooth, non-porous surfaces so as to resist the absorption of liquids and the harsh effects of disinfectants. Furniture must not be positioned in such a manner that makes it difficult to clean spilled liquids or conduct routine maintenance. For example, positioning a Class II biosafety cabinet in a limited concave space might not allow the biosafety cabinet certifier to remove panels of the cabinet when recertifying the unit.

Break rooms

1. The design of the laboratory building must incorporate adequate additional facilities for food storage/consumption and personal hygiene tasks separate from the laboratory areas.

Mechanical, Electrical and Plumbing Considerations

1. The laboratory work area where chemicals are present shall be negatively HVAC balanced with respect to adjacent non-laboratory areas in accordance with NFPA requirements. Return and recirculation of laboratory air where chemicals are present is not permitted.

2. Fire sprinklers are required in all new and renovated NFPA 45 laboratory spaces.

3. Laboratory areas shall provide adequate natural or artificial illumination to ensure sufficient visibility for operational safety. Energy conservation devices that effect room and hood exhaust should not rely solely on connections to lighting controls. The hazards are potentially still present despite the lightning or workers position.

4. GFI protection to electrical receptacles above counter tops and within 6 feet of sinks must be provided.

5. The laboratory should be fitted with an adequate number of electrical outlets and circuits, which can accommodate electrical current requirements with an additional 20-40% capacity.

The laboratory may have several pieces of equipment, which require large amounts of electrical current. Such items include freezers, biosafety cabinets, centrifuges and incubators. The room design must take into consideration concerns such as electrical demand prior to occupancy to avoid a potential power failure.

6. Each laboratory work area shall be provided with emergency shut off valves and electrical shunt trips as outlined by the University Construction Standards. Additional protective measures to be incorporated where deemed necessary by the Department of Environmental Health and Safety. These may include special hood liners, blast shields, compressed gas cabinets, etc.

In the event of an emergency, the laboratory may be unsafe to enter. Hence, the valves for gas and vacuum lines should be located outside the lab.

7. Sink drains where mercury is likely to be used should have traps that are transparent (e.g., made of glass) and easy to inspect or have drain plugs to facilitate mercury spill control.

8. Each laboratory must contain a sink for hand washing.

Exposure to hazardous materials and/or pathogenic organisms can occur by hand-to-mouth transmission. It is extremely important that hands are washed prior to leaving the laboratory. For this very reason, the sink should be located close to the egress.

9. Laboratory sinks shall have lips that protect sink drains from spills.

Sink lips or berms should be ≥0.25 inches and designed to completely separate the laboratory bench or fume hood work area from the sink drain.

10. Combined safety shower and eyewash units are required to be accessible from all spaces where hazardous chemical are dispensed, used or stored. Locations to be in accordance with ANSI standards and approved by the Department of Environmental Health and Safety. Common area locations are preferred where possible for ease of access and improved visibility.

Control Measures

Whenever laboratory personnel exposures exceed the action level (or in the absence of an action level, the lower limit of the PEL or TLV), the Department must implement control measures to reduce laboratory personnel exposure to hazardous chemicals including engineering controls, the use of personal protective equipment and hygiene practices. Exposures to extremely toxic materials, select carcinogens and reproductive toxins must be maintained as low as reasonably achievable (ALARA).

Ventilation Requirements:

Laboratories are required to maintain negative air pressure, single pass air no recirculation in the laboratory, and no recirculation of air to the building if storage or use of hazardous chemicals is intended.

Fume hoods must be used for work with hazardous vapors, dust, and fumes. The face velocity of the hood averages 100 linear ft./min. (lfm). Face velocities may be adjusted by the hood sash position and the sash position should be marked to indicate where acceptable flow rates exist.

Users of hazardous chemicals are responsible for determining that fume hoods and other protective equipment are adjusted and functioning properly prior to initiating an activity requiring their use. Please be aware of the different types of local exhaust and containment devices and what their limitations are. All fume hood installations include a

continuous monitoring device to allow users to monitor hood performance. Do not override hood monitoring devices.

EHS will survey chemical fume hoods biannually. Call Work Control at 3-5223 if you have questions or wish to report a problem. If it is suspected that there is inadequate face velocity, then work in the hood must stop and EHS must be contacted immediately. Likewise, if the low flow alarm is sounding or the continuous monitoring device is showing "low flow," Facilities Operations or EHS must be contacted.

The following apply to the use of fume hoods:

- The fan must be kept on whenever a chemical is inside the hood, whether or not any work is actively being done inside the hood.
- The hood sash should be kept closed at all times unless manipulations of chemicals are being done within the hood.
- Work should be performed a minimum of 6 inches from front edge of fume hood.
- When working in a fume hood with a vertical opening sash, the sash should be kept no higher than 18 inches from the closed position.
- Any operations that generate hazardous vapors, dusts or fumes should only be conducted under the fume hood to prevent exposure.
- The interior of the hood should contain as few items as possible. Chemicals, equipment and other materials should not be stored in hoods or in front of the hoods. This can cause blocked vents or alter airflow patterns which will affect the hood's overall performance.

Safety Showers and Eye Wash Stations

Eye wash stations and safety showers should be accessible within 10 seconds or less. For strong acids or caustics, eyewash fountains should be adjacent to, or within, 50 feet (15 meters) of the hazard. Access to eyewash fountains and safety showers must not be restricted or blocked by temporary storage of objects or in any other way and a clearance of 24 inches from the center should be maintained at all times. If eyewashes and safety showers are not readily available, difficult to access or inoperable, EHS should be contacted.

Eyewash units should be flushed and inspected monthly by laboratory personnel to test functionality and clear contaminants from the water lines. Safety showers are activated periodically by Facilities Operations personnel to ensure adequate performance. Documents posted by the eyewash stations and showers must be dated and initialed upon testing.

Fire Safety Equipment

Fire safety equipment must be easily accessible to the laboratory and include a fire extinguisher (type ABC) available within 75 feet of hazard or 50 feet from high hazard, and may include fire blanket or safety shower. Fire extinguishers provided by EHS are certified annually by EHS vendor.

Laboratory personnel shall maintain fire sprinkler clearance requirements as outlined in the Fire Safety and Prevention training. In cases of clothing fires where no fire blanket is available, please use the "stop, drop, and roll" method or the closest safety shower to put out clothing fires.

Additional Safety Equipment

In addition to fume hoods, eye wash stations, and safety showers, the laboratory must have available the following items:

- First aid kit meeting the requirements of ANSI Z308.1-2003

Any facility having general hazardous chemicals will be given a universal spill kit.

Any facility having oil will be given an oil spill kit.

Any facility having radiological materials will be given radiation decontamination supplies.

Any facility having hydrofluoric acid is required to maintain a hydrofluoric acid spill kit and maintain a stock of calcium gluconate gel.

Personal Protective Equipment

PPE is not used to substitute for engineering, administrative controls or safe-work practices. It is to be used in conjunction with these controls. The PI, with the assistance of the LSC or EHS, should perform a hazard evaluation to determine which PPE is required for each laboratory task.

PPE requirements are covered during laboratory safety training and must be followed by all laboratory personnel and visitors to the laboratory. Any deviations from the PPE requirements covered during laboratory safety training are to be documented within the Standard Operating Procedure (SOP) for each task.

SOPs should include methods used to implement control measures for reducing laboratory workers' exposures to hazardous chemicals and materials.

Departments shall provide laboratory personnel the proper PPE used for their specific tasks. PPE must also be replaced when damaged or when the manufactures recommended hours of use have been exceeded. Laboratory personnel must use them as trained to reduce risks of an injury and/or illness.

PPE Hazard Analysis forms may be downloaded from EHS (reference the University's LHAT). Additional information can be obtained by reviewing the OSHA Personal Protective Equipment Standard, 29 CFR § 1910.132.see Appendix T: Table of Reference Standards for Various Activities

PPE is required at all times while in the laboratory and includes, but may not necessarily be limited to:

- Safety glasses or safety goggles
- Laboratory coat or other suitable clothing which covers the arms and legs completely (long sleeved shirt and long pants)
- Closed-toe shoes

PPE required to be used at all times when handling potentially hazardous chemicals, reproductive toxins, carcinogens, and sensitizers in the laboratory includes, but is not limited to:

- Appropriate gloves
- Approved respirators in the absence of adequate ventilation, e.g., glove boxes or fume hoods
- Hearing protection devices may be required if noise hazards are present in the laboratory.

Gloves

PPE for protection of the hands is recommended when laboratory personnel are exposed to hazards of skin absorption of harmful substances, chemical burns, abrasions, cuts, punctures or extreme temperatures. Not all types of gloves will meet all types of hazardous situations. Glove selection is carefully evaluated based on the characteristics, duration and conditions of each hazardous situation (See Appendix N: Glove Selection Chart). Latex gloves have been proven to cause latex allergies; therefore, nitrile gloves are recommended as a substitute by National Institute for Occupational Safety and Health (NIOSH). Always inspects your gloves before use for holes, rips, degradation or

contamination. Always be mindful of the manufacturer's hours of use for the gloves and chemicals being used. When it is time to replace your glove, dispose of used gloves that are grossly contaminated as environmental hazardous waste. Gloves that are not grossly contaminated may be disposed of as regular laboratory trash.

Protective Clothing

Long sleeve shirts are recommended. Shorts, skirts or other type of clothing which leave skin exposed to chemical contact shall not be worn. Sandals or any type of shoe that partially exposes the feet shall not be worn in any laboratory. Any clothing item that becomes contaminated with chemicals must be decontaminated before reuse.

Synthetic materials can be a hazard in the laboratory. Always be mindful of the type of material you are wearing whether they are your street clothes or the PPE that you have chosen. Many synthetic fabrics are highly flammable or not flame retardant, and some synthetic fabrics or materials can lose form or change shape when they come in contact with solvents or corrosive material. Please check SDSs and PPE manufacturers' specifications before choosing your PPE.

Protective Eyewear

PPE for eye or face protection is recommended when laboratory personnel are exposed to hazards of flying objects, projectile particles, liquid chemicals, acids or caustics, chemical gases or vapors, or injurious light radiation. Protective eyewear shall meet American National Standards Institute (ANSI) Z87.1 standard. At a minimum, to walk into any of the laboratories that fall under the LSM, you must be wearing safety glasses. There are many types of eye protection: safety glasses, safety goggles, face shields and mini masks. Please consult your SDSs and supervisor for assistance in choosing the correct eye protection.

Respiratory Protection

Under ordinary conditions, respirators should not be necessary in the laboratory. Consult with EHS before using respirators, including "dust masks." The wearer may need to enroll and complete a physical exam, fit testing and training. If a respirator is thought to be needed, call EHS to request a hazard assessment.

Where the use of respirators is necessary to maintain exposure below permissible exposure limits (PELs) or the Threshold Limit Values (TLVs), whichever is lower, the Department must provide to the laboratory worker the proper respiratory protective equipment at no cost. Respirators must be selected and used in accordance with the

requirements of the University of Central Florida Respiratory Protection Program (contact EHS for additional information). Use of an air purifying respirator should not be the first option in protection. The use of engineering controls (i.e., chemical fume hoods, biological safety cabinets, glove boxes) should be explored first. The use of an air purifying respirator is suggested, or any derivative of said respirator, only where applicable engineering controls cannot be used to provide proper respiratory protection.

Hearing Protection

Hearing protection devices, such as earmuffs or earplugs, may be necessary to maintain a worker's exposure to noise below permissible exposure limits. These Permissible Exposure Limits (PELs) vary according to duration and decibel. Departments may request a noise evaluation by contacting EHS. Any worker using hearing protection devices must comply with the UCF Hearing Conservation Program.

Cryogenic Protection

When handling cryogenic hazards, at a minimum, wear safety goggles, face shield, cryogenic gloves and protective clothing that cover the arms and core of the body.

Environmental Monitoring

Air Quality

The quality of air in the laboratory environment, and its potential to affect human health, is a great concern to laboratory personnel and those who occupy spaces in proximity to research and teaching laboratories. Great vigilance should be applied to ventilation and air monitoring. Reliance on the sense of smell in order to determine the presence of a contaminant is not acceptable.

Air Contaminants

The Department of Environmental Health and Safety recommends periodic air sampling for all laboratories that use chemicals which present acute or chronic toxic inhalation hazards in accordance with subpart Z. More specifically, the Occupational Health and Safety Administration states that exposure to any substance listed in Tables Z-1, Z-2 and Z-3 of 29 CFR part 1910 subpart Z shall be limited. See Appendix L: OSHA Z-Table List for more details.

Many factors are responsible for the effects of chemicals on our bodies. The most important factor that determines the safeness or harmfulness of any substance is the dose (amount) the body absorbs. The amount of a chemical absorbed is a function of the duration of exposure to the chemical, the concentration of the chemical and how often exposure takes place. The effect of a chemical on the body may produce either acute or chronic toxicity. Acute toxicity results in conditions that are readily apparent. Chronic toxicity usually does not produce effects until exposure has continued for some time. A single chemical may produce both acute and chronic effects.

Medical Surveillance

All laboratory personnel who work with hazardous chemicals have the opportunity to receive medical attention, including follow-up exams, under the following circumstances:

- When a laboratory worker develops signs or symptoms associated with a hazardous chemical that they may have been exposed to, they should receive an appropriate medical exam.
- When an event such as a spill, leak or explosion occurs resulting in the likelihood of a hazardous exposure, medical consultation should be provided to determine the need for a medical examination.

Recordkeeping

Each laboratory must maintain the recordkeeping tab in the Laboratory Safety Notebook. This tab must contain the following information and its most recent updates:

SOPs, Training Records, OTJ Training Records, Evacuation Plan, Accident/ Incident/Near miss records, PI Approvals for Sole Occupancy, PI Approvals for Unattended Operations and copies of EHSA forms and documents (LHAT, Worker Registration, Annual Chemical Inventories, and Self-Inspections)

After Hours Work/Sole Occupancy/Unattended Operations

UCF business hours are Monday through Friday from 8am to 5pm. UCF laboratory personnel are not permitted to work after these hours in the lab, unless prior approval of the PI or Department Chair is given. In situations where after hours work is approved, laboratory personnel will need to work with at least one other member of their laboratory unless sole occupancy is approved by the PI. They may also work with their Departments and PI/Laboratory Manager on a verbal notification system to verify time in/time out with a scheduled check-in call to make sure no hazardous incident has occurred.

Unattended operations are not permitted unless prior approval from the Department, Laboratory Manager or PI is given. The person responsible for the operation will review work procedures to ensure for the safe completion of the operation. An appropriate sign

describing the hazards of the operations running unattended will be posted at all entrances to the laboratory. An apparatus (or area surrounding apparatus) with hazardous chemicals must be labeled to indicate content. When possible, the overhead lights in the laboratory will be left on. The person responsible for the operation will return to the laboratory at the conclusion of the operation to assist in the dismantling of the apparatus.

Basic Laboratory Safety Practices

The Principal Investigator is responsible for safety in the work area. Each laboratory worker must assume individual responsibility for conducting procedures in a safe and proper manner. The following are minimum guidelines for laboratory workers to follow:

- Develop and encourage safe work practices.

- Know the materials that are used (e.g., chemical, biological, radioactive). Refer to the written laboratory standard operating procedures (SOPs) and review the safety data sheets (SDSs) for chemical information. Consider the toxicity of materials, the health and safety hazards of each procedure, the knowledge and experience of laboratory personnel and the safety equipment available.

- Limit access to restricted areas by posting warning signs and access criteria as appropriate.

- Know the location of safety equipment (fire extinguishers, eyewash/safety shower, spill kits, etc.).

- Always wear appropriate clothing and Personal Protective Equipment (PPE) in the laboratory. Remove PPE (safety glasses, laboratory coats, gloves, etc.) before leaving the work area. Contact EHS for additional information on the proper use of PPE.

- Avoid working alone in the laboratory. Any individual who plans to conduct potentially hazardous operations in the laboratory should make arrangements to have another member of their laboratory present while these activities take place.

- Eating, drinking, smoking and applying cosmetics are prohibited in a laboratory. Do not store food in laboratories or laboratory refrigerators.

- All chemicals must be labeled according to the University's labeling requirements and stored properly.

- Work with volatile hazardous chemicals in a properly operating chemical fume hood.

- Know the evacuation procedures for the work area.
- Do not use hallways as storage areas. Access to exits, emergency equipment and controls must not be obstructed.
- Follow approved procedures for hazardous chemical, radioactive and biomedical waste disposal. Contact EHS for more information.
- Keep work area clean and uncluttered at all times.
- Gas cylinders must be secured at all times. Empty gas cylinders must also be properly stabilized.
- Avoid "routine" exposure.
- Avoid unnecessary exposure to chemicals by any route and encourage proper personal hygiene (i.e., wash hands prior to leaving laboratory area).
- Do not smell or taste chemicals.
- Vent any apparatus that may discharge toxic chemicals (vacuum pumps, distillation columns, etc.) into local exhaust devices.
- Test inert atmosphere glove boxes and inspect the gloves before use.
- Do not allow release of toxic substances in cold or warm rooms, since these contain recirculated atmospheres.

Eating, Drinking, Smoking, Use of Cosmetics and Storage of Personal Items

Many institutions including the National Research Council and the Centers for Disease Control and Prevention agree that eating, drinking, smoking, gum chewing, applying cosmetics and taking medicine in laboratories where hazardous chemicals and materials, including unsealed sources of radioactive materials and biological hazards, are used **must be strictly prohibited**. Food, beverages, cups and other drinking and eating utensils are not to be stored in laboratories where hazardous chemicals and materials or radioactive materials are handled or stored. Personal items (backpacks, cellphones, wallets, extra clothing, etc.) may not be stored on hazardous materials' work areas.

Additionally, contact lenses should not be handled in locations where hazardous materials are present.

Each Department should designate areas within laboratory buildings accessible to all laboratory workers where these activities (food, drink, gum chewing, etc.) are permitted. Prohibitions related to the use of hazardous materials in these designated locations must be communicated to all laboratory personnel and the requirement must be enforced.

Refrigerators, freezers, ovens, microwaves and similar appliances in laboratories used to store or process food or beverage for research or testing purposes must be labeled with the terms "FOOD AND BEVERAGE NOT FOR HUMAN CONSUMPTION" or an equivalent marking." Food and Beverage for human consumption is prohibited in laboratories.

Broken Glass

Only broken glass that is not grossly contaminated with chemical residue can be handled in the following manner: the glass should be carefully picked up using forceps or a broom and dust pan and placed in a container such as a cardboard box (or other designated substantial container such as a plastic container designated for broken glass) and clearly labeled as broken glass. Please do not place broken glass in ordinary trash containers as it presents a potential risk to those that handle it. Please check with your department on their policy and procedure for disposal of broken glass. Sealed boxes with broken glass must be labeled "Broken Glass" and can be placed within the regular trash for building custodial or placed directly in the dumpster.

Broken glass grossly contaminated with chemical residue or with biohazardous or radioactive material should be disposed of in a rigid, puncture proof container and labeled for proper disposal in the appropriate waste stream.

Publications

There are many excellent publications containing guidelines for the safe conduct of laboratory work, such as *Safety in Academic Chemistry Laboratories* published by the American Chemical Society, and *Prudent Practices in the Laboratory: Handling and Disposal of Chemicals*, published by National Research Council. These publications are concise, readable and oriented toward academic laboratories. They are recommended reading for all laboratory personnel. Consulting other safety information resources is encouraged. Review the references in Appendix Y: References, or contact the Laboratory Safety Coordinator for additional sources.

The following basic safety practices apply to all laboratories. Each laboratory must include any specific practices pertaining to Standard Operating Procedures used in that particular lab (see Appendix P: Laboratory Standard Operating Procedures Guidelines and Template).

General and Lab Specific Standard Operating Procedures

General/Common SOPs

THIS SECTION INTENTIONALLY LEFT BLANK.
TO BE DEVELOPED AND POSTED ON UCF EHS SOP WEB SITE

Laboratory Specific SOPs

Each Principal Investigator (PI)/Laboratory Manager holds the responsibility of preparing written Standard Operating Procedures (SOPs) for laboratory activities involving highly hazardous chemicals or instrumentation that has potential physical hazards. SOPs can be procedure or process specific (i.e., distillations, reactions, syntheses), hazardous chemical specific (i.e., hydrofluoric acid, formaldehyde, benzene), or hazard class specific (i.e., acids, bases, flammables, reactives, oxidizers). The Laboratory Safety Coordinator will work with the PI/ Laboratory Manager in determining if an SOP is needed. The Chemical Inventory database and LHAT will be used for this determination. In the event of a new procedure or a change in procedure involving chemical use, a new SOP must be written or the previous SOP revised.

Instructors must provide teaching assistants with SOPs regarding experiments conducted in class and this information must be passed on to the students. This is important in the event that a student may have particular health issues that need addressing.
Examples of SOPs are available for use on the EHS website. An SOP form is provided in Appendix P: Laboratory Standard Operating Procedures Guidelines and Template. Specific items in the SOP may include, but are not limited to:

*Names of the chemicals used in the procedure
*Research procedures when using hazardous chemicals
*Hazards associated with exposure to chemical
*Personal hygiene procedures to reduce exposure
*Engineering controls to include ventilation requirements and the presence of eyewash and emergency shower stations
*Use of personal protective equipment
*Hazardous waste handling and disposal procedures
*Laboratory personnel training
*List of all emergency equipment, their locations and emergency contacts
*Decontamination procedures in case of a spill or exposure
*Extremely hazardous chemicals are to have access restrictions and special training for those with access

SOPs must be made available to laboratory personnel. New laboratory personnel must read the SOPs specific to the activities they will be conducting. New laboratory personnel must

be informed of hazards that exist in the laboratory and participate in both annual Safe Laboratory Practices training and Research Laboratory Safety training. See Appendix P: Laboratory Standard Operating Procedures Guidelines and Template for SOP template.

Laboratory Waste Management and Disposal

Laboratory operations that produce waste chemicals are considered as producing hazardous waste. Hazardous waste is regulated by The Florida Department of Environmental Protection (FDEP). All laboratory personnel who produce hazardous waste are required to manage their waste according to UCF's Laboratory Waste Management procedures. State and federal law require the University to manage its hazardous waste. Failure to manage hazardous waste properly may result in criminal prosecution and heavy fines. See Appendix U: Laboratory Environmental Management Procedures for the UCF Laboratory Waste Management and Disposal Procedure.

All laboratory personnel who physically place hazardous waste into designated hazardous waste containers are required to complete Hazardous Waste Management training available through EHS. Annual retraining is provided during the Laboratory Safety Refresher class.

Shipping and Receiving Hazardous Materials/Dangerous Goods (HM/DG)

No person may receive HM/DG without function-specific training. Training must be documented and must be included in the laboratory worker's EHS training records. No person may ship or offer to ship HM/DG unless that person has received certified US DOT training for shipping hazardous materials.

Shipments or offers to ship HM/DG by air also require certified International Air Transport Association (IATA) regulations training. All training must be current per regulation, must be documented and must be included in the laboratory worker's EHS training records. Shipping of HM/DG may be completed by a properly trained and certified third-party freight forwarder if one is available. Shipping, or offering for shipment, shall include any outbound shipment from or inbound shipment to UCF being made on behalf of or for UCF. This includes but is not limited to: shipments of HM/DG from off-campus locations or persons to any campus location or person, or to any permanent or temporary UCF-affiliated off-campus location or person.

See Appendix V: Hazardous Materials Shipping, Receiving and Transportation for more information on shipping and receiving hazardous materials or contact EHS.

Chemical Incident and Emergency Procedures

Spill Prevention and Control

The first and best spill control method is spill prevention. Using the proper equipment, storage and handling techniques can usually prevent spills and inadvertent releases.

Specific suggestions for preventing spills and inadvertent releases are:

− Provide a physical arrangement that permits easy manipulations and material transfers
− Leak-test the system before introducing flammables or toxics
− Make practice runs with inert or non-hazardous materials as a final check
− Use secondary containment

A thorough hazard evaluation including potential spill assessment should be conducted prior to starting a new experiment or project.

• *Preparation:* Laboratory managers, principal investigators and other laboratory personnel shall assure they are knowledgeable regarding the locations and use of the following:

− Main electrical circuit shut-off for specialized equipment
− Main gas shut-off
− Fire extinguishers
− Spill control materials
− Personal protective equipment
− Emergency response contact list
− Written emergency response procedures for that location.

• *Containment:* Provide for containment of spills as a backup to the steps described above. Trays or catch-pans under an apparatus where leaks or spills may occur greatly simplify the clean-up problem. Containers should be large enough to contain the maximum possible spill.

See Appendix W: Chemical Release Procedures.

Injuries and Illnesses

For minor cuts, burns, etc., follow first-aid procedures. If necessary, follow up with a visit to the Health Clinic or physician. If a serious injury or illness occurs, immediately dial 911 and then notify the laboratory manager. Give your name, describe the nature and severity of the medical problem, and the location of the victim.

Apply the following guidelines as appropriate:

• Keep the victim still and as comfortable as possible – DO NOT MOVE THEM unless the hazard presented by remaining in a specific position or location outweighs the potential hazards of moving or attempting to move them. An example of such a condition would be an individual who has been overcome ("passed out") in a room on fire, in which it is clear that the fire is spreading rapidly and could very likely kill the victim.
• If possible, find out what the victim feels/thinks is wrong
• Look for an Emergency Medical ID
• Apply first aid if possible|
• Attempt to comfort the victim until help arrives

If you are a witness to an injury or illness, your willingness to provide information to responding emergency crews is extremely important.

Laboratory/Studio Near Miss and Incident Reporting

A Laboratory Incident report form must be completed by the PI/Lab Manager/Teaching Assistant/Instructor for any incident that occurs in any University of Central Florida System affiliated teaching or research laboratory/studio or field research project. Incidents include near misses, serious injuries or emergencies such as fires and chemical spills. An incident means any unplanned event within the scope of a procedure that causes, or has the potential to cause, an injury or illness and/or damage to equipment, buildings or the natural environment. All incidents need to be reported whether they are near misses, serious injuries or emergencies such as fires and chemical spills. A near miss is an event or situation that could have resulted in an accident, injury or illness but did not either by chance or through timely intervention.

The completed form must be submitted to EHS within 24 hours of the incident. These reports will provide the University Laboratory Committee and EHS with information needed to evaluate laboratory procedures and help prevent reoccurrences of similar incidents. As part of this report, EHS will complete an incident investigation. See Appendix Q: UCF Report of Accident/ Near Miss Procedure for more information.

Due to medical privacy concerns, no personal identifying information of the person involved in the incident shall be entered or submitted with the form.

Preparing the Laboratory for Severe Weather

Departments are responsible for taking protective actions in their own laboratories. The checklist in Appendix R: Hazardous Weather Preparation Checklist is designed to identify suggested tasks and assignment of responsibilities for preparing laboratory areas. Not all items are appropriate for all areas. Departments and researchers should add actions specific to their individual laboratories if needed. The checklist should be completed as a part of the Departmental Tropical Weather Response and Recovery Plan.

When impacts from tropical weather are possible, consider necessary preparations to suspend ongoing experiments involving biological materials, radioactive agents and hazardous chemicals. When UCF suspends normal operations and postpones operations in the laboratory, secure equipment and complete the checklist. Note: personnel should not stay in the laboratory during a storm if UCF has suspended normal operations.

Additional mitigation steps can be taken year-round to reduce impacts from tropical weather and other incidents, including:

- Keep chemical, radiological and biohazardous materials in your inventory to a minimum
- Dispose of hazardous wastes and old chemicals routinely to minimize accumulation of hazardous materials in your facility
- Laboratories with exterior windows should identify a secure area for storage of water reactive chemicals, radioactive materials and biohazardous agents. Ideally, materials with significant potential hazard should be moved to interior rooms. (e.g. – solvents containing reactive metals, glove boxes containing air reactives)
- If dry ice will be needed pre- or post-incident, document vendor information, payment method and delivery or pick-up options (Note: dry-ice should not be transported in a closed vehicle for safety of the occupants)
- Maintain a supply of plastic, waterproof containers to store reactive chemicals, lab notes, research documentation, electronic data and other important materials
- Plan in advance how to ensure the protection of valuable research equipment, samples and data
- Contact UCF Work Control or appropriate property management if planning to use portable generators to determine appropriate and safe use, connection and fueling (Note: portable generators are normally not provided by Work Control)

- Maintain a stock of critical supplies to prevent disruptions
- Update and distribute emergency and contact information to laboratory personnel. Regularly maintain emergency call list with EHS and in the Laboratory Safety Notebook.

EHS202 Laboratory Safety Practical Training Checklist

Name: _____ **Date:** _____ **Training Type:** ***Initial*** ***Transfer***

UCF ID (PID): _____ **PI/Supervisor:** _____ **Department:** _____

This checklist will be used to assist employers with the laboratory-specific training requirements for new lab workers outlined in the Laboratory Safety Manual. Check each box as you learn about each topic on the video. If necessary, ask your PI to provide more information. Sign the form, then upload the form to the course assignment.

Building Safety:

- ☐ Fire Extinguisher
- ☐ First Aid Supplies
- ☐ Safety Shower
- ☐ Fire Alarm
- ☐ Emergency Signage/Exits
- ☐ AED
- ☐ Eye Wash
- ☐ Evacuation Plans

Laboratory Signage:

- ☐ UCF Specific Lab Rules
- ☐ Lab Contact Info
- ☐ NFPA Diamond
- ☐ Lab Storage/Break Areas
- ☐ Lab Security

Engineering Controls:

- ☐ Ventilation
- ☐ Fume Hood/Snorkel/Gas Cabinet
- ☐ Cylinder Restraint
- ☐ Cabinets/Flooring
- ☐ Fire Sprinkler System
- ☐ Biosafety Cabinet
- ☐ Electrical Panel/Shut Off
- ☐ Hand Washing Sinks
- ☐ Gas Valves/Shut Off

Administrative Controls:

- ☐ Signage/Warning Labels
- ☐ Inspections
- ☐ Training
- ☐ Background Checks
- ☐ UCF Policies & Procedures
- ☐ SOPs
- ☐ EHS Department
- ☐ Lab Safety Manual

Personal Protective Equipment:

- ☐ UCF Minimum Requirements
- ☐ Glove Selection
- ☐ Lab Coats/Apparel
- ☐ Eye Protection
- ☐ Respiratory Protection
- ☐ Temperature Protection

UCF Standard Operating Procedures:

- ☐ Safety Data Sheets (SDS/MSDSs)
- ☐ Procedures for use of cryogens
- ☐ Review procedures for working after hours
- ☐ Equipment maintenance
- ☐ Formal and internal inspection programs
- ☐ Chemical inventory and distribution
- ☐ Procedures for use of compressed gas cylinders
- ☐ Chemical Storage
- ☐ Indoor air quality/exposure limits

Waste Handling Procedures

- ☐ Compatibility
- ☐ Labeling
- ☐ Packaging
- ☐ Requests
- ☐ Pick-ups

Training Program

- ☐ Training Requirements

Incidents/Accidents/Injuries

- ☐ Reporting incidents/accidents/injuries
- ☐ General Chemical Spill Kits

Signatures

Employee I have received the assigned training, I understand I have the right to request additional training if my job exposes me to additional hazards now or anytime in the future.

_____ _____

Employee Signature Date

Supervisor(s) I believe the assigned safety training is adequate for this employee's job duties. I/we will assign additional training if needed by a change in the employee's job duties or other circumstance.

_____ _____

Supervisor Signature Date

Employee Laboratory Safety Training Record

Instructions

1. Supervisor(s) fills out **Class Title and description**. Under **Training Type** circle either *initial* for new employees or *Refresher* for existing employee's requiring supplementary training.
2. Supervisor(s) assigns **Training Tasks** required for the employee's duties.
3. Employee completes assign tasks, records **Completed Date** and **Initials**. Unless noted, all training must be completed before working on any job related to an assigned training task or two weeks after the **Date Assigned**, whichever is sooner.
4. When all tasks are completed, supervisor, trainer sign and date under **Signatures**, and employee signs under **Employee Information**.
5. Place form in Laboratory Safety Manual to be kept in each laboratory.

Training Tasks

Class Title		
Class description and key training topics		
Date Assigned		Training Type: *Initial* *Refresher*

Employee Information

Name (s)	PID	NID	Training Type Initial/ Refresher	Completed Date	Signature I have taken the assigned training, I understand I have the right to request additional training if my job exposes me to additional hazards now or anytime in the future.

Signatures

Trainer (s) I have facilitated the assigned training, I believe the assigned safety training is adequate for this employee's job duties.

Trainer Signature Date

Supervisor(s) I believe the assigned safety training is adequate for this employee's job duties. I/we will assign additional training if needed by a change in the employee's job duties or other circumstance.

Supervisor Signature Date

Laboratory Inspection Checklist

Environmental Health and Safety
Keeping UCF Safe

P.I. Name _____ Office Telephone : _____

Department _____ Contact Telephone : _____

Survey Date : _____ Reviewed Date : _____

Survey By : _____ Reviewed By : _____

Inspection Location(s)

Building Name	Building Code	Lab/Room #

		Unsatisfactory	Satisfactory	Needs Improvement	Info	Recom
1. Documentation and Training						
Personnel have documented Laboratory Safety or Biosafety training and are current. Bloodborne Pathogen training is current if applicable.	(DT1)	☐	☐	☐	☐	☐
Standard Operating Procedures (SOP) include specific Personal Protection Equipment/Clothing (PPE) recommendations (hazard assessments) and are kept in the Lab Safety Manual.	(DT3)	☐	☐	☐	☐	☐
Laboratory Hazard Assessment Tool (LHAT) has been filled in EHSA and approved, the laboratory has updated LHAT within two years of the last submission.	(DT2)	☐	☐	☐	☐	☐
2. Hazard Communication						
Accident/incident/injury/near-miss reporting procedure is known and records are kept in the Lab Safety Manual.	(HC5)	☐	☐	☐	☐	☐
Laboratory personnel can locate SDS's for the chemicals in their lab and/or know how to retrieve SDS information.	(HC7)	☐	☐	☐	☐	☐
Laboratory personnel can locate the UCF Laboratory Safety Manual.	(HC6)	☐	☐	☐	☐	☐
Laboratory doors: All doors have a laboratory sign with the required emergency information and hazard warnings.	(HC2)	☐	☐	☐	☐	☐
Hazard warning signs or labels are placed where there are immediate dangers or potential risks.	(HC3)	☐	☐	☐	☐	☐
Refrigerators and microwaves are labeled for designated uses (i.e. biological, radiological, food not for human consumption).	(HC1)	☐	☐	☐	☐	☐
Laboratory specific emergency plan is properly displayed and in the Laboratory Safety Manual.	(HC4)	☐	☐	☐	☐	☐
3. Lab Safety						
The room aisles, hallways, stairways, and pathways are open and not cluttered, blocking travel, or creating tripping hazards.	(LS1)	☐	☐	☐	☐	☐

Environmental Health and Safety
Keeping UCF Safe

P.I. Name _____ Office Telephone : _____

Department _____ Contact Telephone : _____

3. Lab Safety

		Unsatisfactory	Satisfactory	Needs Improvement	Info	Recom
Floors are free of oil, grease, liquids, broken/uneven surfaces, tripping hazards, and sharp objects.	(LS2)	☐	☐	☐	☐	☐
No evidence of food or beverage storage in the lab.	(LS3)	☐	☐	☐	☐	☐
Chemical spill supplies are available and readily accessible.	(LS4)	☐	☐	☐	☐	☐
Laboratory equipment, apparatus, and glassware are free of defects and are not damaged.	(LS6)	☐	☐	☐	☐	☐
Counters, floors, and fume hoods are not soiled with chemical residue or spills.	(LS7)	☐	☐	☐	☐	☐
Safety shower is easily accessible and not blocked.	(LS8)	☐	☐	☐	☐	☐
Safety Showers and Eyewash Stations are inspected monthly.	(LS9)	☐	☐	☐	☐	☐
Laboratory fume hoods are inspected and certification is not expired.	(LS10)	☐	☐	☐	☐	☐
Laboratory fume hoods are not cluttered and not used for storage purposes.	(LS11)	☐	☐	☐	☐	☐
Laboratory fume hood sashes have unobstructed movement and are kept closed when not in use.	(LS12)	☐	☐	☐	☐	☐
Eyewash stations are easily accessible and not blocked.	(LS15)	☐	☐	☐	☐	☐
Fire extinguishers are easily accessible, not blocked, and not expired.	(LS16)	☐	☐	☐	☐	☐
Breaker boxes are easily accessible and not blocked.	(LS17)	☐	☐	☐	☐	☐
Emergency shut-off valves are easily accessible and not blocked.	(LS18)	☐	☐	☐	☐	☐
Cloth chairs are not present in the laboratory.	(LS19)	☐	☐	☐	☐	☐
Personal Protective Equipment and/or laboratory clothing is available.	(LS20)	☐	☐	☐	☐	☐
First aid supplies are available or the nearest location is displayed in the lab.	(LS21)	☐	☐	☐	☐	☐
Employees who use respirators or protective masks are registered with the EH&S Respiratory Protection program.	(LS22)	☐	☐	☐	☐	☐
Lab worker attire is appropriate for hazards present.	(LS23)	☐	☐	☐	☐	☐
Fire doors between fire areas are operable and kept closed.	(LS24)	☐	☐	☐	☐	☐

Environmental Health and Safety
Keeping UCF Safe

P.I. Name _____ Office Telephone : _____

Department _____ Contact Telephone : _____

		Unsatisfactory	Satisfactory	Needs Improvement	Info	Recom
3. Lab Safety						
Storage is beyond 18 inches of the ceiling in an area with sprinkler heads.	(LS25)	☐	☐	☐	☐	☐
Relocatable power taps (RPT) are not connected directly to a permanently installed receptacle. Power Strips are not plugged into additional power strips. Temporary extension cords are not setup as permanent electrical wiring. No daisy chaining.	(LS26)	☐	☐	☐	☐	☐
4. Chemical Storage						
Chemical containers are barcoded and the chemical inventory is up to date in the chemical database.	(CH24)	☐	☐	☐	☐	☐
Chemicals are stored with regard to hazard class/compatibility.	(CH1)	☐	☐	☐	☐	☐
Bases/Alkalines are properly segregated and properly stored.	(CH2)	☐	☐	☐	☐	☐
Acids (organic and inorganic) are properly segregated and stored.	(CH3)	☐	☐	☐	☐	☐
Toxic chemicals are properly segregated and stored.	(CH4)	☐	☐	☐	☐	☐
Oxidizers, peroxide formers, and/or time sensitive chemicals are properly segregated, labeled, and properly stored.	(CH5)	☐	☐	☐	☐	☐
Water reactive or pyrophoric chemicals are properly stored.	(CH6)	☐	☐	☐	☐	☐
Flammable/Combustible liquids do not exceed the regulatory storage limits for the fire area.	(CH7)	☐	☐	☐	☐	☐
Flammable cabinet door(s) are kept closed with vent plugs in place.	(CH8)	☐	☐	☐	☐	☐
Refrigerated flammables stored in an explosion proof refrigerator.	(CH9)	☐	☐	☐	☐	☐
Chemicals are not stacked or on their sides.	(CH10)	☐	☐	☐	☐	☐
Chemical container(s) are in good condition.	(CH11)	☐	☐	☐	☐	☐
All hazardous liquids are stored on shelves at or below eye level.	(CH12)	☐	☐	☐	☐	☐
Chemicals are not stored near heat, ignition sources, and/or in direct sunlight.	(CH14)	☐	☐	☐	☐	☐
Hazardous chemicals are not stored on the floor and/or under the sink.	(CH15)	☐	☐	☐	☐	☐
All chemicals present in the laboratory are not old, outdated, or expired.	(CH16)	☐	☐	☐	☐	☐
Gas cylinders are properly restrained and segregated. Cylinders without regulators are capped.	(CH17)	☐	☐	☐	☐	☐

Environmental Health and Safety
Keeping UCF Safe

P.I. Name _____ Office Telephone : _____

Department _____ Contact Telephone : _____

		Unsatisfactory	Satisfactory	Needs Improvement	Info	Recom
4. Chemical Storage						
The number of compressed gas cylinders secured together with one restraining device does not exceed the allowable limits.	(CH18)	☐	☐	☐	☐	☐
Compressed gas cylinders are clearly marked to identify contents.	(CH19)	☐	☐	☐	☐	☐
Pressurized cryogenic containers relief valves, venting devices, and gauges are appropriate and properly functional.	(CH20)	☐	☐	☐	☐	☐
Dewars are properly labeled with contents and have proper venting.	(CH21)	☐	☐	☐	☐	☐
Chemical containers are closed securely.	(CH22)	☐	☐	☐	☐	☐
Chemical containers are labeled properly.	(CH23)	☐	☐	☐	☐	☐
Does the room have more than 4L of flammable solvents?	(CH26)	☐	☐	☐	☐	☐
Is this room under negative pressure?	(CH27)	☐	☐	☐	☐	☐
Laboratory Inventory Sample. (Please collect 10-15 barcodes for a sample of the inventory to be checked back at EHS. Also collect information on chemicals NFPA 2 and higher without barcodes.)	(CH28)	☐	☐	☐	☐	☐
Flammable/Combustible liquids are properly stored.	(CH29)	☐	☐	☐	☐	☐
5. Biological Safety						
Laboratory specific policies and procedures have been developed, and/or a decontamination SOP is in place. Workers are trained on these procedures.	(B1H2)	☐	☐	☐	☐	☐
Laboratory personnel are knowledgeable about the biological hazard. Principal Investigator must ensure personnel receive the appropriate training and annual updates (training log book recommended).	(B1H3)	☐	☐	☐	☐	☐
Proficiency is demonstrated with standard microbiological procedures. The Principal Investigator is responsible for ensuring personnel demonstrate proficiency in standard and specific microbiological procedures.	(B1H4)	☐	☐	☐	☐	☐
All personnel have appropriate training records on the potential hazards associated with the work involved, the necessary precautions to prevent exposures, and the exposure evaluation procedures.	(B1H5)	☐	☐	☐	☐	☐
A current biosafety manual is present in the lab and/or is customized to include specific laboratory hazards. Personnel are advised of special hazards and have read and followed instructions on practices and procedures.	(B1H7)	☐	☐	☐	☐	☐
The laboratory is designed, constructed, and maintained to facilitate cleaning and housekeeping. The interior surfaces (walls, floors, and ceilings) are water resistant. Laboratory is easy to clean and the floors do not have carpet or rugs.	(B1H8)	☐	☐	☐	☐	☐

Environmental Health and Safety
Keeping UCF Safe

P.I. Name _____ Office Telephone : _____

Department _____ Contact Telephone : _____

		Unsatisfactory	Satisfactory	Needs Improvement	Info	Recom
5. Biological Safety						
A hand-washing sink is located in the laboratory, is accessible, and in working order.	(B1H10)	☐	☐	☐	☐	☐
Negative airflow is recommended in the laboratory. Negative airflow should be present in a BSL-2 laboratory.	(B1H14)	☐	☐	☐	☐	☐
BSC located away from doors, heavily trafficked areas, etc. to allow for the interruption of airflow. There are no open flames in the BSC. Materials and equipment immediately in use are in the BSC. BSC is not used for storage.	(B1H15)	☐	☐	☐	☐	☐
BSC has been certified annually and is current on inspection. Last date certified:	(B1H16)	☐	☐	☐	☐	☐
Personal protective equipment is used based on risk assessment determinations. Proper laboratory attire is worn, at a minimum closed toe shoes and long pants. Appropriate face/eye and respiratory protection should be worn.	(B1H17)	☐	☐	☐	☐	☐
Gloves are changed frequently, hands washed between changes, and/or disposable gloves are not saved for reuse. An alternative to latex gloves should be available.	(B1H18)	☐	☐	☐	☐	☐
Gowns or laboratory coats are worn while in the laboratory and/or gloves are worn when handling infected substances or when skin contact with infectious materials is unavoidable.	(B1H20)	☐	☐	☐	☐	☐
PPE is worn inside of the laboratory only, and not in common areas. The "one-glove" rule is observed.	(B1H21)	☐	☐	☐	☐	☐
Eating, drinking, smoking, the handling of contact lenses, and the application of cosmetics is not done in the lab and food for human consumption is not stored. Mechanical pipetting devices are used.	(B1H23)	☐	☐	☐	☐	☐
Animal and plants not involved in work are not permitted in the laboratory.	(B1H24)	☐	☐	☐	☐	☐
Policies for the safe handling of sharps are instituted: Sharps precautions are used (needles, slides, pipettes, tips, scalpels). Sharps use is restricted unless no other alternative exists. Reusable sharps are stored with no sharp edges exposed.	(B1H26)	☐	☐	☐	☐	☐
A biohazard sign is posted on the entrance whenever infectious agents are present.	(B2H2)	☐	☐	☐	☐	☐
Benchtops, tables, and work surfaces in the room are decontaminated with an effective disinfectant after work with the infectious agent or after overt spills, splashes, or other contamination during lab work.	(B2H4)	☐	☐	☐	☐	☐
Equipment and work surfaces are disinfected regularly after working with infectious material and when soiled. Spills are decontaminated and cleaned by trained staff using posted spill procedures. Surfaces are free of debris and clutter.	(B2H5)	☐	☐	☐	☐	☐

Environmental Health and Safety
Keeping UCF Safe

P.I. Name _____ Office Telephone : _____

Department _____ Contact Telephone : _____

		Unsatisfactory	Satisfactory	Needs Improvement	Info	Recom
5. Biological Safety						
All infectious samples are collected, labeled, transported, and processed in a manner that contains and prevents transmission of the agent(s). Outer surface of the containers is disinfected prior to moving the material.	(B2H8)	☐	☐	☐	☐	☐
Procedures are performed to minimize the creation of aerosols or splatters.	(B2H9)	☐	☐	☐	☐	☐
Manipulations of infectious material are conducted inside of a class II or III biological safety cabinet (BSC) when a potential for aerosols or splashes exist or high concentrations of the agents are used.	(B2H11)	☐	☐	☐	☐	☐
Vacuum lines are protected by disinfectant traps and HEPA filters or equivalent. Disinfectant traps are empty or filters are clean and changed regularly.	(B2H14)	☐	☐	☐	☐	☐
An autoclave is available in the facility to decontaminate infectious waste. Autoclave use procedures are in place.	(B2H15)	☐	☐	☐	☐	☐
Biological waste containers are labeled with the Biohazard symbol of appropriate size and the symbol is facing forward. The biological waste container is covered when not in use.	(BW1)	☐	☐	☐	☐	☐
Biomedical waste container is placed near the point of origin of biomedical waste. Biomedical waste container is clear of the walkway and does not impede movement within the lab space.	(BW3)	☐	☐	☐	☐	☐
Sharps container is closed and below the fill line. The sharps container is located at the point of origin in the lab or brought over to the work area during sharps use.	(BW5)	☐	☐	☐	☐	☐
Biological waste area is maintained in a sanitary condition. Evidence of insects or contamination is not present. Biological waste storage area is easily decontaminated or cleanable, and located on an impervious floor.	(BW6)	☐	☐	☐	☐	☐
Biological waste is not mixed with chemical or radioactive waste products and placed into the biomedical waste container. Mixed wastes are handled seperately.	(BW7)	☐	☐	☐	☐	☐
Biological waste disposed of properly and not in a regular trash container. Non-biological waste items are not disposed of with biohazardous materials.	(BW8)	☐	☐	☐	☐	☐
6.Radiological Safety						
Notice to Employees and Safety Rules & Emergency Procedures is clearly posted	(RH1)	☐	☐	☐	☐	☐
Isotope storage refrigerator/freezer has appropriate signage.	(RH2)	☐	☐	☐	☐	☐
Isotope inventory logs are kept current and are clearly posted at vial storage location.	(RH3)	☐	☐	☐	☐	☐
Stock vial inventory in lab matches EHSA vial inventory.	(RH4)	☐	☐	☐	☐	☐
Daily rate meter survey and/or LSC swipe surveys are current and complete.	(RH5)	☐	☐	☐	☐	☐

Environmental Health and Safety
Keeping UCF Safe

P.I. Name _____ Office Telephone : _____

Department _____ Contact Telephone : _____

		Unsatisfactory	Satisfactory	Needs Improvement	Info	Recom
6.Radiological Safety						
Radiation Safety Notebook is complete and current.	(RH6)	☐	☐	☐	☐	☐
Workers attached to the PI's radiation permit are current on all required training. RC-2A "Radiation Worker Log" has been signed by all workers.	(RH7)	☐	☐	☐	☐	☐
Radioactive material(s) have at least two levels of security.	(RH8)	☐	☐	☐	☐	☐
Radioactive material work area(s) are delineated with radiation tape.	(RH9)	☐	☐	☐	☐	☐
Radiation work area(s) lined with absorbent paper are free from stains and tears.	(RH10)	☐	☐	☐	☐	☐
Radiation work area(s) are kept orderly and contain only equipment, materials, and containers clearly labeled with "Radioactive" tape.	(RH11)	☐	☐	☐	☐	☐
Shielding is in place and appropriate for the type of radioactive materials in use or storage .	(RH12)	☐	☐	☐	☐	☐
Appropriate radioactive spill kits are available and stocked.	(RH13)	☐	☐	☐	☐	☐
Radiation survey meter is available, operable, and up-to-date on calibration.	(RH14)	☐	☐	☐	☐	☐
Radiation Safety As Low As Reasonably Achievable (ALARA) principles, PPE, and best practices are being used.	(RH15)	☐	☐	☐	☐	☐
Radioactive waste properly segregated.	(RH16)	☐	☐	☐	☐	☐
Radioactive waste properly labeled.	(RH17)	☐	☐	☐	☐	☐
Radioactive waste properly collected and stored.	(RH18)	☐	☐	☐	☐	☐
7. Laser Safety						
Approved laser area warning signs present at all entryways.	(LH1)	☐	☐	☐	☐	☐
Class 4 laser lab entryways equipped with interlock or warning light.	(LH2)	☐	☐	☐	☐	☐
Written Standard Operating Procedure available and complete.	(LH3)	☐	☐	☐	☐	☐
All authorized users have received laser safety orientation training, SOP-specific training, and have signed the Authorized Personnel list in the SOP.	(LH4)	☐	☐	☐	☐	☐
View of optics from entryway blocked.	(LH5)	☐	☐	☐	☐	☐
Beam controls are adequate.	(LH6)	☐	☐	☐	☐	☐
Laser and beam enclosure warning labels are adequate.	(LH7)	☐	☐	☐	☐	☐

Environmental Health and Safety
Keeping UCF Safe

P.I. Name _____ Office Telephone : _____

Department _____ Contact Telephone : _____

		Unsatisfactory	Satisfactory	Needs Improvement	Info	Recom
7. Laser Safety						
Appropriate eyewear must be available for all laser hazards present.	(LH8)	☐	☐	☐	☐	☐
All eyewear is labeled and in good condition.	(LH9)	☐	☐	☐	☐	☐
Laser safety eyewear available at Class 4 entryways.	(LH10)	☐	☐	☐	☐	☐
Class 3b and 4 laser inventory in lab matches Laser Device Registration Form.	(LH11)	☐	☐	☐	☐	☐
8. Waste Managment						
Laboratory waste is properly segregated and in appropriate containers. (i.e. sharps, chemical waste, biological waste, radiological waste, broken glass, etc.)	(WM7)	☐	☐	☐	☐	☐
Hazardous Chemical Waste containers are properly labeled.	(WM1)	☐	☐	☐	☐	☐
Hazardous waste is stored in a designated area and segregated according to compatibility.	(WM2)	☐	☐	☐	☐	☐
Hazardous chemical waste containers are appropriate for contents, integrity of the container is sufficient to prevent leaks or spills, and containers are kept closed when not in use.	(WM3)	☐	☐	☐	☐	☐
Hazardous waste accumulated in the laboratory area is within the allowed quantity limits and the regulatory time limit.	(WM4)	☐	☐	☐	☐	☐
Hazardous/Chemical Waste is handled and stored in a manner to prevent rupture or leakage.	(WM5)	☐	☐	☐	☐	☐
Hazardous Waste is being disposed of by impermissible methods.	(WM6)	☐	☐	☐	☐	☐
9. Controlled Substances DEA & DOH						
Controlled Substances, as defined by the Drug Enforcement Agency (DEA), are kept under lock and key with limited access.	(CS1)	☐	☐	☐	☐	☐
A logbook detailing use, as required for the DEA Controlled Substance Act, is provided.	(CS2)	☐	☐	☐	☐	☐
Other Hazards Not Previously Addressed						
No Deficiencies found.	(NOV)	☐	☐	☐	☐	☐
Other safety issues, not previously addressed.	(OH1)	☐	☐	☐	☐	☐
No violations noted at time of inspection	(0)	☐	☐	☐	☐	☐

P.I. Name _____ Office Telephone : _____

Department _____ Contact Telephone : _____

Additional Comments ; _____

Laboratory Self-Inspection Checklist

Environmental Health and Safety UCF UNIVERSITY OF CENTRAL FLORIDA	**Effective Date:** 04/27/2018	**Form Number:** EHS_SOP342_FORM001
TITLE: Laboratory Self-Inspection Checklist	**Responsible Authority:** Laboratory Safety Coordinator	

Date:				Department:			
Auditor(s):				Building/Room:			
PI:							
	Y	N	N/A		Y	N	N/A
EHS Door Postings Present	◯	◯	◯	Fire Extinguishers Inspected and not Blocked	◯	◯	◯
Radiation, Laser, Biological Signs Posted	◯	◯	◯	Safety-shower and Eye-wash Inspected and not Blocked	◯	◯	◯
Emergency Numbers Posted	◯	◯	◯	Fume Hoods Functional, Inspection and Status Labels Attached, Hoods not Cluttered and no Red Tagged Hoods in Use.	◯	◯	◯
Proper PPE Used and Dress Requirements Observed	◯	◯	◯	Sufficient Working Space in Hood	◯	◯	◯
MSDS's Accessible for all Materials	◯	◯	◯	Biological Cabinets have Valid Test Date	◯	◯	◯
Power Strips Properly Rated UEL and not Over Loaded	◯	◯	◯	Paths to both Exits are Open and Uncluttered	◯	◯	◯
All Containers are Properly Labeled	◯	◯	◯	Work Area is Free of Clutter or Contamination	◯	◯	◯
All Chemicals are in Proper Containers that are Free of Structural Damage	◯	◯	◯	Sharps and Broken Glass Containers present	◯	◯	◯
Spill Kits Available and in Good Condition	◯	◯	◯	No more than 5 Gallons of Flammable Liquids outside of Flammables Cabinets	◯	◯	◯
No Glass Containers on the Floor	◯	◯	◯	Oxidizers and Solvents Segregated	◯	◯	◯
Acids and Bases Segregated	◯	◯	◯	No Food or Drink being Consumed or Stored in Lab	◯	◯	◯
No Use of Open Flames Near Flammable Materials	◯	◯	◯	Everyone in Lab Wearing Close-toed Shoes and Protective Eyewear	◯	◯	◯
No Application of Cosmetics or Lotions while in Lab	◯	◯	◯	Compressed Gas Cylinders secured/capped and Limited in Number	◯	◯	◯
Refrigerator Properly Labeled	◯	◯	◯	Waste Containers Properly Labeled, Sealed, and in Secondary Containment	◯	◯	◯
Cryogenic Hazards Signs and PPE Present	◯	◯	◯				
Comments:							

Environmental Health and Safety	Effective Date: 02/13/2023	Procedure Number: EHS_SOP340
	Revision: 1	Page 1 of 7
TITLE: Lab Closeout	Approved by Chemical Hygiene Officer Sean Brennan Digitally signed by Sean Brennan Date: 2023.04.05 15:19:55 -04'00' Date:	

1. APPLICABILITY

Laboratory close-out procedures are to be used in the event that University of Central Florida (UCF) laboratories will be vacated due to a Principal Investigator (PI) leaving the institution, the relocation or termination of research activities in a particular laboratory, or planning for a renovation project.

2. PROCEDURE STATEMENT

Laboratories owned or operated by the University of Central Florida (UCF) must be left in a state suitable for new occupants or for renovation activities. The vacating Principal Investigator and department are responsible for ensuring the decontamination of equipment and counters, the recycling of electronics and fluorescent bulbs, and that the transfer or disposal of chemical, biological, and radioactive materials is properly completed prior to vacating the space.

3. DEFINITIONS

4. RESPONSIBILITY

Environmental Health and Safety (EHS) will provide proper guidance for the vacating of laboratories. Principal Investigators and departments will be guided through the process of cleaning up a laboratory for clearance purposes. They will be issued a laboratory close-out clearance from EHS for those vacated laboratories found to be compliant with these guidelines.

Each department is responsible for ensuring that all Principal Investigators follow these procedures to ensure laboratory close-out clearance by EHS. Departments are ultimately responsible for the clearance of laboratory space and equipment of Principal Investigators that have left UCF.

Principal Investigator(s) are responsible for following these procedures to ensure that laboratories are left in a suitable condition for EHS to issue a laboratory close-out clearance.

Facilities Operations, Facilities Planning, and Outside Contractors must not work in laboratories that have not been cleared. Cleared laboratory equipment will have an EHS_SOP330_FORM001 Notice of EHS Clearance Form, signed by EHS, attached.

5. ASSOCIATED DOCUMENTS

EHS_SOP310 Regulated Waste for Generator
EHS_SOP330_FORM001 Notice of EHS Clearance Form (Equipment)
EHS_SOP340_FORM001 Laboratory Close-out Notification
EHS_SOP340_FORM002 Laboratory Closeout Checklist

6. PROCEDURE

Laboratory space cannot be re-occupied nor renovation work started until the space has been inspected and cleared by EHS. Once clearance is completed, the Laboratory Clearance Form will be posted in a highly visible place in the laboratory or area that has been cleared.

The vacating Principal Investigator and department must notify EHS with the EHS_SOP340_FORM001 Laboratory Close-out Notification document 30 days prior to anticipated date of close-out. The vacating Principal Investigator must complete the EHS_SOP340_FORM002 Laboratory Closeout Checklist document prior to the Clearance Form being issued by EHS.

- **Radioactive Materials (RAM)**

    - Prior to close-out of a radioactive materials use area and/or a radioactive materials use permit, it is the responsibility of the department and the authorized permit holder to contact the Radiation Safety Officer (RSO) for proper lab decommissioning.

    - Any unwanted radioactive materials and waste must be removed from the lab by the RSO. The RSO will assist the lab with the transfer radioactive materials to a new location.

    - The RSO or assistant will perform wipe sampling to insure there is no contamination left in the lab.

    - Remove all radiation signs, stickers, and tape from the lab after decontamination is complete.

- **Biological Waste Materials**

  - Place all sharps (syringes, Pasteur pipettes, serological pipettes, razor blades, etc.) in a sharps container and place container in biohazard box.

  - Dispose of all solid media and supplies in the laboratory as bio waste.

  - Dispose of all other potentially biohazardous waste from the laboratory in red bags.

  - Decontaminate all liquid media by autoclaving or by treating for 30 minutes with bleach solution (final concentration to be 10%) before drain disposal.

  - Decontaminate all work surfaces using freshly prepared 10% bleach solution or 70% alcohol.

- **Biological Safety Cabinets (BSC)**

  - Remove all of the contents.

  - If necessary, disconnect tissue culture media vacuum flask.

  - Decontaminate all accessible surfaces with an appropriate disinfectant.

  - Ensure Decontamination of the BSC by a certified contractor, if a BSC is being relocated to a location outside of the building.

  - Re-certify the BSC using a certified contractor when a BSC is relocated.

  - If the BSC is not being moved or repair work will not open the contaminated inner space, a surface decontamination with an appropriate disinfectant is sufficient.

- **Internal Relocation of Chemicals**

Lab personnel are allowed to transport chemicals from their current laboratory to the new laboratory, if the labs are in the same building (i.e., no transporting on sidewalks and across streets). Lab personnel must contact EHS to discuss transportation procedures including cart usage, secondary containment, and proper incompatible chemical segregation. Upon relocation, the chemical inventory for the laboratory must be updated. If the lab does not wish to move the chemicals, the lab can utilize the procedure for “External Relocation of Chemicals.” The lab is responsible for the costs of the outside contractor.

- **External Relocation of Chemicals**

Chemical moves to laboratories in external locations/outside buildings must be transported by a U.S. Department of Transportation approved hazardous material hauler. EHS has agreements with vendors to provide this service. However, all related chemical move costs are the responsibility of the laboratory. The vendor will prepare all paperwork necessary for the chemical move. In order to utilize these services, lab personnel are required to:

  - Remove all laboratory chemicals from shelves, cabinets, etc., which require moving and place them in a central location. Label the area "Chemicals to be moved".

  - Upon relocation, the chemical inventory for the laboratory must be updated.

- **Chemical Waste Disposal**

All chemical waste must be managed in accordance with the UCF Waste Disposal Procedures. At a minimum the following procedures must be used:

  - Keep an appropriate hazardous waste label on all chemical waste containers. Hazardous waste labels are available free-of-charge by contacting EHS.

  - Keep all chemical waste in an appropriate container and closed at all times.

  - Keep an area of the laboratory or other points of waste generation designated for chemical waste only, and label utilizing Chemical Waste Satellite Accumulation Area.

  - Complete the EHS_SOP310 Regulated Waste for Generator on the EHS website.

  - For disposal of various aqueous buffers and empty containers please refer to the UCF Waste Disposal Procedures.

  - Do not relocate hazardous waste containers from area of original waste generation.

- **Disposal of Compressed Gas Cylinders**

Remove regulators and replace the valve stem cap. Return gas cylinders to the supplying vendor. Contact EHS for non-returnable cylinders.

- **Relocating Compressed Gas Cylinders (including Liquid Nitrogen Cylinders)**

When laboratory relocations require crossing a public road, compressed gas cylinders (including Liquid Nitrogen Cylinders) must be transferred by the supplying vendor. Please call the appropriate vendor prior to relocating to arrange the move.

- **Liquid Nitrogen-lined Freezers**

The vendors supplying liquid nitrogen recommend that liquid nitrogen-lined freezers be drained to a minimum level (to sustain freezing of cells) prior to relocating. Liquid nitrogen freezers are moved by the moving company and should be scheduled for refill as soon as possible at the new location by the vendor.

- **Laboratory Equipment Relocation or Disposal**

The following procedures must be completed before laboratory equipment will be cleared:

  - Remove all contents from laboratory equipment, e.g. chemicals, media, and glassware.

  - Remove all bench coat and disposable liners/covers from equipment and dispose of properly.

  - Decontaminate all surfaces of contamination prone equipment, e.g., refrigerators, freezers, incubators, water baths, biological safety cabinets and centrifuges, with an appropriate disinfectant. Contact EHS for assistance.

  - Freezers which have been used for the storage of biological materials must be unplugged and defrosted.

  - Incubators and water baths must be drained of all standing water, including water inside the jacket.

- **Electronics Recycling**

All electronics (central processing units, monitors, keyboards, printers, televisions, and scanners) must be separated from general trash and sent to surplus. https://fo.ucf.edu/enterprise-logistics/surplus-property/

- **General Laboratory Cleanup**

All laboratory areas must be thoroughly cleaned to assure removal of all hazardous residues. All surfaces where hazardous chemicals have been used or stored must be washed with detergent and water. This includes bench tops, cabinets, drawers, floors, etc. For furniture and other items that are to be removed from the laboratory, thoroughly decontaminate accessible surfaces to prevent harm to movers.

- Remove all bench coat and disposable liners/covers from work surfaces and dispose in properly.

- Empty and properly dispose of material from all drawers, cabinets, and fume hoods.

- Properly clean laboratory bench tops, cabinets, drawers, floors and fume hood surfaces (preferably with soap and water).

7. RECORD KEEPING

Laboratories closeout records are kept on hand by the Laboratory Safety Coordinator for 3 years.

8. ARCHIVES

Laboratories closeout records are archived for life by the Laboratory Safety Coordinator.

9. DISTRIBUTION

This document is shared through:

□ EHS only	□ Facility and Safety	☑ UCF community
□ Secured Document	□ Contractor	☑ EHS Web site
□ Other: _____		

10. REVIEW

	Name	Signature	Date
Chemical Hygiene Officer	Sean Brennan	Sean Brennan Digitally signed by Sean Brennan Date: 2023.04.05 15:19:37 -04'00'	04/05/23

11. DOCUMENT HISTORY

Date	Revision number	Author	Modifications
07/01/2019	0	Casey Brock	Format based on EHS_SOP001
02/13/2023	1	Franco Del Pino	Updated surplus link

Environmental Health and Safety UNIVERSITY OF CENTRAL FLORIDA	**Effective Date:** 03/15/2023	**Form Number:** EHS_SOP340_FORM001
TITLE: Laboratory Closeout Notification	**Responsible Authority:** Chemical Hygiene Officer	

Building:_____Lab Number(s):_____Department:_____

Principal Investigator: _____ Phone #: _____

Lab or Dept. Contact: _____ Phone #: _____

Reason for Closeout: _____

Estimated start date for close-out process: _____

Estimate completion date for close-out process: _____

Were radioactive materials used in the lab? No☐ Yes☐

Describe: _____

Were chemicals used in the lab? No☐ Yes☐

Describe: _____

What waste removal issues are present?

Mixed chemical/radioactive materials_____

Biohazardous chemical waste_____

Radioactive waste_____

Highly reactive chemicals_____

Shock sensitive materials_____

Temperature sensitive materials_____

Highly toxic compressed gases_____

Unlabeled/unknown materials_____

Signatures:

Principal Investigator Date

Department Administrator Date

Environmental Health and Safety UCF UNIVERSITY OF CENTRAL FLORIDA	**Effective Date:** 03/15/2023	**Form Number:** EHS_SOP340_FORM002
TITLE: Laboratory Closeout Checklist	**Responsible Authority:** Chemical Hygiene Officer	

This checklist is to guide laboratory personnel when laboratory operations are moved or discontinued. Other requirements may apply. Contact the Department of Environment, Health and Safety (EHS) 30 days prior to vacating the laboratory, room or area. For more information, call the Laboratory Safety Coordinator at 3-5498 or see http://www.ehs.ucf.edu.

Procedure	**Date Completed**
Chemicals	
Evaluate all chemicals and label all containers.	
Update online chemical inventory. **	
Identify unknown chemicals if possible.	
Submit waste forms online at https://ehs.net.ucf.edu/	
Clean laboratory surfaces.	
Confirm hazardous waste has been removed. ***	
Post completed clearance form on entry door to lab.	

Controlled Substances	
For disposal of DEA materials, please call the DEA agent for UCF, at (407) 333-7000. You must schedule an appointment for him to visit your lab and dispose of the DEA material. Have your Controlled Substance Registration Certificate, and any disposal paperwork ready for inspection. If you do not have a Controlled Substance Registration Certificate, please call the EHS Health Sciences Campus Coordinator at 6-7080 for disposal arrangements. **Guidelines for DEA schedule substances.** Controlled Substances Schedule I through V, and the Drug Codes associated with each controlled substance. http://www.deadiversion.usdoj.gov/schedules/	
Gas Cylinders	
Return to supplier if applicable.	
For non-returnables, request cylinder disposal using the online waste form at: https://ehs.net.ucf.edu/	
*Make sure cylinder is disconnected, valve off, and the cap is on.	
Animal and Human Tissue	
Dispose of preserved human tissue. Human tissue in preservative can be left in specimen containers. If there are many specimen containers with the same preservative, the specimen containers should be placed into a wide mouth plastic container for waste pickup. Submit waste forms online at https://ehs.net.ucf.edu/ It must be indicated on the waste form “tissue is non-infectious”. Infectious prions could be present in brain tissue preserved in formalin. This tissue must be autoclaved before it can be picked up as hazardous waste.	
Dispose of preserved animal tissue. Animal tissue in preservative can be left in specimen containers. If there are many specimen containers with the same preservative, the specimen containers should be placed into a wide mouth plastic container for waste pickup. Submit waste forms online at https://ehs.net.ucf.edu/	

Animal and human tissue that is not preserved must be placed in a biohazard bag and autoclaved. After autoclaving, animal tissue must be put in a biohazard box and sealed to go for incineration. Contact the Biological Safety Officer at 3-1526 for pick-up of human tissue after autoclaving.	
If cultures are being left behind in the lab list name of new person responsible for them. Transfer responsibility of samples to: _____	
Microorganisms and Cultures	
Autoclave waste, please contact the Biological Safety Officer at 3-1526.	
Liquid materials are to be autoclaved in vented containers on the liquid cycle of the autoclave. Once cool, it can be flushed down the sink.	
Users should transfer cultures to back-up incubators prior to beginning the procedures listed below. • The moving and reconnection of incubators will be done in two stages so that cultures can stay behind in back-up incubators until incubators in the new location are up and running. • Schedules should be made to explain in detail the timing of disconnecting/draining/reconnecting for the incubators. • Users will drain incubators and prepare them for moving. • CO2 tanks should be in place in the new building and ready for connection to incubators. • Users will bring water, etc. to the new building and will be responsible for refilling.	
Decontaminate all laboratory surfaces with appropriate disinfectant.	
Remove all biohazard and carcinogen signage in the laboratory and on the laboratory door.	
If cultures are being left behind in the lab list name of new person responsible for them. Transfer responsibility of samples to: _____	

Radioactive Materials	
Prepare Radioactive waste for pick-up and use the online form found at: https://ehs.net.ucf.edu/	
For all types of equipment, shielding, source containers, work surfaces etc.., do wipe tests, and attach results to the RC-14 form found online at https://ehs.ucf.edu/radiation-safety	
Call Radiation Safety Officer at 3-0476 to change permit to new locale or to terminate permit.	
Exit survey of rooms and equipment is required.	
Laboratory Equipment	
Large quantities, overflows, or confidential paper pick-ups: https://fo.ucf.edu/recycling-at-ucf	
Clean and defrost refrigerators/freezers.	
Units for disposal that may contain refrigerants must be evaluated by Facilities Operations to determine if the refrigerant needs to be removed. If refrigerant needs to be removed, submit a work order to Facilities Operations (3-5223).	
For equipment that may be contaminated with radioactive material, decontaminate, remove warning stickers, complete a Notice of Decontamination Form, and attach it to the unit. For information, call the Radiation Safety Officer at 3-0476.	
For equipment (including refrigerators, freezers, incubators, drying ovens) that may be contaminated with chemicals or biological material, decontaminate according to manufacturer's recommendations with an appropriate disinfectant, remove warning stickers, complete a Notice of Decontamination form, and attach it to the unit prior to surplus. For information, call 3-5498 or see Decontamination Guidelines at: http://www.ehs.ucf.edu	

When cleaning the incubators in the event of bacterial or fungal contamination, flasks and culture plates shall be moved to biological safety cabinet. Shelves shall be moved to sink for wipe down with 10% bleach solution followed by a thorough wipe down with disposable towels soaked in 70% ethanol.	
Biological Safety Cabinets must be decontaminated with formaldehyde gas before they can be moved or discarded and when it is being left in the lab for another user. If the cabinet is relocated, recertification will be required. Please call 3-1526 to schedule decontamination and recertification of cabinets.	
BSL3 laboratories must be decontaminated with formaldehyde gas when the laboratory is vacated. Please contact the Biological Safety Officer at 3-1526 for information.	
The "Surplus Property Management System"; for information on Surplus Property please contact Surplus Property at (3-1111) https://fo.ucf.edu/enterprise-logistics/surplus-property/	
If you intend to discard a chemical fume hood, please contact the Laboratory Safety Coordinator at 3-5498, and complete the decontamination form and affix the form to the hood.	
Sharps and Glassware Disposal	
Clean out all laboratory drawers. Dispose of all sharp items (glass, pipettes, syringes, blades) in a sharps container or, if unused, transfer to another laboratory.	
For chemically or biologically contaminated sharps, use a poly sharps container, and submit for biological waste pickup. To obtain information on sharps containers please contact the Biological Safety Officer at 3-1526.	
For radioactive sharps, use plastic container or cardboard box and place in radioactive dry waste container, label them sharps, and then prepare Radioactive waste for pick-up using the online form found at: https://ehs.net.ucf.edu/	
Deface labels on empty bottles then discard in normal trash or recycle.	

Other glassware that is empty, use plastic-lined cardboard glass box, then discard in normal trash.	
Transportation of Hazardous Materials	
All materials must be transported in secondary containment that is rigid, puncture resistant, leak proof, impervious to moisture. The secondary container must be sealed to prevent leakage and must be labeled with content (follow University Hazmat Transportation Policy).	
Carts should be used to transport materials. Do not stack materials or overcrowd the cart.	
Use indoor hallways to transport materials. Avoid busy, public corridors.	
Liquid nitrogen must be emptied from dewars before the dewars can be moved.	
If refrigerators or freezers will be moved with infectious material in them, the material in the equipment must be packed in secondary containment. The equipment must be taped or shrink wrapped shut.	

** Incubators, Non UCF Tenants or Shop/Studios my not have online inventory and the Chemical Safety & Security Coordinator will need to be consulted for proper Inventory close out verification.

*** Incubators or Non UCF Tenants will need a final Hazardous waste bill prior to Laboratory close-out.

Environmental Health and Safety	Effective Date: 03/01/2023	Procedure Number: Appendix F EHS_SOP341
	Revision: 1	Page 1 of 5
TITLE: Laboratory Decontamination	Approved by Chemical Hygiene Officer	

1. APPLICABILITY

The procedures described here are to be used for the decontamination of laboratory fixtures and equipment prior to maintenance activities, relocation, transferring ownership, or disposal.

2. PROCEDURE STATEMENT

A laboratory employee knowledgeable of the hazardous materials used in the laboratory and/or equipment must prepare the equipment according to the instructions below, complete EHS_SOP341_FORM001 Notice of Laboratory/Equipment Decontamination Form, and tape it to the decontaminated fixtures and/or equipment as verification that it is safe to reassign and/or handle.

Inform UCF EHS of all work order requests for maintenance work occurring in the lab to ensure Facilities Maintenance Staff can work safely in the lab. Maintenance work cannot occur during active manipulation of hazardous materials.

3. DEFINITIONS

4. RESPONSIBILITY

Environmental Health and Safety (EHS) will provide proper guidance for decontamination activities and will issue decontamination clearance for equipment found to be compliant with these procedures.

Each Department is responsible for ensuring that all Principal Investigators follow these procedures. Departments are ultimately responsible for the clearance of laboratory space and equipment of Principal Investigators that have left the University of Central Florida (UCF). However, Principal Investigator(s) are primarily responsible for following these procedures.

Facilities Operations, Facilities Planning, and Outside Contractors must not work in laboratories or on equipment that have not been cleared. Cleared laboratory equipment will have an EHS_SOP330FORM001 Clearance Form, signed by EHS, attached.

5. ASSOCIATED DOCUMENTS

EHS_SOP325_FORM001 Radiation Laboratory Survey
EHS_SOP330_FORM001 Notice of EHS Clearance (Equipment)
EHS_SOP341_FORM001 Notice of Decontamination

6. PROCEDURE

- Equipment and fixtures used to process or store chemicals (e.g. chemical fume hoods, refrigerators, storage cabinets)
    - Safely remove all chemicals from the equipment.
    - Collect the material for reuse or for hazardous waste disposal.
    - If applicable, use an inert liquid to purge or rinse out chemical residue. In some cases, rinsate will need to be disposed of as hazardous waste. Call EHS with questions regarding hazardous waste disposal of chemicals and/or rinsate.
    - Contaminated refrigerators, ovens and other equipment with non-permeable surfaces must be decontaminated by scrubbing with warm soapy water. Call EHS for more specific information about decontamination.
    - Before facilities personnel work inside a fume hood, the researcher must remove all containers from the fume hood and thoroughly wash interior surfaces with warm, soapy water. Complete the EHS_SOP341_FORM001 Notice of Decontamination and tape to the front of the unit.
    - Before a laboratory can be closed out and signed off on, all fixtures, cabinets drawers, and preparation areas for chemicals must be decontaminated with warm soapy water, and the EHS_SOP341_FORM001 Notice of Decontamination must be completed and taped to the areas that were decontaminated.
    - Contact the UCF Laboratory Safety Officer for assistance (3-5498).
- Equipment and fixtures used to process of store biological material (e.g. biosafety cabinets, centrifuges, incubators)

- Remove biological material from the equipment.

- Decontaminate with an appropriate disinfectant and allow adequate contact time.

- Clean the equipment with warm soapy water, and scrub as necessary. If bleach is used, it may be necessary to rinse the metal surfaces with water and/or 70% ethanol, as bleach will corrode the metal. Complete the EHS_SOP341_FORM001 Notice of Decontamination and tape it to the front of the unit.

- Before a laboratory can be closed out and signed off on, all fixtures, cabinet drawers, and preparation areas for biological must be decontaminated with appropriate disinfectant and allowed adequate contact time.

- Clean areas with warm soapy water and, if bleach is used, it may be necessary to rinse the metal surfaces with water and / or 70% ethanol. The EHS_SOP341_FORM001 Notice of Decontamination must be completed and taped to the areas that were decontaminated.

- Contact the UCF Biosafety Officer for assistance (3-1526).

- Equipment and fixtures used to process or store radioisotopes

  - A thorough radiation survey of all accessible surfaces must be performed with an appropriate instrument and swipes and recorded on form EHS_SOP325_FORM001 Radiation Laboratory Survey.

  - If radioactive contamination is detected, the equipment must be cleaned until a survey shows that contamination has been removed or meets an acceptable level per the Radiation Safety Manual.

  - Before a laboratory can be closed out and signed off on, all fixtures, cabinets drawers, and preparation areas for radioisotopes must be decontaminated with appropriate cleaner provided by the Radiation Safety Officer, and the EHS_SOP341_FORM001 Notice of Decontamination must be completed and taped to the areas that were decontaminated.

  - Contact the UCF Radiation Safety Officer for assistance (3-0476).

- Requirements for laboratory equipment disposal

  - The equipment must be cleaned and decontaminated inside and out so that it is safe to handle by Facilities Operations or contractors without the use of personal protective equipment (e.g., gloves).

- If the equipment contains hazardous or regulated components, e.g., coolant from a refrigerator, mercury containing bulbs from a microscope, or oil from a vacuum pump, contact EHS about the safe removal of these components.

- All labels, signage, and hazard warnings (e.g., universal biohazard symbol) must be removed or defaced.

- If the unit is on the UCF Inventory, complete the process to remove unit from the inventory and remove inventory decals.

- Once the above tasks have been completed, contact EHS to determine how to proceed.

- Note: In most cases, electrical equipment **may not** be discarded in the normal trash.

- **IF THE EQUIPMENT CAN NOT BE DECONTAMINATED OR HAZARDOUS/REGULATED COMPONENTS CANNOT BE REMOVED, CONTACT EHS.**

7. RECORD KEEPING

Records generated by this procedure are kept on hand by the Laboratory Safety Coordinator for 3 years.

8. ARCHIVES

Records generated by this procedure are archived by the laboratory Safety Coordinator for life.

9. DISTRIBUTION

This document is shared through:

□ EHS only □ Facility and Safety ☑ UCF community
□ Secured Document □ Contractor ☑ EHS Web site
□ Other: _____

10. REVIEW

	Name	Signature	Date
Chemical Hygiene Officer	Sean Brennan	*Sean Brennan*	04/04/2023

11. DOCUMENT HISTORY

Date	**Revision number**	**Author**	**Modifications**
07/01/2019	0	Casey Brock	Format based on EHS_SOP001
03/01/2023	1	Franco Del Pino	Added hyperlink to Notice of Decontamination Form. Updated BSO and RSO extension number

UCF Environmental Health and Safety UNIVERSITY OF CENTRAL FLORIDA	**Effective Date:** 04/27/2018	**Form Number:** EHS_SOP341_FORM001
TITLE: Notice of Decontamination	**Responsible Authority:** Laboratory Safety Coordinator	

Contact Name:	**Phone:**
Department/ PI:	**Location of Equipment:**

LAB EQUIPMENT/ SURFACES (e.g., Microwaves, Freezers, Incubators, Water Baths, Centrifuges, Fume Hoods, Biosafety Cabinets, Counter tops, Cabinets, Drawers)

Type of Equipment:

Make:	**Model No.:**	**Serial No.:**

Decontamination Method:

Decontamination Date:

HAZARDS: To the best of my knowledge, the following hazardous materials were used and/or stored in the equipment that was decontaminated according to the guidelines in EHS_SOP341.

☐ **Radiological (list):**

☐ **Biohazard (list):**

☐ **Chemical (Toxics/ Corrosives/ Reactives) (list):**

Chemical Fume Hoods (FH) & Biosafety Cabinets (BSC) & Bench Tops (BT) Only
The following actions were taken to prepare the FH, BSC, or BT for repair/maintenance/Certification:

☐ **Stopped all experiments and or manipulation in the FH, BSC, or BT.**	☐ **All materials and apparatus have been removed from the interior.**	☐ **All surfaces (interior and exterior) have been properly decontaminated.**	☐ **Obstructions have been removed to allow access to the FH, BSC, or BT.**

☐ **The equipment to be serviced must not be used until repair/maintenance is complete.**

☐ **The equipment to be disposed of has been removed from the UCF Inventory.**

I have removed all known hazardous materials from this equipment. All exposed surfaces have been cleaned and decontaminated. If applicable, I have prepared the equipment or FH/BSC/BT according to the guidelines on page 1-3. To the best of my knowledge, this equipment is safe to handle and does not pose a hazardous materials risk to personnel.

_____

Name: (print) **Signature:** **Date:**

Hazardous Substances & Particularly Hazardous Substances List

Exposure to harmful substances can result in local toxic effects, systemic toxic effects, or both. Local effects involve injury at the site of first contact, for example skin, nose, and respiratory tract. Systemic effects, however, occur after the substance has been absorbed into the bloodstream and distributed throughout the body. Some terms are critical to understanding health effects and information from documents such as Safety Data Sheets. For example, the term "acute exposure" refers to a local or systemic effect from a single exposure while the term "chronic exposure" refers to repeated or long-duration exposures.

OSHA's Definition of "Hazardous Substance"

OSHA defines "hazardous substance" as "a chemical for which there is statistically significant evidence based on at least one study, conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees". Classifications of "health hazards" include carcinogens, sensitizers, hepatotoxins (liver), nephrotoxins (kidneys), neurotoxins (CNS), hematopoietic toxins (blood), reproductive toxins (mutagens, teratogens), and agents which damage the lungs, skin, eyes, or mucous membranes.

Particularly Hazardous Substances

OSHA's Laboratory Standard states that the employer must make "provisions for additional employee protection for work with "particularly hazardous substances".

1. Establishment of a designated area;
2. Use of containment devices such as fume hoods or glove boxes;
3. Procedures for safe removal of contaminated waste; and
4. Decontamination procedures.

These chemicals include carcinogens (See Appendix H), reproductive hazards (See Appendix I), and substances with a high degree of acute toxicity. In some circumstances, it may not be necessary to employ all of these special precautions, such as when the total amount of an acutely toxic substance to be handled is a small fraction of the harmful dose. **Review the individual SDS for toxicity information.**

Irritant:

Non-corrosive chemical that causes reversible inflammatory effects (redness and swelling) on living tissue by chemical action at the site of contact.

Acrylamide	Formaldehyde	Peracetic acid
Acetic anhydride	Propylamine	Ozone

Corrosive:

Chemical that causes destruction of living tissue by chemical action at the site of contact. These can be solids, liquids, or gases.

Sodium hydroxide	Perchloric acid	Trifluoroacetic acid (TFA)
Nitric acid	Hydrochloric acid	Hydrofluoric acid

Allergen:

A chemical that causes an adverse reaction by the immune system to a chemical resulting from a previous sensitization to that chemical or a structurally similar chemical. Once sensitization occurs, allergic reactions can result from exposure to extremely low doses of the chemical. Symptoms often include red, itchy, swollen skin or eyes, or difficulty breathing.

Formaldehyde	Latex	Toluene diisocyanate

Asphyxiant:

A chemical that interferes with the transport of oxygen to the vital organs of the body leading to rapid collapse and death. Some asphyxiants simply displace oxygen in the air while others interact with hemoglobin in the blood to reduce the capacity of blood to carry oxygen.

Nitrogen Carbon monoxide Halon

Neurotoxin:

A chemical that adversely affects the structure or function of the central and/or peripheral nervous system. Effects can be reversible or permanent. Confusion, slurred speech, and staggered gait are common symptoms of overexposure.

Acrylamide Dimethyl mercury Phenol Hexane

Target Organ Toxin:

Chemical that causes adverse effects to organs other than the reproductive or neurological systems. These organs typically include the liver, kidneys, blood producing organs, and lungs.

Acrylonitrile Carbon tetrachloride Phenol Benzene

Highly Flammable Substances:

A gas, liquid, or solid that readily catches fire and burns in air. A highly flammable substance has a flash point of less than room temperature. *(The flashpoint is the lowest temperature at which a liquid has a sufficient vapor pressure to form an ignitable mixture with air near the surface of the liquid.)*

Acetone (-18°C)
Benzene (-11.1°C)
Diethyl ether (-45°C)
Tetrahydrofuran (-14°C)
Acetaldehyde (-37.8°C)
Potassium hydride *(ignites on contact with moist air)*

High Level Acute Toxins

Chemicals that can cause extremely harmful effects after a single exposure. "Prudent Practices in the Laboratory" indicates that substances with a toxicity rating of "highly toxic" or "extremely toxic", based on an animal oral LD_{50} of 50 mg per kg (or less), are considered to have a high level of acute toxicity.

Acrolein
Arsine Chlorine
Diazomethane
Diborane (gas)
Hydrogen cyanide
Hydrogen fluoride
Methyl fluorosulfonate
Nickel carbonyl
Nitrogen dioxide Osmium
tetroxide Ozone
Phosgene
Sodium azide
Sodium cyanide *(and other cyanide salts)*
Hydrofluoric acid

Carcinogen List

Carcinogens

*This list is based on the OSHA Select Carcinogen definition at the bottom of this document as of October 2017.

OSHA - Occupational Safety and Health Administration, U.S. Department of Labor
Group ORC: OSHA Regulated Carcinogen
Group S: OSHA Select Carcinogen
IARC - International Agency for Research on Cancer
Group 1: Carcinogenic to humans
Group 2A: Probably carcinogenic to humans
Group 2B: Possibly carcinogenic to humans
NTP - National Toxicology Program, Public Health Service, U.S. Department of Health and Human Services
Group 1: Known to be Human Carcinogens (K)
Group 2: Reasonably Anticipated to be Human Carcinogens (R)

This list of select and suspected carcinogens is supplied as a guide and is not all inclusive. Always review material safety data sheets before working with chemicals.

	Basis of OSHA Carcinogen Listing for TRI Chemicals			
Chemical Name	**IARC**	**NTP**	**OSHA–**	
Acetaldehyde	2B	RA	–	
Acetamide	2B	–	–	
2-Acetylaminofluorene	–	RA	Z	
Acrylamide	2A	RA	–	
Acrylonitrile	2B	RA	Z	
2-Aminoanthraquinone	–	RA	–	
4-Aminoazobenzene	2B	–	–	
4-Aminobiphenyl	1	K	Z	
1-Amino-2,4-dibromoanthraquinone	2B	RA	–	
1-Amino-2-methylanthraquinone	–	RA	–	
Amitrole	–	RA	–	
o-Anisidine	2B	–	–	
o-Anisidine hydrochloride	–	RA	–	
Arsenic and inorganic arsenic compounds	1	K*	Z	
Asbestos (friable)	1	K	Z	
Benzene	1	K	Z	
Benzidine	1	K	Z	
Benzoic trichloride	2B	RA	–	
Beryllium and beryllium compounds	1	RA*	–	
2,2-Bis(bromomethyl)-1,3-propanediol	2B	RA	–	
Bis(chloromethyl)ether	1	K	Z	
1,3-Butadiene	2A	K	–	
1,2-Butylene oxide	2B	–	–	
Cadmium and cadmium compounds	1	K*	Z	
Carbon tetrachloride	2B	RA	–	

Catechol	2B	–	–	
Chlordane	2B	–	–	
Chlorendic acid	2B	RA	–	
p-Chloroaniline	2B	–	–	
Chloroform	2B	RA	–	
Chloromethyl methyl ether	1	K	Z	
3-Chloro-2-methyl-1-propene	–	RA	–	
Chlorophenols	2B	–	–	
Chloroprene	2B	RA	–	
Chlorothalonil	2B	–	–	
p-Chloro-o-toluidine	2A	RA	–	
Chromium (VI) compounds	1	K	–	
C.I. Acid Red 114	2B	–	–	
C.I. Direct Black 38	2A	K	–	
C.I. Direct Blue 6	2A	K	–	
C.I. Direct Brown 95	2A	–	–	
C.I. Food Red 5	2B	–	–	
C.I. Solvent Yellow 3 (o-aminoazotoluene)	2B	RA	–	
C.I. Solvent Yellow 34 (Auramine)	2B	–	–	
Cobalt and cobalt compounds	2B	RA*	–	
Creosote	2A	K	–	
p-Cresidine	2B	RA	–	
Cumene	2B	RA	–	
Cupferron	–	RA	–	
2,4-D**	2B	–	–	
2,4-D butoxyethyl ester**	2B	–	–	
2,4-D butyl ester**	2B	–	–	
2,4-D chlorocrotyl ester**	2B	–	–	
2,4-D 2-ethylhexyl ester**	2B	–	–	
2,4-D 2-ethyl-4-methylpentyl ester**	2B	–	–	
2,4-Diaminoanisole	2B	–	–	
2,4-Diaminoanisole sulfate	–	RA	–	
4,4'-Diaminodiphenyl ether	2B	–	–	
2,4-Diaminotoluene	2B	RA	–	
Diaminotoluene (mixed isomers)	2B	RA	–	
Diazinon	2A	–	–	
1,2-Dibromo-3-chloropropane	2B	RA	Z	
1,2-Dibromoethane	2A	RA	–	
1,4-Dichlorobenzene	2B	RA	–	
Dichlorobenzene (mixed isomers)	2B	RA	–	
3,3'-Dichlorobenzidine	2B	RA	Z	
3,3'-Dichlorobenzidine dihydrochloride	2B	RA	Z	
3,3'-Dichlorobenzidine sulfate	2B	RA	Z	
Dichlorobromomethane	2B	RA	–	
1,2-Dichloroethane	2B	RA	–	
Dichloromethane	2A	RA	Z	
1,2-Dichloropropane	1	–	–	
trans-1,3-Dichloropropene	2B	–	–	
1,3-Dichloropropylene	2B	RA	–	
Dichlorvos	2B	–	–	

Diepoxybutane	2B	RA	–	
Di-(2-ethylhexyl)phthalate	–	RA	–	
Diethyl sulfate	2A	RA	–	
Diglycidyl resorcinol ether	2B	RA	–	
Dihydrosafrole	2B	–	–	
3,3'-Dimethoxybenzidine	2B	RA	–	
3,3'-Dimethoxybenzidine dihydrochloride	2B	RA	–	
3,3'-Dimethoxybenzidine hydrochloride	2B	RA	–	
4-Dimethylaminoazobenzene	2B	RA	Z	
3,3'-Dimethylbenzidine	2B	RA	–	
3,3'-Dimethylbenzidine dihydrochloride	2B	RA	–	
3,3'-Dimethylbenzidine dihydrofluoride	2B	RA	–	
Dimethylcarbamyl chloride	2A	RA	–	
1,1-Dimethylhydrazine	2B	RA	–	
Dimethyl sulfate	2A	RA	–	
2,4-Dinitrotoluene	2B	–	–	
2,6-Dinitrotoluene	2B	–	–	
1,4-Dioxane	2B	RA	–	
1,2-Diphenylhydrazine	–	RA	–	
2,4-D isopropyl ester**	2B	–	–	
2,4-DP**	2B	–	–	
2,4-D propylene glycol butyl ether ester**	2B	–	–	
2,4-D sodium salt**	2B	–	–	
Epichlorohydrin	2A	RA	–	
Ethyl acrylate	2B	–	–	
Ethyl benzene	2B	–	–	
Ethyleneimine	–	–	Z	
Ethylene oxide	1	K	Z	
Ethylene thiourea	–	RA	–	
Formaldehyde	1	K	Z	
Furan	2B	RA	–	
Glycidol	2A	RA	–	
Heptachlor	2B	–	–	
Hexachlorobenzene	2B	RA	–	
alpha-Hexachlorocyclohexane	2B	RA	–	
Hexachloroethane	2B	RA	–	
Hexamethylphosphoramide	2B	RA	–	
Hydrazine	2B	RA	–	
Hydrazine sulfate	–	RA	–	
Isoprene	2B	RA	–	
Lead and inorganic lead compounds	2A	RA	Z	
Lindane	2B	RA	–	
Malathion	2A	–	–	
Mecoprop**	2B	–	–	
Methoxone**	2B	–	–	
Methoxone sodium salt**	2B	–	–	
4,4'-Methylenebis (2-chloroaniline)	1	RA	–	
4,4'-Methylenebis (N,N-dimethyl) benzeneamine	2B	RA	–	
4,4'-Methylenedianiline	2B	RA	Z	
Methyleugenol	2B	RA	–	

Methyl isobutyl ketone	2B	–	–	
Michler's ketone	–	RA	–	
Mustard gas	1	K	–	
Naphthalene	2B	RA	–	
alpha-Naphthylamine	–	–	Z	
beta-Naphthylamine	1	K	Z	
Nickel	2B	RA	–	
Nickel compounds	1	RA*	–	
Nitrilotriacetic acid	–	RA	–	
o-Nitroanisole	2B	RA	–	
Nitrobenzene	2B	RA	–	
4-Nitrobiphenyl	–	–	Z	
Nitrofen	2B	RA	–	
Nitrogen mustard	2A	–	–	
Nitromethane	2B	RA	–	
2-Nitropropane	2B	RA	–	
N-Nitrosodi-n-butylamine	2B	RA	–	
N-Nitrosodiethylamine	2A	RA	–	
N-Nitrosodimethylamine	2A	RA	Z	
N-Nitrosodi-n-propylamine	2B	RA	–	
N-Nitroso-N-ethylurea	2A	RA	–	
N-Nitroso-N-methylurea	2A	RA	–	
N-Nitrosomethylvinylamine	2B	RA	–	
N-Nitrosomorpholine	2B	RA	–	
N-Nitrosonornicotine	1	RA	–	
N-Nitrosopiperidine	2B	RA	–	
o-Nitrotoluene	2A	RA	–	
Parathion	2B	–	–	
2,3,4,7,8-Pentachlorodibenzofuran	1			
Pentachlorophenol	2B	–	–	
Phenolphthalein	2B	RA	–	
Phenytoin	2B	RA	–	
Polybrominated biphenyls (PBBs)	2A	RA	–	
Polychlorinated alkanes (C_{12}, 60% chlorinated)	–	RA	–	
Polychlorinated biphenyls (PCBs)	1	RA	–	
Polycyclic aromatic compounds (PACs):	2B		–	
Benz(a)anthracene	2A	P	–	
Benzo(b)fluoranthene	2B	P	–	
Benzo(j)fluoranthene	2B	P	–	
Benzo(k)fluoranthene	2B	P	–	
Benzo(rst)pentaphene	2B	–	–	
Benzo(a)pyrene	2A	P	–	
Dibenz(a,h)acridine	2A	P	–	
Dibenz(a,j)acridine	2B	P	–	
Dibenzo(a,h)anthracene	2B	P	–	
7H–Dibenzo(c,g)carbazole	2B	P	–	
Dibenzo(a,e)pyrene	2B	P	–	
Dibenzo(a,h)pyrene	2B	P	–	
Dibenzo(a,l)pyrene	2B	P	–	
7,12–Dimethylbenz(a)anthracene	2B	–	–	

1,6-Dinitropyrene	2B	P	–	
1,8-Dinitropyrene	2B	P	–	
Indeno[1,2,3–cd]pyrene	2B	P	–	
5–Methylchrysene	2B	P	–	
6-Nitrochrysene	2B	P	–	
1-Nitropyrene	2B	P	–	
4-Nitropyrene	2B	P	–	
Potassium bromate	2B	–	–	
Propane sultone	2A	RA	–	
beta-Propiolactone	2B	RA	Z	
Propyleneimine	2B	RA	–	
Propylene oxide	2B	RA	–	
Safrole	2B	RA	–	
Sodium pentachlorophenate	–	RA	–	
Sodium o-phenylphenoxide	2B	–	–	
Styrene	2B	RA	–	
Styrene oxide	2A	–	–	
Tetrachloroethylene	2A	RA	–	
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1	K	–	
Tetrafluoroethylene	2A	RA	–	
1,1,1,2-Tetrachloroethane	2B	–	–	
1,1,2,2-Tetrachloroethane	2B	–	–	
Tetranitromethane	2B	RA	–	
Thioacetamide	2B	RA	–	
4,4'-Thiodianiline	2B	RA	–	
Thiourea	–	RA	–	
Toluene-2,4-diisocyanate	2B	RA	–	
Toluene-2,6-diisocyanate	2B	RA	–	
Toluene diisocyanate (mixed isomers)	2B	RA	–	
o-Toluidine	1	RA	–	
o-Toluidine hydrochloride	–	RA	–	
Toxaphene	2B	RA	–	
Trichloroethylene	1	K	–	
2,4,6-Trichlorophenol	2B	RA	–	
1,2,3-Trichloropropane	2A	RA	–	
Tris(2,3-dibromopropyl)phosphate	2A	RA	–	
Trypan blue	2B	–	–	
Urethane	2B	RA	–	
Vinyl acetate	2B	–	–	
Vinyl bromide	2A	–	–	
Vinyl chloride	1	K	Z	
Vinyl fluoride	2A	RA	–	
2,6-Xylidine	2B	–	–	

Note: The list of TRI chemicals meeting the OSHA carcinogen standard and, therefore, not reported when in a mixture at a concentration level below the de minimus level of 0.1% has been updated, and this list reflects the update.
IARC: 1–The chemical is carcinogenic to humans; 2A–The chemical is probably carcinogenic to humans; 2B–The chemical is possibly carcinogenic to humans.
NTP: K–The chemical is known to be a human carcinogen; RA–The chemical is reasonably anticipated to be a human carcinogen.
OSHA: Z–The chemical appears at 29 CFR part 1910 Subpart Z.
* Certain compounds.
** Chlorophenoxy herbicides (IARC 2B).

EPCRA Section 313 Chemical List for Reporting Year 2022

Reproductive Hazards List

This list is provided as a guide and is not all inclusive. Always review material safety data sheets before working with chemicals.

NAME	CAS NUMBER
Acetaldehyde	75-07-0
Arsenic	7440-38-2
Aniline	62-53-3
Aflatoxins	1402-68-2
Benzene	71-43-2
Benzo(a)pyrene	50-32-8
Carbon disulfide	75-15-0
Chloroform	67-66-3
Chloroprene	126-99-8
Dimethyl formamide	68-12-2
Di-sec-octyl-phthalate	117-81-7
Dinitrooctyl phenol	63149-81-5
Dithane	111-54-6
2-Ethoxy ethanol	110-80-5
2-Ethoxyethyl acetate	111-15-9
Ethylene thiourea	96-45-7
2-Ethyhexanol	104-76-7
Glycol ethers Hydrazine(s)	302-01-2
Hexafluoroacetone	684-16-2
Halothane	151-67-7
Karathane	131-72-6
Lead (inorganic compounds)	7439-92-1
2-Methoxyethanol	109-86-4
2-Methoxyethyl acetate	110-49-6
Methyl chloride	74-87-3
N-Methyl-2-pyrrolidone	872-50-4
Propylene glycol monomethyl ether	107-98-2
Propylene glycol monomethyl ether acetate	108-65-6
Propylene oxide	75-56-9
Trichloroethylene	79-01-6
RH-7592 Systhane/RH-3866	88671-89-0
TOK (herbicide)	1836-75-5
Toluene	108-88-3
Vinyl chloride	75-01-4

Shock Sensitive and Explosive Materials List

Shock Sensitive and Explosive Chemicals

This list is provided as a guide and is not all inclusive. Always review material safety data sheets before working with chemicals.

Compounds:

Acetylene
Acetylides of heavy metal
Amatex
Amatol
Ammonal
Ammonium nitrate
Ammonium perchlorate
Ammonium picrate
Azides of heavy metals
Baratol
Calcium nitrate
Chlorate
Copper acetylide
Cyanuric triazide
Cyclotrimethylenetrinitramine
Dinitrophenol
Dinitrophenol hydrazine
Dinitrotoluene
Ednatol
Erythritol tetranitrate
Ethylene oxide
Ethyl-tetryl
Fulminate of mercury
Fulminate of silver
Fulminating gold
Fulminating mercury
Fulminating platinum
Fulminating silver
Gelatinized nitrocellulose
Guanyl
Guanyl nitrosoamino
Guanyltetrazene
Hydrazine
Nitrated carbohydrate
Nitrated glucoside
Nitrogen trichloride
Nitrogen triiodide
Nitroglycerin
Nitroglycide
Nitroglycol
Nitroguanidine
Nitroparaffins
Nitrourea
Organic nitramines
Ozonides
Pentolite
Perchlorates of heavy metals
Peroxides
Picramic acid
Picramide
Picratrol
Picric acid
Picryl sulphonic acid
Tetranitromethane
Silver acetylide
Silver azide

Mixtures:

Germanium
Hexanitrodiphenyamine
Hexanitrostilbene
Hexogen
Hydrazoic acid
Lead azide
Lead mononitroresorcinate
Lead styphnate
Manntol hexanitrate
Sodium picramate
Tetranitrocarbazole
Trinitrobenzoic acid
Trinitrocresol
Trinitroresorcinol
Trinitonal
Urea nitrate

Peroxide Forming Chemical List, Detection and Removal Guidelines

Peroxide-Forming Chemicals

Organic peroxides are some of the most hazardous substances handled in a laboratory. They are usually sensitive to shock, sparks, or accidental ignition. An example of a particularly dangerous situation that may be found in a lab is an ether bottle that has evaporated to dryness. In some chemicals, inhibitors are added to extend the storage lifetime of the chemical. However, because distillation of such a stabilized liquid will remove the inhibitor, the end product must be stored with care as a potential peroxide-former. Please note: peroxide may form on the surface of alkali metals and their amides. Do not perform standard peroxide tests on these materials (alkali metals & their amides) since they are water reactive. All of these chemicals should be purchased in small quantities and used up as soon as possible.

Fire Code [based on NFPA 45 (1991)] requires that all peroxide forming chemicals be dated upon opening. It is also prudent to date these chemicals upon first arrival in the facility. Unopened peroxide forming chemicals should not be used if greater than 1 year old.

Types of compounds known to auto oxidize to form peroxides:

Aldehydes

Ethers, especially cyclic ethers and those containing primary and secondary alkyl groups (never distill ether before it has been shown to be free of peroxides).

Compounds containing benzylic hydrogens

Compounds containing allelic hydrogens (C=C-CH), including most alkenes; vinyl and vinylidene compounds

Compounds containing a tertiary CH group (e.g., decalin and 2,5-dimethylhexane)

Classes of chemicals that can form peroxides upon ageing:

Class I: Unsaturated materials, especially those of low molecular weight, may polymerize violently and hazardously due to peroxide initiation:

Acrylic acid	Acrylonitrile
Butadiene	Chlorobutadiene (chloroprene)
Chlorotrifluoroethylene	Methyl methacrylate
Styrene	Tetrafluoroethylene
Vinyl acetate	Vinyl acetylene
Vinyl chloride	Vinyl pyridine
Vinylidene chloride	

Class II: The following chemicals are a peroxide hazard upon concentration (distillation/evaporation). A test for peroxide should be performed if concentration is intended or suspected. A potassium iodide test strip can be used to check for peroxides after the chemical has expired or six months after opening with test results placed on the bottle. If the test is not performed, then these chemicals should be disposed of 6 months after opening. A written record of test results should be maintained.

Acetal
Cyclohexene
Cyclopentene
Dicyclopentadiene
Diethyl ether
Ethylene glycol dimethyl ether (glyme)
Methyl acetylene
Methyl-I-butyl ketone
Tetrahydronaphthalene
Cumene
Cyclooctene
Diacetylene
Diethylene glycol dimethyl ether (diglyme)
Dioxane (p-dioxane)
Furan
Methyl cyclopentane
Tetrahydrofuran
Vinyl ether

Class III: Peroxides derived from the following compounds may explode without concentration. It is recommended that these chemicals be disposed of 3 months after opening.

Organic	Inorganic
Divinyl ether	Potassium metal
Isopropyl ether	Potassium amide
Divinyl acetylene	Sodium amide (sodamide)
Vinylidene chloride	

(Note: Lists are illustrative but not exhaustive)
** Prudent Practices in the Laboratory: Handling and Disposal of Chemicals. National Research Council 1995

Test Procedure for Peroxides

Ethers, particularly cyclic ethers and those synthesized from primary and secondary alcohols (such as tetrahydrofuran, diethyl ether and diisopropyl ether) form peroxides. Aldehydes, alkenes that have allylic hydrogen atoms (such as isopropyl benzene) and vinyl compounds (vinyl acetate) may also form peroxides. Although peroxides are not powerful explosives, they are extremely sensitive to shock, sparks, light, heat, friction, and impact. When peroxide forming compounds are distilled, the peroxide has a higher boiling point than the parent compound and remains in the distilling flask as a residue which can become overheated and explode. Thus, never distill any compound which may contain peroxide impurities to dryness to avoid explosion.

Peroxide formation often occurs in stored ethers. Since ethers are frequently used solvents and form peroxides easily, the solvent container should be dated when opened. If not used within one

month, the container must be tested for peroxide formation. Do not test uninhibited ether, which has been opened for more than six months, or inhibited ether, which has been opened and stored more than one year.

Peroxide Detection

Sodium Iodide Detection Method

Add 1 ml of the liquid suspected of containing peroxide to a solution of 0.1 g sodium iodide in 1 ml of glacial acetic acid. If the mixture turns brown, a high concentration of peroxide is present; whereas a yellow solution indicates that a low level of peroxide exists in solution.

Ferrous Thiocyanate Detection Method

Mix a 5 ml solution of 1% ferrous ammonium sulfate, 0.5 ml of 1 N sulfuric acid and 0.5 ml of 0.1 N ammonium thiocyanate (if necessary decolorize with a trace of zinc dust). Shake with an equal quantity of the solvent to be tested. If peroxides are present, a red color will develop.

Peroxide Test Strips

Strips are available from laboratory supply companies. Strips quantify peroxides up to a concentration of 25 ppm. The actual concentration at which peroxides become hazardous is not specifically stated in the literature. A number of publications use 100 ppm as control value for managing the material safely.

Peroxide Removal

The solvent containing peroxides should be poured through a column of basic activated alumina, which will simultaneously remove peroxide and dry the solvent. During peroxide removal, do not let the column dry out. Be sure to test the solvent again to determine if peroxide is still present. When the alumina column no longer removes peroxide, wash the column with 5% aqueous ferrous sulfate and discard the material as chemical waste

OSHA Z-Table List

• Table Z-1

1) Substances with limits proceeded by “C” – Ceiling values.

Exposure to any substance in Table Z-1, the exposure limit of which is preceded by a “C”, shall at no time exceed the exposure limit given for that substance. If instantaneous monitoring is not feasible, then the ceiling shall be assessed as a 15-minute time weighted average exposure which shall not be exceeded at any time during the working day.

2) Other substances – 8-hour Time Weighted Averages.

Exposure to any substance in Table Z-1, the exposure limit of which is not preceded by a “C”, shall not exceed the 8-hour time weighted average given for that substance in any 8-hour work shift of a 40-hour work week.

• Table Z-2

1) 8-hour Time Weighted Averages.

Exposure to any substance listed in Table Z-2, in any 8-hour work shift of a 40-hour workweek, shall not exceed the 8-hour time weighted average limit given for that substance in Table Z-2.

2) Acceptable ceiling concentrations.

Exposure to a substance listed in Table Z-2 shall not exceed at any time during an 8-hour shift the acceptable ceiling concentration limit given for the substance in the table, except for a time period, and up to a concentration not exceeding the maximum duration and concentration allowed in the column under “acceptable maximum peak above the acceptable ceiling concentration for an 8-hour shift”.

• Table Z-3

Exposure to any substance listed in Table Z-3, in any 8-hour work shift of a 40-hour workweek, shall not exceed the 8-hour time weighted average limit given for that substance in the table.

• Computation formulae

The computation formula, which shall apply to employee exposure to more than one substance for 8-hour time weighted averages, are listed in subpart Z of 29 CFR part 1910 in order to determine whether an employee is exposed over the regulatory limit is as follows:

$E = (CaTa + CbTb + ... CnTn) / 8$

Where:

E is the equivalent exposure for the working shift.

C is the concentration during any period of time T where the concentration remains constant.

T is the duration in hours of the exposure at the concentration C.

The value of E shall not exceed the 8-hour time weighted average specified in subpart Z of 29 CFR part 1910 for the substance involved.

In case of a mixture of air contaminants the equivalent exposure shall be computed as follows:

Em = (C1/L1 + C2/L2) +.... (Cn/Ln)

Where:

Em is the equivalent exposure for this mixture.

C is the concentration of a particular contaminant.

L is the exposure limit for that for that substance specified in subpart Z of 29 CFR part 1910.

The value of Em shall not exceed unity (1).

EPA's Chemical Compatibility Chart

EPA-600/2-80-076 April 1980

A METHOD FOR DETERMINING THE COMPATIBILITY OF CHEMICAL MIXTURES

Please Note: This chart is intended as an indication of some of the hazards that can be expected on mixing chemical wastes. Because of the differing activities of the thousands of compounds that may be encountered, it is not possible to make any chart definitive and all inclusive. It cannot be assumed to ensure compatibility of wastes because wastes are not classified as hazardous on the chart, nor do any blanks necessarily mean that the mixture cannot result in a hazard occurring. Detailed instructions as to hazards involved in handling and disposing of any given waste should be obtained from the originator of the waste.

CODE	CONSEQUENCE
H	Heat Generation
F	Fire
G	Innocuous and non-flammable gas generation
GT	Toxic Gas formation
GF	Flammable Gas formation
E	Explosion
P	Violent Polymerization
S	Solubilization of toxic substance
U	May be hazardous, but Unknown

#	REACTIVITY GROUP NAME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	101	102	103	104	105	106	107
1	Acids, Mineral, Non-oxidizing																																									
2	Acids, Mineral, Oxidizing																																									
3	Acids, Organic		G H																																						
4	Alcohols and Glycols	H	H F	H P																																					
5	Aldehydes	H P	H F	H P																																					
6	Amides	H	H GT																																						
7	Amines, Aliphatic and Aromatic	H	H GT	H		H																																			
8	Azo Compounds, Diazo Compounds and Hydrazines	H G	H GT	H G	H G	H																																			
9	Carbamates	H G	H GT						G H																																
10	Caustics	H	H	H		H				H G																															
11	Cyanides	GT GF	GT GF	GT GF					G																																
12	Dithiocarbamates	H,F GF	H,F GF	H,GT GF		GF GT		U	H G																																
13	Esters	H	H F						H G		H																														
14	Ethers	H	H F																																						
15	Fluorides, Inorganic	GT	GT	GT																																					
16	Hydrocarbons, Aromatic		H F																																						
17	Halogenated Organics	H GT	H,F GT					H GT	H G		H GF	H																														
18	Isocyanates	H G	H,F GT	H G	H P			H P	H G		H,P G	H G	U																													
19	Ketones	H	H F						H G		H	H																														
20	Mercaptans and Other Organic Sulfides	GT GF	H,F GT						H G									H	H	H	20																				
21	Metals, Alkali and Alkaline Earth, Elemental	H,F GF	H,F GF	H,F GF	H,F GF	H,F GF	GF H	GF H	GF H	GF H	GF H	GF H	GF,H GT	GF H				H E	GF H	GF H	GF H	21																			
22	Metals, Other Elemental & Alloys as Powders, Vapors, or Sponges	H,F GF	H,F GF	G F					H,F GT	U	GF H							H E	GF H		H,F GF		22																		
23	Metals, Other Elemental & Alloys as Sheets, Rods, Drops, etc.	H,F GF	H,F GF						H,F G									H F						23																
24	Metals and Metal Compounds, Toxic	S	S	S			S	S			S														24																
25	Nitrides	GF HF	H,F E	H GF	H,E GF	GF H			U	H G	U	GF H	GF H	GF H				GF H	U	GF H	GF H	E				25														
26	Nitriles	H,GT GF	H,F GT	H							U											H P			S	GF H	26													
27	Nitro Compounds, Organic		H,F GT			H					H E											H,E GF				H,E GF		27												
28	Hydrocarbons, Aliphatic, Unsaturated	H	H F			H																	H E					28											
29	Hydrocarbons, Aliphatic, Saturated		H F			H																							29										
30	Peroxides and Hydroperoxides, Organic	H G	H E		H F	H G		H GT	H,F E	H,F GT		H,E GT	H,F GT					H E	H	E	H,F GT	H E	H G		H G	H,E GF	H,P GT		H P		30									
31	Phenols and Cresols	H	H F						H G										H P			GF H				GF H					H	31								
32	Organophosphates, Phosphothioates, Phosphodithioates	H GT	H GT						U		H E											H									U		32							
33	Sulfides, Inorganic	GT GF	HF GF	GT		H			E										H												H GT			33						
34	Epoxides	H P	H P	H P	H P	U		H P	H P		H P	H P	U								H P	H P	H P		H P	H P					H P	H P	U	H P	34					
101	Combustible and Flammable Materials, Miscellaneous	H G	H,F GT																			H,F G				H,F GF					H,F GT					101				
102	Explosives	H E	H E	H E					H E		H E			H E								H E	H E	H E	E	E					H E	H E		H E	H E	H E	102			
103	Polymerizable Compounds	P H	P H	P H					P H		P H	P H	U									P H	P H	P H	P H	P H					P H	H		P H			H E	103		
104	Oxidizing Agents, Strong	H GT		H GT	H F	H F	H,F GT	H,F GT	H E	H,F GT		H,E GT	H,F GT	H F	H F		H F	H GT	H,F GT	H F	H,F GT	H,F E	H,F E	H F		H,F E	H F	H F	H F	H GT	H G	H F	H,F GT	H,F GT	H,F G	H,F G	H E	H,F GT	104	
105	Reducing Agents, Strong	H GF	H,F GT	H GF	H,F GF	H,F GF	H GF	H G			H	H GT	H F				H,F E	H E	H GF	H GF	H GF						H GF	H E			H E	H GF	H GF	H	H GF	H E	H,P GF	H,F E	105	
106	Water and Mixtures Containing Water	H	H						G		H G		H GF	H GF		S	H GF																	GT GF					GF GT	106	
107	Water Reactive Substances	<---EXTREMELY REACTIVE! DO NOT MIX WITH ANY CHEMICAL OR WASTE MATERIAL! EXTREMELY REACTIVE!--->																																						107
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	101	102	103	104	105	106	107

Glove Selection Chart

This chemical resistant chart is presented as a guide only. This does not consider permeability of glove, chemical combinations, temperature, length of time that glove is in contact with the chemical and thickness of glove. These factors will alter or affect the performance of glove. Recommend actual on-the-job testing of glove.

Glove Type and Chemical Use

*Limited Service VG=Very Good G=Good F=Fair P=Poor (not recommended)

Chemical	Neoprene	Latex/Rubber	Butyl	Nitrile
Acetaldehyde*	VG	G	VG	G
Acetic acid	VG	VG	VG	VG
Acetone*	G	VG	VG	P
Ammonium hydroxide	VG	VG	VG	VG
Amy acetate*	F	P	F	P
Aniline	G	F	F	P
Benzaldehyde*	F	F	G	G
Benzene*	P	P	P	F
Butyl acetate	G	F	F	P
Butyl alcohol	VG	VG	VG	VG
Carbon disulfide	F	F	F	F
Carbon tetrachloride*	F	P	P	G
Castor oil	F	P	F	VG
Chlorobenzene*	F	P	F	P
Chloroform*	G	P	P	F
Chloronaphthalene	F	P	F	F
Chromic acid (50%)	F	P	F	F
Citric acid (10%)	VG	VG	VG	VG
Cyclohexanol	G	F	G	VG
Dibutyl phthalate*	G	P	G	G
Diesel fuel	G	P	P	VG
Diisobutyl ketone	P	F	G	P
Dimethylformamide	F	F	G	G
Dioctyl phthalate	G	P	F	VG
Dioxane	VG	G	G	G
Epoxy resins, dry	VG	VG	VG	VG
Ethyl acetate*	G	F	G	F
Ethyl alcohol	VG	VG	VG	VG
Ethyl ether*	VG	G	VG	G
Ethylene dichloride*	F	P	F	P
Ethylene glycol	VG	VG	VG	VG

Chemical	Neoprene	Latex/Rubber	Butyl	Nitrile
Formaldehyde	VG	VG	VG	VG
Formic acid	VG	VG	VG	VG
Freon 11	G	P	F	G
Freon 12	G	P	F	G
Freon 21	G	P	F	G
Freon 22	G	P	F	G
Furfural*	G	G	G	G
Gasoline, leaded	G	P	F	VG
Gasoline, unleaded	G	P	F	VG
Glycerin	VG	VG	VG	VG
Hexane	F	P	P	G
Hydrazine (65%)	F	G	G	G
Hydrochloric acid	VG	G	G	G
Hydrofluoric acid (48%)	VG	G	G	G
Hydrogen peroxide (30%)	G	G	G	G
Hydroquinone	G	G	G	F
Isooctane	F	P	P	VG
Kerosene	VG	F	F	VG
Ketones	G	VG	VG	P
Lacquer thinners	G	F	F	P
Lactic acid (85%)	VG	VG	VG	VG
Lauric acid (36%)	VG	F	VG	VG
Lineolic acid	VG	P	F	G
Linseed oil	VG	P	F	VG
Maleic acid	VG	VG	VG	VG
Methyl alcohol	VG	VG	VG	VG
Methylamine	F	F	G	G
Methyl bromide	G	F	G	F
Methyl chloride*	P	P	P	P
Methyl ethyl ketone*	G	G	VG	P
Methyl isobutyl ketone*	F	F	VG	P
Methyl metharcrylate	G	G	VG	F
Monoethanolamine	VG	G	VG	VG
Morpholine	VG	VG	VG	G

Chemical	Neoprene	Latex/Rubber	Butyl	Nitrile
Naphthalene	G	F	F	G
Napthas, aliphatic	VG	F	F	VG
Napthas, aromatic	G	P	P	G
Nitric acid*	G	F	F	F
Nitric acid, red fuming	P	P	P	P
Nitric acid, white fuming	P	P	P	P
Nitromethane (95.5%)*	F	P	F	F
Nitropropane (95.5%)	F	P	F	F
Octyl alcohol	VG	VG	VG	VG
Oleic acid	VG	F	G	VG
Oxalic acid	VG	VG	VG	VG
Palmitic acid	VG	VG	VG	VG
Perchloric acid (60%)	VG	F	G	G
Perchloroethylene	F	P	P	G
Petroleum distillates (naphtha)	G	P	P	VG
Phenol	VG	F	G	F
Phosphoric acid	VG	G	VG	VG
Potassium hydroxide	VG	VG	VG	VG
Propyl acetate	G	F	G	F
Propyl alcohol	VG	VG	VG	VG
Propyl alcohol (iso)	VG	VG	VG	VG
Sodium hydroxide	VG	VG	VG	VG
Styrene	P	P	P	F
Styrene (100%)	P	P	P	F
Sulfuric acid	G	G	G	G
Tannic acid (65)	VG	VG	VG	VG
Tetrahydrofuran	P	F	F	F
Toluene*	F	P	P	F
Toluene diisocyanate (TDI)	F	G	G	F
Trichloroethylene*	F	F	P	G
Triethanolamine (85%)	VG	G	G	VG
Tung oil	VG	P	F	VG
Turpentine	G	F	F	VG
Xylene*	P	P	P	F

OSHA Personal Protective Equipment Table 4 - http://www.osha.gov/Publications/osha3151.pdf

General Laboratory Safety Rules

1. Do not work alone when using hazardous materials or performing hazardous procedures.
2. Always confirm that help is available in case of emergencies. Laboratory personnel should not deviate from the assigned work schedule without prior authorization from the laboratory supervisor.
3. Do not perform unauthorized experiments.
4. Always read the SDS and the label information before using any chemical in the laboratory.
5. Ensure proper positioning of all equipment before beginning any operation. Follow SOP's and manufacturer recommendations.
    - Always understand theory and read instruction manuals before operating equipment.
    - Check cords and plugs for condition. Replace if damaged.
    - Do not handle any electrical connection with damp hands or wet feet.
    - Do not continue to operate motors after liquid has spilled on the motor.
    - After heating a piece of glass, put it out of the way, and warn others.
6. Wear the appropriate level of eye protection at all times while in the lab. Wear goggles or face shield, gloves, and a lab coat when handling chemicals. Chose the proper type of PPE for other laboratory work.
7. Know the location and proper use of the eye wash, safety shower, fire extinguisher, first aid kit, spill kit, and any specialty emergency equipment in your lab.
8. Contact your PI/Lab Manager if you have any questions about safety equipment or chemical methods.
9. Maintain situational awareness. Beware of the hazards posed by the work of others as well as your own.
10. Make others aware of any special hazards associated with your work.
11. Notify advisor/supervisor of any allergies or sensitivities.
12. Report all injuries, accidents, and *near misses*.
13. Do not allow unauthorized persons in the laboratory. Keep doors locked when the lab is unoccupied.
14. Properly dispose of all chemical waste. Do not pour hazardous chemical into drains.
15. Do not use headphones while working in the lab.
16. Discuss possible unsafe conditions with your advisor/supervisor.
17. Do not remove chemicals, glassware, or equipment from the laboratory without approval from your PI/Lab Manager
18. Label storage containers before filling and never fill with material other than called for by the label. The label shall contain the following information: sample description or chemical name, date prepared, initials of responsible party, and hazard warning.
19. Do not leave any unlabeled containers.
20. The contents of all containers and experiments must be disposed of properly when no longer need, wanted, or usable.

Laboratory Standard Operating Procedures Guidelines and Template

Standard Operating Procedure (SOP) Development

Use the EHS SOP website to find SOPs relevant to your lab that you can modify for your specific purposes. Your lab must have copies of the relevant SOPs and documented training for lab personnel that perform that task.

How to Prioritize Which SOPs to Develop

SOPs are required for hazardous operations that include use of hazardous chemicals and/or equipment that could cause harm to lab workers.

- Use your knowledge about your lab's chemical hazards and throughput as well as processes to help prioritize SOP development.

- The UCF Chemical Inventory System has a built-in "Particularly Hazardous Chemical" report which lists hazardous chemicals in your lab's chemical inventory that are highly toxic, carcinogenic, or reproductive hazards. This report can be used to help prioritize your SOP development.
    - Each lab has a chemical inventory contact. Only s/he has access to the Chemical Inventory program. Others have read only access but should still be able to view info
    - Once logged into the Chemical Inventory program and in the room view, go the "Special" menu and select "Show Related Items." Then select "Particularly Hazardous Chemical" from the "Special" menu.

- Contact EH&S for help (Laboratory Safety Coordinator at extension 3-5498)

Blue text is meant to be a guideline to assist in the completion of the SOP.

UCF	**Department of _____Fill in _____ Standard Operating Procedure for___Process**		
Chemical Class:		**Manufacturer/ CAS#:**	Fill in
PI/Lab Manager:	Fill in	**Building/Room:**	Fill in
Revision Number:	Fill in	**Date:**	Fill in
Revision Made By:	Fill in	**Approved By:**	Fill in

1. **Circumstances of Use:**

Provide a brief description of the biological, chemical, equipment, or process, the reason for it, and how it will be used.

2. **Potential Hazards:**

Please include any potential hazards associated with **all** equipment, materials, biologicals. chemicals, or products, associated with this procedure/equipment.

3. **Hazard Controls-Elimination/Substitution:**

Provide information about other ways to achieve the goal without using this specific hazardous chemical or process. If this is not possible, please explain why not.

4. **Hazard Controls-Engineering Controls and Work Practices:**

Identify the following:
-Designated Work Area Location:
-location of equipment relevant to points of egress
-Will aisle clearances be affected?
-Engineering Controls and Work Practices (this includes, but is not limited to ventilation systems, equipment, storage locations, waste management, security systems, etc.):
-Administrative Controls:
-Storage Location:
-Locked Storage: Y or N

5. **Hazard Controls-Personal protective equipment (PPE):**

List all PPE; include the type of gloves and ensure no one is allergic to latex. Indicate how the staff will attend the required training, maintain the equipment, and store it. Keep in mind that PPE is the last line of defense and will only be used if the other hazard control methods (Elimination, Substitution, Engineering Controls, and Work Practices) are not sufficient to protect the staff or are not feasible. Please consult the SDS.

6. **Procedure:**

Explain research thoroughly in detail and how the biologicals and chemicals will be used with quantities, where will it be conducted.

7. **Waste Disposal:**

-Identity waste determination: chemical and biological
-Where will waste be stored:
-Identify container type to be used:

EHS Notes:

- Unused chemical **Waste** solution should be collected and disposed as hazardous chemical waste.
- Solid debris and small liquid vials and containers can be packaged into sealed plastic "Zip-Lock[tm]" bags, double bagged.
- Spill clean-up debris containing **waste materials** should be double bagged and managed as chemical waste.
- Overtly contaminated gloves should be collected and disposed as hazardous chemical waste.
- Sharps should be collected and disposed in the following manner:
    - Sharps containing **waste materials** solution but never used to inject animals or humans can be disposed in a rigid container labeled "chemical sharps only." Submit a waste pickup request via EHSA.

Labeling the Waste:

Complete all boxes on waste label legibly and attach to each container, listing the contents and percentages. An incomplete label will delay your waste to be picked up by Environmental Health and Safety (EHS).

Arrange for a Waste Pick-up:

- The waste will either be picked up by EHS or a licensed waste disposal contractor upon scheduling.
- An online waste pickup form can be found as well as more information here: http://www.ehs.ucf.edu

Biological Waste:

- Biological waste must be placed inside a red bag lined biomedical waste fiberboard box.
- Tape all seams in an "H" pattern using clear tape. Do not overfill the boxes – the maximum weight is 50 lbs.
- Label each bag of biohazardous waste with the following:
  • The University's Full Name: University of Central Florida
  • Point of Generation: Building # and Room #
  • Point of Contact: PI's Name and Phone Number
- Place the closed and labeled biomedical waste boxes in the hall for pick-up by the biowaste contractor.
- SHARPS, All medical sharps (e.g. metal lancets, scalpel blades, needles or syringe/needle combinations) must be disposed of in red, plastic sharps containers even if they are unused or not biologically contaminated.
- Sharps containers that contain only sharp items shall be closed when they are ¾ full and discarded in the red bag lined biomedical waste box within 30 days after closure. Label each sharps container with the following:
  • The University's Full Name: University of Central Florida
  • Point of Generation: Building # and Room #

• Point of Contact: PI's Name and Phone Number

Arrange for a Biological Waste Pick-up:

- The waste will either be picked up a licensed biomedical waste disposal contractor upon scheduling.

An online waste pickup form and more information can be found here: http://www.ehs.ucf.edu

8. **Exposures/Unintended contact:**

- In the event of a recognized exposure to **hazardous materials or equipment**, follow the First Aid Measures indicated on the Safety Data Sheet (SDS).
  - **For glass cuts**, wash the affected area with antiseptic soap and warm water for 15 minutes. *Note: All needle stick/puncture exposures **MUST** be reported to EHS within 24 hours.*
  - For mucous membrane exposure, flush the affected area for 15 minutes using an eyewash station.
- For medical emergency, dial 911.
- Notify the supervisor immediately of the incident.
- Notify AmeriSys at 1-800-455-2079 to initiate medical treatment.
- Contact EHS to report and complete the injury or illness report.

For an actual chemical exposure, accident or near miss complete the Accident Report or Near Miss Form found here: http://www.ehs.ucf.edu.
Please include specific procedures for hazardous substances per manufacturer SDS sheet(s).
Please attach relevant SDS(s).

9. **Spill Procedure:**

Personal Precaution: Fill in.

List required PPE: Fill in per SDS.

Environmental Precaution:
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment MUST be avoided.

Biological Spill Containment and Clean-up:
Please describe spill clean-up for the hazard being used:
Fill in.

Chemical Spill on Body or Clothes
Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Seek medical attention. Notify supervisor and EHS immediately.

Biological/Chemical Splash into Eyes:
Immediately rinse eyes using the emergency eyewash station for 15 minutes by forcibly holding the eye open. Seek medical attention. Notify supervisor and EHS immediately

10. **Training of personnel:**

Documentation of Training *(signature of all users is required)*
Prior to commencing any work with_____, the Principal Investigator/Facility Manager shall conduct formal training of all staff that will be engaged in the use and/or handling of the instruments.

The training must include an understanding of all hazards of use, storage and handling including using appropriate PPE, work area decontamination and emergency procedures. All staff receiving the training must sign the training record with the person's name, signature and date of training.

Signatures

Use the following table to list all personnel who will use/handle_____. Initializing indicates that the staff member has read the Safety Plan and this SOP and understands the hazards and safe work practices as detailed in this SOP.

Name	Employee ID #	Initials	Date of Training

Principal Investigator/Facility Manager Name: (Print): _____

Principal Investigator/Facility Manager (Signature): _____

Date: _____

See https://ehs.ucf.edu/forms/standard-operating-procedure-template for electronic version of this template.

UCF Report of Accident / Near Miss Procedures

Instructions: This form shall be used to report ***all*** accidents or near miss events that occur at UCF. This helps us identify and correct hazards before they cause additional injuries to personnel or damage to property. This form shall be completed by employees / supervisors ***by the end of the shift in which the accident took place***. In the event of **multiple or serious injuries or death EHS must be notified immediately**.

Note: ***If more than one (1) employee is injured, you must fill out a separate Accident / Near Miss form for each employee.***

Terms: ***Accident*** is an unwanted outcome of an event that resulted in injuries to a person or persons. ***Near Miss*** is an event that could have caused an accident

SECTION I: EMPLOYEE INFORMATION		
1. I am reporting a(n): ○ accident ○ near miss.		**2. Date of accident/near miss:**
3. Have you told your supervisor about this accident/near miss? ○Yes ○No		**4. Time of accident/near miss:**
5. Did this injury occur while you were working? ○Yes ○No	**6. Were there three (3) or more employees injured in this event?** ○Yes ○ No ○Don't Know	
THIS QUESTION IS FOR EMPLOYEES ONLY **7. If you had a work related accident, have you called and reported it to AmeriSys at 800-455-2079? ○ Yes ○ No**		
8. I am a(n): ☐ Regular full time employee ☐ Regular part time employee ☐ Working Student ☐ Temporary employee ☐ Volunteer ☐ Other		
9. Employee Job Category: ☐ Housekeeping ☐ Laboratory ☐ LNR ☐ Law Enforcement ☐ Maintenance ☐ Office ☐ Teaching ☐ Other		
10. Employee Name:	**11. Employee Job Title:**	**12. Employee Phone Number:**
13. Supervisor Name:	**14. Supervisor Job Title:**	**15. Supervisor Phone Number:**
16. Date of Employment/Hire?	**17. Age Range:** ☐ 18-24 ☐25-34 ☐35-44 ☐45-54 ☐55-64 ☐65+	**18. Did death occur?** ○Yes ○No

SECTION 2: ACCIDENT / NEAR MISS INFORMATION		
19. Were tools, equipment, vehicles, or other objects involved? ○Yes ○No ○Don't Know	**19a. If yes, what was it?**	**20. Choose all that apply as a result of the event:** ☐First Aid ☐Reporting ☐Workman Comp ☐Days Off ☐Light Duty
21. Were any motor vehicles involved? ○Yes ○No	**21a. Motor Vehicle owner:** ☐State ☐Student ☐Faculty/Staff ☐Contractor ☐Others ☐Not Applicable	**21b. Motor Vehicle 1 License Plate / Registration #**
21c. Motor Vehicle 2 License Plate / Registration #	**22. Is there Property Damage involved?** ○Yes ○No	**22a. What property was damaged?**
23. Names of witnesses (if any):		
24. Provide the specific building, room, area, and street in which the event occurred:		
25. What were you doing at the time?		
26. Describe step by step what led up to the accident/near miss.		

27. What could have been done to prevent this accident/near miss?

28. Has the employee been trained in safety practices related to this event? ○Yes ○No ○Don't Know. If yes, when?_____/___/_____

29. Has the employee been trained in the use of Personal Protective Equipment related to this event? ○Yes ○No ○Don't Know

○ Not Applicable If yes, when?____/___/_____

30. Was the employee wearing Personal Protective Equipment at the time of the accident? ○Yes ○No ○Don't Know ○ Not Applicable

30a. Protective Eye Wear	**30b. Hard Hat**	**30c. Safety Shoe**	**30d. Goggles**	**30e. Gloves**	**30f. Hearing Protection**	**30g. Respiratory Protection**
☐ Safety Glasses	☐ Plastic	☐Toe Protection	☐ Dust	☐ Nitrile ☐ PVC	☐ Ear Muff	☐ Disposable Dust Mask
☐ Prescribed Glasses with Side Shield	☐ Metal	☐Electrical	☐ Chemical	☐ Cotton ☐ Leather	☐ Ear Plugs	☐ Full Face
☐ Other	☐ Other	☐Slip Resistant	☐ Other	☐ Natural Rubber	☐ Other	☐ Half Face
		☐Other		☐ Electrical ☐ Other		☐ Other

31. If this is a near miss, how could you or someone else have been injured?

32. <u>To Be Completed by Supervisor:</u> What corrective action(s) have you implemented since the injury or near miss to protect the employee? (or comments/suggestions)

SECTION 3: SUPERVISOR ACKNOWLEDGES EVENT

33. ☐ Supervisor: I have read and completed this report based on my notes, employee assistance, or other means**.**

33a. Supervisor Signature:	**33b. Date:**	**33c. Supervisor Email:**

34. ☐ Acknowledgement: I acknowledge the information is accurate and completed to the best of my knowledge.

34a. Employee Signature:	**34b. Date:**	**34c. Email:**

35. Signature of individual Completing Report (*If not Employee or Their Supervisor*):

Hazardous Weather Preparation Checklist

Departments are responsible for taking protective actions in their own laboratories. This checklist is designed to identify suggested tasks and assignment of responsibilities for preparing laboratory areas. Not all items are appropriate for all areas. Departments and researchers should add actions specific to their individual laboratories if needed.

When impacts from tropical weather are possible, consider necessary preparations to suspend ongoing experiments involving biological materials, radioactive agents and hazardous chemicals. When UCF suspends normal operations, postpone operations in the laboratory, secure equipment and complete the checklist. **Note: personnel should not stay in the laboratory during a storm if UCF has suspended normal operations.**

Additional mitigation steps can be taken year-round to reduce impacts from tropical weather and other incidents, including:

- Keep chemical, radiological and biohazardous materials in your inventory to a minimum.
- Dispose of hazardous wastes and old chemicals routinely to minimize accumulation of hazardous materials in your facility.
- Laboratories with exterior windows should identify a secure area for storage of water reactive chemicals, radioactive materials and biohazardous agents. Ideally, materials with significant, potential hazard should be moved to interior rooms. (e.g. – solvents containing reactive metals, glove boxes containing air reactive materials)
- If dry ice will be needed pre- or post-incident, document vendor information, payment method and delivery or pick-up options. Note: dry-ice should not be transported in a closed vehicle for safety of the occupants.
- Maintain a supply of plastic, waterproof containers to store reactive chemicals, lab notes, research documentation, electronic data and other important materials.
- Plan in advance how to ensure the protection of valuable research equipment, samples and data.
- Contact appropriate work management center (Work Control) if planning to use portable generator to determine appropriate and safe use, connection and fueling. Note: portable generators are normally not provided by work management centers.
- Maintain a stock of critical supplies to prevent disruptions.
- Update and distribute emergency and contact information to laboratory personnel. Regularly maintain emergency call list on the notice board at the laboratory door.

APPENDIX R: HAZARDOUS WEATHER PREPARATION CHECKLIST

□	Action/Task	Location	Staff Responsible		Notes
			Primary	Alternate	
	Turn down refrigerators and freezers to the lowest practical settings and plug into emergency power where available. Red outlets typically designate emergency power.				
	Place recording maximum/minimum thermometers in refrigerators and freezers containing temperature critical supplies and samples.				
	Plug incubators into emergency power outlets if cultures must be maintained in vitro.				
	Cover and secure or seal vulnerable equipment with plastic.				
	Remove or secure equipment from outdoor and rooftop locations.				
	Ensure arrangements have been made for the care and feeding of laboratory animals. Follow the recommended actions of UCF Animal Care Services.				
	In areas subject to flooding, relocate or elevate equipment, chemicals, wastes and other important items from the floor to prevent damage.				
	Secure radioactive isotopes, biohazardous agents, recombinant materials and hazardous chemicals to prevent breakage and release.				
	Fill dewars and cryogen reservoirs for sample storage and/or critical equipment.				
	Over-pack reactive chemicals in plastic, waterproof containers.				

□	Action/Task	Location	Staff Responsible		Notes
			Primary	Alternate	
	Remove regulators and cap gas cylinders, except for CO2 needed to maintain cell cultures. Ensure all cylinders are secure.				
	Autoclave or inactivate infectious or rDNA waste.				
	Due to the possibility of power outages, store volatile, toxic materials in tightly sealed, break-resistant containers rather than fume hoods or open room.				
	Protect valuable files, research samples and notebooks in place or move to a safer location.				
	Protect notebooks and secure samples/data as necessary for colleagues unable to reach the lab.				
	Update emergency contact information including notification list on lab door. Add and expand temporary contact information if staying at a different location during storm.				
	Close and latch (or secure with tape if needed) filing cabinets and cupboards.				
	Back-up electronic data and store in multiple locations.				
	Follow IT provider instructions for computer equipment preparations.				
	Close and lock all doors and windows before leaving.				
	If appropriate, complete Attachment 1 – Vehicle Assignments for Tropical Weather.				
	If appropriate, complete Attachment 3 – Office and Administrative Areas Checklist.				

Acronyms and Definitions

LIST OF ACRONYMS

ACGIH – American Congress of Governmental Industrial Hygienists

ANSI – American National Standards Institute

BSC – Biological Safety Cabinet

BSL – Biological Safety Level

CDC – Centers for Disease Control and Prevention

CFR – Code of Federal Regulations

CHO – Chemical Hygiene Officer

CHP – Chemical Hygiene Plan

DEP – Department of Environmental Protection

DNA – Deoxyribonucleic Acid

rDNA – Recombinant Deoxyribonucleic Acid

DOT – Department of Transportation

EH&S – Environmental Health and Safety

FAC – Florida Administrative Code

FDLES – Florida Department of Labor and Employment Securities

HEPA –High Efficiency Particulate Air

IACUC – Institutional Animal Care and Use Committee

LFPM – Linear Feet per Minute

LSO – Laser Safety Officer

MSDS – Material Safety Data Sheet

NFPA – National Fire Protection Association

NIH – National Institutes of Health

OSHA – Occupational Safety and Health Administration

PEL – Permissible Exposure Limit

PI – Principle Investigator

PPE – Personal Protective Equipment

RCRA – Resource Conservation and Recovery Act

RSO – Radiation Safety Officer

SOP – Standard Operating Procedure

SDS- Safety Data Sheet

UCF – University of Central Florida

DEFINITIONS

The definitions listed below are taken directly from the OSHA Lab Standard (29 CFR§1910.1450(b)).

Chemical Hygiene Plan: A written program developed and implemented by an employer which sets forth procedures, materials, personal protective equipment and work practices that (i) are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace and (ii) meet the requirements of paragraph (e) of the Lab Standard.

Emergency: Any occurrence such as, but not limited to, equipment failure, rupture of containers or failure of control equipment that results in an uncontrolled release of hazardous chemicals in the workplace.

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

Hazardous chemical: A chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees.

Health hazard: A term that includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin, eyes, or mucous membranes.

Laboratory: A facility where the "laboratory use of hazardous chemicals" occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

Laboratory scale: Work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safely manipulated by one person. "Laboratory scale" excludes those workplaces whose function is to produce commercial quantities of materials.

Laboratory-type hood: A device located in a laboratory that is enclosed on five sides with a movable sash or fixed partial enclosure on the remaining side. It is designed to prevent or minimize the escape of air contaminants into the laboratory and to keep the breathing zone of the operator uncontaminated. Walk-in hoods with adjustable sashes meet this definition provided that the sashes are adjusted during use so that the airflow and the exhaust of air contaminants are not compromised and employees do not work inside the enclosure during the release of airborne hazardous chemicals.

Laboratory use of hazardous chemicals: The handling or use of such chemicals in which all of the following conditions are met:

1. Chemical manipulations are carried out on a "laboratory scale;"

2. Multiple chemical procedures or chemicals are used;

3. The procedures involved are not part of a production process, nor in any way simulate a production process; and

4. "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

Physical hazard: A chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water reactive. In general electrical, Heat, LASER, and energetic material.

Protective laboratory practices and equipment: Those laboratory procedures, practices and equipment accepted by laboratory health and safety experts as effective, or that the employer can show to be effective, in minimizing the potential for employee exposure to hazardous chemicals.

Based on these definitions, the CHP will apply to all areas engaged in the laboratory use of hazardous chemicals.

Table of Reference Standards for Various Activities

- **Bloodborne Pathogens Standard**
- **Hazard Communication Standard**
- **Occupational Exposure to Hazardous Chemicals in Laboratories**
- **Globally Harmonized System for Hazard Communication**

See the online Laboratory Safety Manual at www.ehs.ucf.edu for text.

Environmental Health and Safety	Effective Date: 09/12/2023	Procedure Number: EMS-WP-001
	Revision: 1	Page 1 of 14
TITLE: **Laboratory Environmental Management Procedures**	**Responsible Authority:** Director, Environmental Health and Safety	

APPLICABILITY/ACCOUNTABILITY

The following procedures are applicable to all laboratory personnel working with chemicals. The laboratories covered under this procedure include, but are not limited to, those in departments and research centers in:

College of Engineering: CECS, EECS, FSI, IEMS, MMAE, SWMA
College of Medicine: BSBS, Molecular Biology and Microbiology, Pegasus Health
College of Optics and Photonics: CREOL, FPCE, TLI
College of Science: Anthropology, Biology, Chemistry, NCFS, Physics
Office of Research: AMPAC, FSEC, NSTC
UCF Faculty Clusters

The Department of Environmental Health and Safety (EHS) is the designated office in charge of ensuring compliance and administration of this procedure.

PROCEDURE STATEMENT

The University of Central Florida (UCF) has assessed the potential environmental impacts related to chemical use in research and academic laboratories. The following procedures have been established to minimize these impacts and to ensure laboratory operations are in compliance with applicable environmental laws, rules, and regulations.

DEFINITIONS

Environmental Health and Safety Assistant (EHSA): The integrated web-based software system that manages EHS related data from laboratory identification and space assignment, principal investigator chemical use permits, laboratory hazard analysis tools, chemical inventory, laboratory worker identification and training records, and inspection results and history.

Laboratory Manager: Person assigned by a department or individual Principal Investigator as the point of contact for departmental or individual laboratory issues.

Laboratory Personnel: Faculty, staff, graduate students (i.e., teaching assistants, research assistants, and laboratory assistants), contractors, and visitors performing duties or tasks physically situated in a UCF laboratory facility.

Principal Investigator (PI): Person assigned as point of contact for departmental or individual laboratory space. This person is in charge and responsible for all operations and activities performed in the laboratory.

Shared laboratory space: A room used for multiple research or academic interests that is not under the control of one principal investigator.

RCRA (Resource Conservation and Recovery Act) hazardous waste: Waste that meets the definitions of listed or characteristic hazardous wastes.

Non-regulated laboratory waste: Wastes that do not meet the definition of RCRA waste but still are considered toxic or environmentally unfriendly.

Satellite Accumulation Areas (SAA): Areas in individual laboratories where waste is collected for removal to the main accumulation area at Building 48. Wastes must stay in the area (laboratory) where they have been generated, be under control of the operator of the process which generated the waste, and contain no more than 55 gallons of hazardous waste or 1quart acutely hazardous waste.

In line Waste Collection: Any system that accumulates laboratory wastes automatically, periodically, or continuously, and is associated with a chemical or instrumental operation in a laboratory.

PROCEDURES

1. Identification of Laboratory Activities and Responsibility

Each department or research center covered under by this document is responsible for updating the Laboratory Identification form to notify EHS when chemical laboratory room use or space assignments to specific PI's change.

Information included in the Laboratory Identification Form: department name, name of chair or director, name of laboratory manager, name of central purchasing agent, lab number, assigned principal investigator(s), and type of activities.

Updates must be reported prior to reuse of space from chemical to non-chemical, significant renovations, and reassignment of space between departments or PI's.

Laboratory Manager Appointment: Each department shall assign a departmental laboratory manager or require principal investigators to assign a dedicated laboratory manager for their individual lab(s). Chairs or PI's shall assign roles under their permit in EHSA.

The Lab Manager will serve as point of contact for laboratory issues and attend the additional EHS training classes as outlines in *Training Requirements for Potentially Hazardous Activities.*

2. Laboratory Close-Out

Each area is responsible for following guidelines in Laboratory Close-out Procedures whenever a lab worker permanently leaves an assigned lab as a result of graduation, resignation, termination, or transfer or in the event of a lab move or renovation.

3. Hazardous Materials Procurement Methods

Each department should identify a centralized purchasing agent. This centralized agent will use current UCF Purchasing Department guidelines for hazardous material purchases. The name of this individual should be listed on the Laboratory Identification Form.

Procurement cards are not to be used for hazardous material purchases per *University policy 3-107*.

Chemicals should be ordered in the smallest possible quantities to reduce waste disposal costs and minimize storage in overcrowded labs.

Whenever possible, less toxic alternatives should be purchased. Purchases of thermometers, sphygmomanometers, manometers, and barometers must be non-mercury containing unless required by individual research methods.

Donations of chemicals or equipment containing chemicals must be reported on the In-Kind Gift Donation form and approved by EHS prior to accepting the materials.

4. Hazard Communication and Inventory Requirements

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.

Chemical manufacturers are required to send a Safety Data Sheet (SDS) when a chemical shipment is ordered. Departments are required to keep a hard-copy or electronic version of all SDS in their chemical inventory.

All laboratories are required to maintain their chemical inventory on the University online chemical inventory database in accordance with *Chemical Inventory Procedures*. This includes a requirement to perform a review for expired/unwanted/unlabeled chemicals at least annually.

Unknowns and expired chemicals must be disposed through EHS and unwanted, but usable, chemicals should be processed through the chemical redistribution system.

5. Waste Determination

Initial waste determinations should be performed on all waste streams to determine whether they need to be managed as regulated hazardous waste or not and to provide guidance on segregation of waste storage.

The waste determination should be performed using laboratory personnel knowledge of the process, Safety Data Sheets, Waste Determination Flowchart , or other reference materials. EHS recommends documentation of this waste determination.

Laboratory personnel are responsible for identifying all components of the waste stream and performing initial waste determination.

EHS personnel are responsible for assisting laboratory personnel with waste determinations. EHS may remove containers previously identified as waste from laboratory operations if it is determined that the material transferred to another area for use.

6. In-Laboratory Waste Storage Area Requirements

Hazardous waste must remain at or near the point of generation. Individual labs must designate an area in each laboratory space where chemical wastes are being generated for storage of waste. This space is called the Satellite Accumulation Area (SAA).

Laboratories with SAA’s must be locked when personnel are not present.

SAA’s must have containment trays that can be used to segregate the hazard classes and contain potential spills.

Avoid locating SAA's in fume hoods to minimize loss of usable fume hoods space and the potential for decreased hood effectiveness. Avoid locating SAA's near laboratory exits.

7. SAA Storage Limits

Each lab may temporarily hold a total of 208 liters (55 gallons) of individual waste streams with the exception of RCRA acutely hazardous (p-listed) waste. Quantities of unused p-listed waste are limited to 1 quart or 2.2 pounds.

When 55 gallons has been collected, or the p-listed quantity exceeded, the waste must be transferred from the lab to the EHS storage area within 72 hours.

Fire Code storage limits of hazardous materials are typically much less than 55 gallons. EHS recommends that labs request waste collection when individual containers are full.

8. Hazardous Waste Container Labeling

All laboratory waste must be labeled with a hazardous waste or non-regulated waste label. The label must include the chemical name of all hazardous constituents with estimated percentage in the mixture. Do not use chemical formulas as the chemical name.

If the container is too small to hold a label, the label shall be placed on a larger secondary container (for example, a tray, larger bottle, or plastic bag).

If the label is too small to hold the list of components, laboratory personnel should maintain a log of wastes added to the container.

Printed labels can be obtained from EHS.

9. Hazardous Waste Container Requirements

Chemical waste must be in a sealed container that shows no sign of leakage or damage. Spills and residues on the outside of the container must be cleaned up immediately.

Containers sealed with broken or loose caps, stoppers, films, or are otherwise unsealed are prohibited.

Containers must not be overfilled to account for expansion. Generally, fill to within 3 to 5 inches of the mouth of the bottle.

Choose container materials that are compatible with your waste stream. Corrosives and halogenated solvents must be in glass or plastic containers. Do not use food or beverage containers for hazardous waste collection.

Halogenated solvent waste must be collected and stored in separate containers from other solvent waste.

Containers of waste must be securely closed at all times except when wastes are being added to (including during in-line waste collection) or removed from the container. If there is a risk of pressurization of the container, leave the cap loosely closed and the container in the fume hood until the reaction is complete. After the reaction is complete, tightly close the lid and move the container to the SAA.

It is the individual department or research unit's responsibility to provide waste collection containers. EHS does not stock empty containers for SAA waste collection.

Most containers, with the exception of 5-gallon carboys that contain solvents that can be consolidated into 55-gallon drums, will not be returned to you.

In-line waste collection systems must be constructed to prevent the release of laboratory waste into the environment. These systems must provide for sealed containment of the waste as it is being collected.

10. Disposal of Waste from the Laboratory

Waste is ready to be removed from the laboratory when the containers are full, the lab has reached its waste accumulation limits, or the laboratory requests removal.

Check condition of the container for leaks, drips, and make sure the container is completely sealed.

Check to make sure the waste label is accurate and complete.

Go on-line to EHSA and enter the waste pickup request details (www.ehs.ucf.edu).

If your lab is located on UCF Main Campus and certain Research Park Facilities, EHS will pick up your waste in 30 business days. Off-site locations will have waste collected directly from the laboratory by the UCF hazardous waste vendor within six months of request.

11. Disposal of Unknowns and Gas Cylinders

Containers with unidentified contents present potential hazards and are expensive to dispose. Departments should not allow students/staff to vacate a laboratory without first identifying all containers. Follow the Laboratory Close-Out Procedures to avoid future accumulation of unknown materials.

EHS will collect unknowns only during scheduled campus pick-ups by our hazardous waste contractors. If unknowns are listed on the online request, you will be notified when the contractor will be on campus.

When labeling unknowns for disposal, use a hazardous waste label and state “waiting waste determination” along with as much information you have about the process or chemical as possible.

Contact the gas cylinder vendor for removal and disposal. If the vendor cannot be identified or if the vendor will not accept the cylinder for disposal, create an EHS waste pickup request. EHS will collect gas cylinders during scheduled campus pick-ups by our hazardous waste contractors.

12. Empty Containers and Broken Glass

UNLESS a container has held an acutely hazardous (p-listed) waste, the container is considered empty and not a regulated hazardous waste if:

All wastes that can be removed have been removed using conventional methods (pouring, scraping. e.g.) and

No more than 2.5 centimeters remain on the bottom of the container or

No more than 3 percent of the capacity of a container equal to or less than 119 gallons remain or

No more than 0.3 percent of the capacities of a container greater than 119 gallons remain.

Containers with acutely hazardous (p-listed) residues must be labeled with a **hazardous waste label** reading "Container contaminated with _____" (state name of highly toxic residue) and follow the disposal procedures.

Containers considered RCRA empty, but which still contain some free material, should not be recycled. This can present a hazard to recycling workers, and the receiving facility doesn’t want containers still holding hazardous materials. These containers should be managed by EHS as hazardous waste. An example of a container which would fall into this category is a metal solvent can, which is difficult to empty entirely.

Disposing of Empty Chemical Containers
Chemical containers, when emptied of their hazardous contents, can be triple rinsed out and disposed of through normal municipal trash or recycling.

The Triple Rinse Process
Once you have removed as much product as possible through traditional means, your empty chemical container can be rinsed and disposed of or reused to store another chemical/waste product.

Using a solvent capable or removing the contaminant (water, acetone, etc.), rinse out the inside of the container.

Pour off the solvent/contaminant rinse into a hazardous waste container. You can combine compatible wastes into 1 container, being sure not to combine too many waste streams (*waste containers are not a science experiment!*).

Repeat this two more times for a total of 3 rinses. Three is the absolute minimum. If chemical residues remain, you may repeat this process as many times as necessary.

When the container is empty (criteria below) and ready to be discarded, the label should be defaced and a "**Triple Rinsed**" sticker should be affixed.

If containers have been **triple rinsed and are completely emptied** of their contents they may be sent out through recycling or the regular trash. Laboratories managed by UCF Facilities Operations can recycle their empty containers by placing them in the regular recycling.

Be sure to:

Deface the chemical name and all hazard symbols on the manufacturer label. **The chemical name and hazard pictograms should be illegible.**

Write the word "**Empty**" on the container label.

Remove the chemical from the **online EHSA Chemical Inventory**.

Remove or deface the **bar code sticker** on the container.

<u>Laboratories not managed by UCF Facilities Operations should follow the above steps, but should check with their laboratory manager for container recycling procedures specific to their location.</u>

Do NOT place broken glass in the recycle or trash bins. Broken glass **grossly contaminated with chemical residue** or with biohazardous or radioactive material should be disposed of in a rigid, puncture proof container and labeled for proper disposal in the appropriate waste stream.

Only broken glass that is **NOT** grossly contaminated with chemical residue can be handled in the following manner: the glass should be carefully picked up using forceps or a broom and dust pan and placed in a container such as a cardboard box (or other designated substantial container such as a plastic container designated for broken glass) and clearly labeled as broken glass. Please do not place broken glass in ordinary trash containers as it presents a potential risk to those that handle it. Please check with your department on their policy and procedure for disposal of broken glass. Sealed boxes with broken glass must be labeled “Broken Glass” and can be placed within the regular trash for building custodial or placed directly in the dumpster.

13. Contaminated Lab Debris

Chemically contaminated lab debris (gloves, paper towels, wipes, absorbent paper, gels) must be evaluated for proper disposal. Pipette tips and other transfer vessels are considered containers; see section 12 for disposal guidelines.

In general, lab debris does not have to be collected as hazardous waste as long as it is not grossly contaminated with hazardous chemicals (no free liquids or solids) unless it falls into one of more of the following categories:

Contaminated spill clean-up materials.

Debris contaminated with p-listed chemicals.

Debris contaminated with over the regulated quantities of TCLP contaminants.

Collect debris that is either grossly contaminated or falls into one of the above categories separately from non-hazardous debris and dispose as hazardous waste. Contain the debris in a sealed bucket, can, or hazardous material bag compatible with the waste stream. Label appropriately.

14. Disposal or Transfer of Laboratory Equipment Containing or Contaminated with Hazardous Materials.

Equipment that has been used to store or handle hazardous materials must be free of hazards prior to disposal, transfer to another campus location, or transfer to Surplus property. The equipment owner is responsible for draining oil, removing hazardous components (batteries, switches), discharging

capacitors, depressurizing, etc. unless the equipment is being sold for reuse and needs to remain operable. If the equipment was used to store chemicals, biological material, or radioisotopes the user shall decontaminate the equipment prior to EHS assessment. Decontamination shall be per EHS's *Laboratory and Equipment Decontamination Procedures* . Once decontaminated contact EHS to provide an assessment of the equipment prior to surplus or disposal per the *Environmental Assessment of Equipment Prior to Surplus, Salvage or Disposal procedure*.

15. Treatment and Evaporation of Hazardous Wastes

Laboratories are allowed to adjust the pH of corrosive waste streams by neutralizing in container as long as the waste does not exhibit any other hazardous waste characteristic.

Laboratories are prohibited from all other hazardous waste treatment intended to render the waste non-hazardous including deliberate evaporation or dilution of the hazardous waste.

16. Drain Disposal

Collect all chemical waste for disposal through EHS. Drain disposal of laboratory chemicals is restricted in the followings cases:

More than *de minimis* (residual) amounts of RCRA hazardous waste from rinsing empty containers or cleaning glassware or

Any amount of RCRA acutely hazardous (p-listed) hazardous waste or

Those that exceed the local pollutant limits set by the City of Orlando (Chapter 30 Pretreatment of Wastewater)

City of Orlando (Chapter 30 Pretreatment of Wastewater), Local Pollutant Limits:

Constituent	Maximum Uniform Concentration Limit (mg/l)
Antimony	0.35
Arsenic	0.35
Barium	9.5
Beryllium	0.15
Boron	1.0
Cadmium	0.25
Chlorides	250
Chromium (Total)	0.50
Cobalt	0.65

Constituent	Maximum Uniform Concentration Limit (mg/l)
Copper	0.75
Cyanide	0.35
Fluoride	7.5
Lead	0.25
Lithium	0.50
Manganese	2.50
Mercury	0.001
Molybdenum	0.25
Nickel	1.1
PH	5.5 to 10.5
Phenols (Total)	3.0
Selenium	0.20
Silver	0.12/BMP
Sodium	300
Zinc	1.40

17. Transportation

EHS will remove hazardous waste based the “Hazardous Waste Pick Up Calendar” found on the EHS website. No laboratory workers can take laboratory waste to the main accumulation area, unless authorized by EHS.

Hazardous wastes **must** stay in the SAA at the point of generation until collection by EHS or the approved hazardous waste vendor.

Reactive wastes unsuitable for transport will stay in the lab until the hazardous waste disposal vendor is on campus for a scheduled pick up.

Off-campus departments not approved by FDEP for UCF EHS collection will have the opportunity to have waste collected by UCF hazardous waste contractor on at least a bi-annual basis.

18. Chemical waste mixed with biomedical waste or radioactive waste

Do NOT use Biohazard, Biomedical, Sharps, or Radiation waste containers for chemical waste unless the waste displays both chemically hazardous and infectious or radioactive properties.

In the event the wastes types are mixed, label the biohazard or radiation container with a laboratory hazardous waste label. Keep the mixed waste separate from other biohazardous or radioactive materials and contact EHS for disposal information.

See the *Radiation Safety Manual* and *Biological Safety Manual* for additional disposal procedures.

19. Emergency Preparedness and Response Procedures

Incidental Spills

All laboratories are supplied with a spill kit to control small spills (4L or less) of known substances that are not acutely hazardous. The spill kits contain absorbent materials that can be used on a wide range of chemicals. Laboratories with hydrofluoric acid are required to purchase spill control materials specific to hydrofluoric acid.

Lab Personnel are expected to respond to small (4L or less) spills of chemicals as long as:

He/she has knowledge of the chemical's physical and health hazards.

The spill does not involve highly toxic, reactive, or multiple chemicals where the reaction by-products are unknown, and there has been no fire, explosion, or injury.

The clean-up procedures are known and appropriate materials are readily available.

Waste generated from spill response should be disposed in accordance of section 10 of this document.

Larger Spills

Contact your supervisor or lab manager and evacuate the area if the spill:

Is Larger than 4 L or

Involves multiple chemicals where the reaction by-products are unknown or

Involves mercury or

The clean-up procedures are not known or appropriate materials are not readily available.

Call 911 and evacuate the area if the spill:

Involves injured personnel or

Involves a highly toxic or reactive material or

May endanger the environment

Call Work Control Center at 3-5223 after contacting appropriate emergency responders. **All spills must be reported to EHS.**

20. Training

All laboratory personnel receive initial and annual training commensurate with their job responsibilities in accordance with *Training Requirements for Potentially Hazardous Activities*. Specifically:

Anyone working with hazardous materials must complete the online Laboratory Safety Series and attend a Laboratory Safety Practical. Review of the online Laboratory Safety Series is required annually.

Additionally, laboratory managers must attend the annual advanced hazardous materials course.

21. Inspections and Audits

Annual laboratory audits will be performed by EHS in accordance with the *Laboratory Safety Manual*. Periodic inspections will be performed by EHS during routine laboratory or SAA visits.

When violations are identified, EHS will notify the PI or laboratory manager with a request for corrective actions to be performed. The PI or departmental laboratory manager must provide corrective actions within 30 days. Any violation not resolved within 30 days will be submitted to the department chair/director. Violations not resolved in 45 days may be reported to the University provost.

Unscheduled inspections from outside regulatory agencies may occur at any time. Departments and individual researchers are responsible for fines incurred for improper environmental management practices in their assigned lab space including failure to provide adequate training to lab workers.

ASSOCIATED DOCUMENTS

Chemical Inventory Procedures
Chemical Release Procedures
Environmental Management Program
Environmental Assessment of Equipment Prior to Surplus, Salvage or Disposal Procedure

Hazard Communication Program
Hazardous Materials Transportation Policy
In-Kind Gift Donation
Laboratory Close-out Procedures
Laboratory and Equipment Decontamination Procedures
Laboratory Identification Form
Laboratory Safety Manual
Possession of Prescription Drugs and Controlled Substances Procedures
Radiation Safety Manual (link to FS page)
Training Requirements for Potentially Hazardous Activities
Waste Determination Flowchart

REFERENCES

40 CFR Parts 260-262
City of Orlando Chapter 30 Local Pollutant Limits
UCF Policy 3-107 Procurement, Use, and Possession of Hazardous Materials

DOCUMENT HISTORY

Date	Revision number	Author	Modifications
09/07/2023	0	Franco Del Pino	New format based on EHS_SOP001
09/12/2023	1	Renee Michel	Added 30 days to pick up waste, SB added triple rinse empty bottles instructions.

Environmental Health and Safety	Effective Date: 09/25/2023	Procedure Number: EHS_SOP303
TITLE: Hazardous Materials Shipping, Receiving, and Transportation	**Revision: 1**	**Page** 1 of 8
	Approved by Director of Environmental Health & Safety	

1. APPLICABILITY

This procedure applies to all faculty members, visiting scholars, staff members, students, volunteers, and affiliates who ship, receive, or transport regulated hazardous materials or dangerous goods.

2. PROCEDURE STATEMENT

This procedure details the process for shipping, receiving, and transporting hazardous materials while also providing examples of various situations where this procedure is necessary.

3. DEFINITIONS

Dangerous Goods (DG) - Articles or substances which are capable of posing a risk to health, safety, property, or the environment; which are shown in the International Air Transportation Association (IATA) list of dangerous goods; or which are classified according to the IATA regulations

Dangerous Goods Regulations - IATA regulations governing air shipments of regulated materials

Hazardous Material (HM) - A substance or material which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported by vehicle on a public roadway or by rail. All hazardous wastes are hazardous material under this definition. A list of hazardous materials can be found in U.S. Code of Federal Regulations (CFR) Title 49 part 172.101.

Hazardous Material Employee - A person who, in the course of full time, part time, or temporary employment, directly affects hazardous materials transportation safety. A person who loads, unloads, handles, or prepares (identifies, classifies, packages, marks, labels, or documents) hazardous materials packages, including the preparation of shipping papers; who tenders hazardous materials into commerce; or who otherwise transports hazardous

materials shipments. This does not include persons not directly employed by the University

Hazardous Materials Regulations (HMR) - Department of Transportation (DOT) regulations governing the transportation of hazardous materials in commerce, as found in 49 CFR parts 171 through 180. The DOT has established regulations for domestic transport (within the United States) of hazardous materials by rail, air, vessel (ships), and motor carrier (ground)

Materials of Trade - A hazardous material, other than a hazardous waste, that is carried on a motor vehicle:

- For the purpose of protecting the health and safety of the motor vehicle operator or passengers;
- For the purpose of supporting the operation or maintenance of a motor vehicle (including its auxiliary equipment); or
- By a private motor carrier (including vehicles operated by a rail carrier) in direct support of a principal business that is other than transportation by motor vehicle.

Materials of Trade are exempted from a portion of the 49 CFR. There are limitations on quantity and type of material that can be included in this exemption. (See Section 5, Associated Documents for all restrictions and requirements for Materials of Trade.) Materials of Trade should only be carried on a State-owned motor vehicle in direct support of university-related business.

Examples:

- A maintenance worker who carries pesticides or small amounts of gasoline for gas-powered equipment;
- A welder who carries acetylene and oxygen cylinders for use when welding in small amounts;
- A laboratory worker who carries prepared samples or reagents needed for a field experiment in to a field site.

4. RESPONSIBILITY

The Department of Environmental Health and Safety (EHS) is the designated authority for compliance with hazardous materials and dangerous goods shipping regulations.

Individuals acting on behalf of the University are responsible for safe and secure shipping, receipt, and transportation. Individuals must be properly trained and follow the shipping regulations as described in this procedure.

Failure to follow these regulations may result in accidents, injuries, regulatory violations, fines, loss of grant funding to the University, criminal penalties, and/or imprisonment.

5. ASSOCIATED DOCUMENTS

Materials of Trade: Rules and Regulations (49 CFR § 173.6)
§ 173.6 Materials of trade exceptions.

When transported by motor vehicle in conformance with this section, a material of trade (see § 171.8 of this subchapter) is not subject to any other requirements of this subchapter besides those set forth or referenced in this section.

(a) ***Materials and amounts.*** A material of trade is limited to the following:

(1) A Class 3, 8, 9, Division 4.1, 5.1, 5.2, or 6.1 material contained in a packaging having a gross mass or capacity not over -

(i) 0.5 kg (1 pound) or 0.5 L (1 pint) for a Packing Group I material;

(ii) 30 kg (66 pounds) or 30 L (8 gallons) for a Packing Group II or Packing Group III material;

(iii) 1500 L (400 gallons) for a diluted mixture, not to exceed 2 percent concentration, of a Class 9 material.

(2) A Division 2.1 or 2.2 material in a cylinder with a gross weight not over 100 kg (220 pounds), in a Dewar flask meeting the requirements of § 173.320, or a permanently mounted tank manufactured to the ASME Code of not more than 70 gallon water capacity for a non-liquefied Division 2.2 material with no subsidiary hazard.

(3) A Division 4.3 material in Packing Group II or III contained in a packaging having a gross capacity not exceeding 30 mL (1 ounce).

(4) A Division 6.2 material, other than a Category A infectious substance, contained in human or animal samples (including, but not limited to, secreta, excreta, blood and its components, tissue and tissue fluids, and body parts) being transported for research, diagnosis, investigational activities, or disease treatment or prevention, or is a biological product or regulated medical waste. The material must be contained in a combination packaging. For liquids, the inner packaging must be leakproof, and the outer packaging must contain

sufficient absorbent material to absorb the entire contents of the inner packaging. For sharps, the inner packaging (sharps container) must be constructed of a rigid material resistant to punctures and securely closed to prevent leaks or punctures, and the outer packaging must be securely closed to prevent leaks or punctures. For solids, liquids, and sharps, the outer packaging must be a strong, tight packaging securely closed and secured against shifting, including relative motion between packages, within the vehicle on which it is being transported.

(i) For other than a regulated medical waste, the amount of Division 6.2 material in a combination packaging must conform to the following limitations:

(A) One or more inner packagings, each of which may not contain more than 0.5 kg (1.1 lbs) or 0.5 L (17 ounces), and an outer packaging containing not more than 4 kg (8.8 lbs) or 4 L (1 gallon); or

(B) A single inner packaging containing not more than 16 kg (35.2 lbs) or 16 L (4.2 gallons) in a single outer packaging.

(ii) For a regulated medical waste, a combination packaging must consist of one or more inner packagings, each of which may not contain more than 4 kg (8.8 lbs) or 4 L (1 gallon), and an outer packaging containing not more than 16 kg (35.2 lbs) or 16 L (4.2 gallons).

(5) This section does not apply to a hazardous material that is self-reactive (see § 173.124), poisonous by inhalation (see § 173.133), or a hazardous waste.

(b) ***Packaging.***

(1) Packagings must be leak tight for liquids and gases, sift proof for solids, and be securely closed, secured against shifting, and protected against damage.

(2) Each material must be packaged in the manufacturer's original packaging, or a packaging of equal or greater strength and integrity.

(3) Outer packagings are not required for receptacles (*e.g.,* cans and bottles) or articles that are secured against shifting in cages, carts, bins, boxes, or compartments or by other means.

(4) For gasoline, a packaging must be made of metal or plastic and conform to the requirements of this subchapter or to the requirements of the

Occupational Safety and Health Administration of the Department of Labor contained in 29 CFR 1910.106(d)(2) or 1926.152(a)(1).

(5) A cylinder or other pressure vessel containing a Division 2.1 or 2.2 material must conform to packaging, qualification, maintenance, and use requirements of this subchapter, except that outer packagings are not required. Manifolding of cylinders is authorized provided all valves are tightly closed.

(c) ***Hazard communication.***

(1) A non-bulk packaging other than a cylinder (including a receptacle transported without an outer packaging) must be marked with a common name or proper shipping name to identify the material it contains, including the letters “RQ” if it contains a reportable quantity of a hazardous substance.

(2) A bulk packaging containing a diluted mixture of a Class 9 material must be marked on two opposing sides with the four-digit identification number of the material. The identification number must be displayed on placards, orange panels or, alternatively, a white square-on-point configuration having the same outside dimensions as a placard (at least 273 mm (10.8 inches) on a side), in the manner specified in § 172.332 (b) and (c) of this subchapter.

(3) A DOT specification cylinder (except DOT specification 39) must be marked and labeled as prescribed in this subchapter. Each DOT-39 cylinder must display the markings specified in 178.65(i).

(4) The operator of a motor vehicle that contains a material of trade must be informed of the presence of the hazardous material (including whether the package contains a reportable quantity) and must be informed of the requirements of this section.

(d) ***Aggregate gross weight.*** Except for a material of trade authorized by paragraph (a)(1)(iii) of this section, the aggregate gross weight of all materials of trade on a motor vehicle may not exceed 200 kg (440 pounds).

(e) ***Other exceptions.*** A material of trade may be transported on a motor vehicle under the provisions of this section with other hazardous materials without affecting its eligibility for exceptions provided by this section.

6. PROCEDURE

- **General**

All hazardous materials employees must receive function-specific training. Basic training may be provided by EHS, or EHS will provide a list of training vendors to departments with employees requiring more comprehensive training.

State-owned motors vehicles must be used for any transportation of hazardous materials by individuals acting on behalf of the University. Transporting chemicals in personal vehicles, either on campus or to off-site research locations for university-business, is prohibited. Use of campus shuttles and other public transit is prohibited. Any transportation, on private or public roadways, of regulated hazardous wastes by individuals other than trained EHS personnel or licensed waste vendors is prohibited.

- **Receipt of shipments of HM/DG**

  Examples:

  - Central Receiving personnel who load or unload HM/DG packages;

  - Administrative or laboratory personnel who receive or return orders of HM/DG packages from a carrier such as Federal Express (FedEx) or United Parcel Service (UPS).

Individuals involved in the receipt of HM/DG packaging must be trained in general DOT awareness and security measures. Training is required within 90 days of hire and recurrent every three years.

- **Transport of HM/DG on contiguous University property or public roadways**

  Examples:

  - Forwarding orders of HM/DG packages received at Central Receiving to an on-campus or Research Park facility;

  - Moving Materials of Trade from campus building to building, from campus to campus, or from campus to field location via State-owned motor vehicle;

  - Moving small amounts of chemicals from one lab to another lab via campus walkways or private roadways;

  - Shops or labs moving materials to a field location for use on projects.

Individuals involved in the transportation of hazardous materials on contiguous University property or over public roadways must be trained in Hazard Communication, or DOT Awareness, Security Measures, and Spill Response procedures, and in general vehicle loading practices. Training is at the time of assignment requiring transport of hazardous materials.

Materials of Trade rules and regulations apply to transportation over public roadways. (See Section 5, Associated Documents, above.)

- **Shipments of HM/DG**

  Examples:

  - Laboratory relocation;
  - Forwarding orders of HM/DG received at Central Receiving to facilities not located on contiguous University property or adjacent private roadways;
  - Shipping an HM/DG off campus, out of state, or out of the U.S. via a carrier;
  - Carrying an item with you when you travel on an airplane.

Individuals wishing to ship HM/DG are responsible for the accurate description of the materials. This may involve developing a Safety Data Sheet for otherwise uncharacterized research compounds.

The shipments must be properly classified, described, packaged, marked, and labeled. DOT or IATA training on each of these topics is required within 90 days of hire and is recurrent every three years (two years for certain IATA shipments).

Because of the training necessary and the continual changes in the regulations, EHS staff members have been trained to be in regulatory compliance and are available to help with your shipments. If a department needs to ship regulated materials frequently, EHS can provide information for department staff to receive compliance training.

7. RECORD KEEPING
8. ARCHIVES
9. DISTRIBUTION

This document is shared through:

□ EHS only	□ Facility and Safety	☑ UCF community
□ Secured Document	□ Contractor	☑ EHS Web site

□ Other: _____

10. REVIEW

	Name	Signature	Date
Director	Renee Michel	Renee Michel	9/25/2023

11. DOCUMENT HISTORY

Date	Revision number	Author	Modifications
09/25/2023	2	Renee Michel	Formatting
07/01/2019	1	Casey Brock	Format based on EHS_SOP001
06/11/2012	0	EHS	FSP 2012 EHS0003

UCF Environmental Health and Safety	Effective Date: 09/18/2023	Instruction Number: EHS_SOP345_INST001
	Revision: 1	Page 1 of 4
TITLE: Chemical Release	**Approved by** Director, Environmental Health & Safety	

1. APPLICABILITY

This procedure applies to all faculty members, visiting scholars, staff members, students, volunteers, and affiliates whose activities involve work around hazard materials.

2. PROCEDURE STATEMENT

This instruction details the appropriate steps to follow in the event of an unplanned release of a chemical or petroleum product. **Any release meeting the definition of emergency chemical release (listed below) should be reported to 911 immediately.**

3. DEFINITIONS

Emergency Chemical Release: Involve larger quantities of hazardous materials where local fire department response is required. These spills may involve injury, fire, explosion, acutely hazardous materials, unknowns, multiple containers, or result in uncontrollable releases to waterways or soil. Persons responding to these spills have comprehensive training in hazardous materials emergency response.

Incidental Chemical Release: Involve a small quantity of a known hazardous material in the workplace where the material is routinely used. The worker discovering or causing the spill has knowledge of the hazards and can perform the clean-up using available spill kit materials. These spills DO NOT involve unknowns, acutely hazardous materials, injury, fire, explosion, or uncontrollable releases.

Nuisance Chemical Odors: Involve hazardous material use in routine laboratory, maintenance, or construction work where engineering controls are inadequate to keep chemical odors localized in the immediate work area.

4. RESPONSIBILITY

In the event of an unplanned release of a chemical or petroleum product, it is the responsibility of the person causing the spill to promptly clean up the spill when it is safe to do so. UCF has determined that incidental spills-see definitions-should be cleaned up by persons trained to work with the chemical spilled. If the spill is larger than can be handled by persons in the immediate area but does not meet the definitions of an emergency chemical release, in-house, trained responders should be called to assist in the clean-up.

5. INSTRUCTION

- **Emergency Chemical Releases**

For major chemical releases resulting in actual or probable imminent danger to life or property:

1. Exit the lab or work area and isolate the area by closing the door.

2. Pull fire alarm in hallway.

3. Evacuate the building and alert nearby coworkers that there has been a major chemical release.

4. Call 911 while evacuating to a safe location.

5. Orange or Seminole County Fire Department Hazmat Team will respond to the site to determine the level of hazard.

6. UCF Police Department will respond to the chemical release site.

7. UCF Police Department will call EHS.

- **Incidental Chemical Releases**

1. Exit the lab or work area and isolate the area by closing the lab door. Alert nearby coworkers that there has been a minor spill in the area. Notify your supervisor, lab manager, or PI that a spill has occurred and discuss whether outside assistance is needed to clean up the spill.

2. Call Work Control (WCC) at 407-823-5223 to report. Provide the following information to WCC:
   - Name and Phone # where you may be reached;
   - Location of chemical release (Building and Room #);
   - Name of chemical released;

- Quantity of chemical released;
- Report of any injury;
- Report of any damage to property;
- Whether spill clean-up can be handled by the laboratory staff or if assistance or supplies are needed.

3. WCC will report incidental chemical releases to EHS and dispatch a trained chemical spill responder if assistance is needed.

4. Use available spill kits. Absorb spill and place materials in sealable bag, can or bucket for waste collection. Label container with contents. Save for disposal through Environmental Health and Safety. Contact EHS for disposal instructions and spill kit replacement.

- **Nuisance Chemical Odors**

1. Call Work Control (WCC) at 407-823-5223 to report. Provide the following information to WCC:
   - Name and Phone # where you may be reached;
   - Location(s) where chemical odor is detected;
   - Time or trends in occurrence;
   - Type of odor;
   - Report of any injury or physical symptoms. Are others experiencing similar symptoms?

2. WCC will report nuisance chemical odors to Environmental Health and Safety and dispatch an investigator.

3. EHS will investigate, prescribe corrective actions, and report findings.

6. DISTRIBUTION

This document is shared through:

□ EHS only	□ Facility and Safety	☑ UCF community
□ Secured Document	□ Contractor	☑ EHS Web site
□ Other: _____		

7. DOCUMENT HISTORY

Date	Revision number	Author	Modifications
05/21/2018	0	Casey Brock	Format based on EHS_SOP001
09/18/2023	1	Renee Michel	Annual Review

Environmental Health and Safety	Effective Date: 09/25/2023	Procedure Number: EHS_SOP302
	Revision: 1	**Page** 1 of 8
TITLE: Chemical Inventory	**Approved by** Director, Environmental Health & Safety	

1. APPLICABILITY

This policy applies to all faculty, staff, students, visiting scholars, volunteers, and affiliates who procure, use, or store hazardous materials. It outlines the local, state, and federal laws which require the University of Central Florida (UCF) chemical inventory to be kept current and updated in a timely manner. This document is applicable to all UCF owned, operated, or leased spaces.

The definitions and procedures described are to ensure that departments, Principal Investigators (PI), laboratory personnel, and shop workers understand the responsibility that they have to present an accurate and up-to-date chemical inventory. These procedures apply to all departments which use hazardous materials/chemicals.

2. PROCEDURE STATEMENT

A departmental employee knowledgeable of the work within the department, laboratory, or shop is responsible for ensuring that the chemical inventory presented to EHS is accurate and current.

Any chemical that has a National Fire Protection Association (NFPA) hazard rating of 2 or higher in any category must be included in the chemical inventory. All chemicals and mixtures that are considered hazardous (corrosive, acutely toxic, reproductive toxins, flammable, etc.) and require that a SDS be kept on hand according to OSHA (29 CFR 1910) or appear on the Department of Homeland Security (DHS) Chemicals of Interest list (6 CFR 27 Appendix A) must be included in the chemical inventory. Non-hazardous chemicals may be included for tracking by the department, but it is not a requirement.

Commercially available cleaning products, stock solutions, and samples that have been prepared from an inventoried parent container, biologically hazardous materials, radioactive materials, and non-hazardous chemical products are excluded from the chemical inventory. Biologically hazardous and radioactive materials are covered under other guidelines and require their own record-keeping.

On behalf of UCF, EHS uses the chemical inventory database to demonstrate compliance with statutory and regulatory requirements. The table below reflects some of the relevant regulatory agencies and documents.

Reasons for Chemical Inventory:	**Required by:**
Employee and Public Health	• State Fire Marshal • OSHA (29 CFR 1910)
Environmental Protection	• City of Orlando Industrial Waste Water • Florida Tier II (EPCRA) • RMP (40 CFR 68.130) • EPCRA Title III • OSHA (29 CFR 1910)
Emergency Planning, Spill Response, and Disaster Response	• Florida Tier II (EPCRA) • State Fire Marshal • CFATS (6 CFR 27) • RMP (40 CFR 68) • ATF • OSHA (29 CFR 1910)
Tax Free Alcohol Industrial Use Permit	• ATF (27 CFR 22)
Granting Agencies	• IACUC • NIH Grants Policy Statement 4.1.12

3. DEFINITIONS

ATF - Bureau of Alcohol, Tobacco, Firearms and Explosives

CERCLA - Comprehensive Environmental Response, Compensation and Liability Act of 1980; also known as Superfund

CFATS - Chemical Facility Anti-Terrorism Standards

CFR - Code of Federal Regulations

Commercially available - products for sale to the general public

DOT- Department of Transportation

EPCRA - Emergency Planning and Community Right-to-Know Act of 1986, commonly known as SARA Title III. The Florida EPCRA statutes can be found in the Florida EPCRA Act of 1988, Chapter 252, Part II

Hazardous chemical - any chemical or mixture with an NFPA rating of 2 or higher for Health, Flammability, and/or Reactivity (Note: This definition may also pertain to any chemical or mixture for which OSHA requires the SDS to be on hand and available to workers)

IACUC - Institutional Animal Care and Use Committee

LEPC - Local Emergency Planning Commission

NFPA - National Fire Protection Association

NIH - National Institutes of Health, U.S. Department of Health and Human Services

OSHA - Occupational Safety and Health Administration

Primary container - vendor- or manufacturer-supplied container

Physical inventory- the act of visually inspecting a container's location, integrity, and volume of contents

RMP- Risk Management Plan (40 CFR 68)

SARA - Superfund Amendments and Reauthorization Act of 1986

Secondary container - a container other than the vendor/manufacturer-supplied container

SDS - Safety Data Sheet

SERC - State Emergency Response Commission for Hazardous Materials

4. RESPONSIBILITY

Each department is responsible for assuring that their chemical inventory contains an accurate record of acquisition and consumption of all chemicals defined as hazardous by UCF, local, state, or federal guidelines. Environmental Health and Safety (EHS) will offer support, maintain a centralized database in which the chemical inventory is recorded, and periodically verify that the inventory is accurate. Departments are responsible for entering their chemical inventory into the centralized database. Maintenance areas, studios, and workshops are responsible for maintaining an accurate chemical inventory for that location and supplying that information to EHS.

Legal requirements imposed by local, state, and federal hazardous material agencies require that records must be kept, listing the quantities of hazardous materials used and on hand. These records are subject to audit on-demand, with no advance notice. Fines and penalties from local, state, and federal agencies can be assessed for failing to meet these requirements. See Associated Documents (below) for a listing of applicable regulations.

5. ASSOCIATED DOCUMENTS

(a) Local and State Statutes:

The City of Orlando regulates industries (including UCF) that discharge to the City of Orlando wastewater treatment facilities under the City of Orlando Industrial Waste Pretreatment Program (Chapter 30). In 30.03.9.i and 30.03.10.h, an inventory of chemicals is required.

The Florida Emergency Planning and Community Right-to-Know Act of 1988, Chapter 252, Part II, Florida Statutes requires the State Emergency Response Commission (SERC) for Hazardous Materials to collect information on extremely hazardous substances, CERCLA hazardous substances, and toxic chemicals. This information is also collected at the local level by one of the 11 Local Emergency Planning Committees (LEPCs) to develop hazardous materials emergency plans in the event of a release or spill of hazardous or toxic substances.

The State Fire Marshal requires accurate information for the hazards associated with laboratories and buildings in the event of an emergency. Emergency responders should have an accurate representation of the associated hazards before they enter UCF facilities.

The State Fire Marshal requires individual permits for the possession of explosive compounds (Chapter 552, Florida Statutes).

(b) Federal Statutes:

The Chemical Facility Anti-Terrorism Standards (CFATS), as directed by the Department of Homeland Security (DHS), is part of the Code of Federal Regulations (6 CFR Part 27). On November 20, 2007, with the publication of the final Appendix A in the Federal Register, all provisions of 6 CFR Part 27 became enforceable.

The U.S. Environmental Protection Agency (EPA) regulates chemical process safety through its Risk Management Plan (RMP) and the Emergency Planning and Community Right-to-Know Act (EPCRA). The RMP guidelines are laid out in 40 CFR. In 40 CFR 68.130, a series of tables list substances covered under the chemical accident prevention provisions (40 CRF Part 68). EPCRA (Title III), Subtitle B requires reporting of chemical substances held in inventory, along with maintenance of SDS records for those compounds.

The U.S. Department of Justice, through the Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF), regulates through licenses and permits tax-free alcohol (190-proof or more) and explosive compounds. Each entity holding an industrial use permit to use tax-free alcohol shall file inventory on a biannual basis. Regulations (27 CFR 22.162) require physical inventory of tax-free alcohol to be

taken at the end of each month. Individuals possessing explosive compounds must be included on UCF's Federal ATF license and possess a State Explosive License from the Florida Division of State Fire Marshal.

The U.S. Department of Labor, through the Occupational Safety & Health Administration (OSHA), 29 CFR Part 1910, Subparts H (1910.101-126: Hazardous Materials) and Z (1910.1000-1450: Toxic and Hazardous Substances), requires regulation of substances in use that would present a catastrophic event at or above the threshold quantity. A chemical inventory also is helpful at meeting 29 CFR 1910.39, in particular, a list of all major fire hazards and proper handling and storage procedures for hazardous materials.

The National Institutes of Health (NIH) issued the National Institutes of Health Grants Policy Statement (NIHGPS) in 1998. This policy is part of the terms and conditions of NIH grant awards. The latest update of this policy became effective on October 1, 2022. Section 4.1.12 pertains to Health and Safety Regulations and Guidelines. This Section requires the adherence to 29 CFR 1910.

6. PROCEDURE

(a) Maintenance Area, Studio, and Workshop Inventory Procedure:

All chemicals and mixtures that are considered hazardous (corrosive, acutely toxic, reproductive toxins, flammable, etc.) and therefore require an SDS be kept on hand in accordance with OSHA (29 CFR 1910) must be included in the chemical inventory for that location. Any chemical that has a National Fire Protection Association (NFPA) hazard rating of 2 or higher in any category must be included in the chemical inventory.

Each location must maintain a spreadsheet of the following information:

- Item/Chemical Name;
- Manufacturer Name;
- Product Code, if available;
- Maximum Quantity on Hand;
- Building;
- Room Number(s) (storage location);
- Availability of the SDS;
- Whether the Item is Still in Use;
  (Note: When no longer in use, the date when the item was removed from the premises must be recorded.)

- Comments/Descriptions (typically what the item is used for.)
  (Note: If a new chemical is received during the calendar year, the date that the item was received must be reported.)

(b) Teaching and Research Laboratory Inventory Procedure:

All primary (vendor-supplied) containers of chemicals and mixtures must have a UCF bar code and be entered into the main UCF chemical inventory database if they have an NFPA rating of 2 or higher in any category. The NFPA rating can usually be found on the SDS supplied by the vendor.

- Additions: Items with an NFPA rating of 2 or higher in any category need to be added to the system as soon as they are received. Items must be added to the UCF database within five (5) days of receipt.

- Disposals: Items that have been consumed or are considered waste by the researcher (in addition to following the UCF Hazardous Waste Disposal Procedures) must be marked as disposed in the database within the month that they are consumed or prior to being picked up as waste. It is the PI's responsibility to maintain their chemical inventories in the UCF database.

- Relocations: Items that are being relocated must be transferred in the chemical inventory if they will be stored in that space overnight. Chemicals must only be relocated to another approved chemical storage space.

Individual research groups may choose to keep track of all chemicals (including those in non-manufacturer/secondary containers) and their lot numbers using the UCF maintained database, but this is not required.

- UCF Bar Code Generation: Bar codes will be supplied by EHS. Requests can be made by contacting the Chemical Safety Officer, 407-823-3307, or by sending an email via the "Requesting bar code labels" link found at https://ehs.ucf.edu/chemical-inventory.

  If a research group will be generating its own bar codes (inventory numbers), rather than using numbers supplied by EHS, a unique prefix or suffix must be requested from the Chemical Safety Officer. This assigned prefix or suffix must then be part of the bar code affixed to the chemicals inventoried.

- Placement of the UCF Bar Code: A single bar code must be placed on each container. Do not obscure the labeling that is on the container, including the vendor's name, warnings, and hazards. Horizontal placement (parallel to the shelf) is preferred, but vertical placement may be the only option on small bottles. If necessary, the sticker may be trimmed down, but the number and bar code must be left intact. Place the bar code on a flat or slightly curved face of the container. On "squared" containers, do not place the bar code "around a comer."

- Secondary and Tertiary Locations: It may be helpful when trying to locate items within a large research group or laboratory to designate secondary and tertiary storage locations (e.g., shelf A; shelf B, tray 1; refrigerator 1, tray 1.)

  These locations can be recorded in the EHS-maintained database, EHSA. The field "Storage_Location" within EHSA follows the secondary location naming convention, "building abbreviation-room number (without a dash)," followed by the secondary location.

(c) Gas Cylinder and Cryogenic Dewar Inventory Procedure:

Gas cylinders or cryogenic dewars which are refilled by a vendor are required to be recorded in the chemical inventory.

Refillable vessels should be assigned a bar code for each chemical or mixture due to frequent return to vendor; do not affix bar codes to them.

Lecture bottles and other small canisters require bar codes to be affixed and shall be included in the chemical inventory.

The required information is: chemical name; supplier; product number; mass of gas (or cubic feet) in tank as received; and physical state.

If personnel have difficulty determining the mass or cubic feet of gas, they should supply the Chemical Safety Officer with the vendor, product number, and size of the cylinder.

It is the responsibility of the researcher (or designee) to update the database and inform EHS when gases will no longer be in use or are moved to another location.

(d) Tax Free Alcohol (Ethanol 190-proof or higher) Inventory Procedure:

Because UCF holds an industrial use permit for tax-free alcohol, each primary point of distribution (whomever ordered the alcohol) shall file inventory with EHS every six months. Regulations require physical inventory of tax-free alcohol to be taken at the end of each month (27 CFR 22.162). Forms and additional information can be found at https://ehs.ucf.edu/tax-free-alcohol.

In addition, because ethanol has an NFPA rating (both health and flammability) of 2 or higher, ethanol must be bar coded and tracked within the chemical inventory. These inventory items must have their amount verified and updated at the end of each month within the centralized database.

(e) Lead-Acid Battery Inventory Procedure:

If lead-acid batteries are used by a department in non-DOT registered vehicles (forklifts, gators, golf carts, etc.), generators, or large banks of batteries (server UPS systems), the department must report the overnight location of the equipment/battery, the number of batteries, and the weight of each battery. If the percentage of the individual components are known (through the manufacturer-supplied SDS), that information should be included in the report.

Each department must maintain a spreadsheet of the following information:

- Number of batteries on hand;
- Weight of each battery;
- Overnight location of the equipment/battery; (building and room number, if applicable.)
- Percentage of individual components (if known);
- If the item is still in use; (Note: if no longer in use, the date when the item was removed from the premises must be noted.)

If batteries are added during the calendar year, through the acquisition of new vehicles or UPS, the date that the batteries were received must be noted.

7. RECORD KEEPING

8. ARCHIVES

9. DISTRIBUTION

This document is shared through:

□ EHS only	□ Facilities and Safety	☑ UCF community
□ Secured Document	□ Contractor	☑ EHS Web site
□ Other: _____		

10. DOCUMENT HISTORY

Date	Revision number	Author	Modifications
09/25/2023	1	Sandra Hick	Format and Annual Review
08/01/2012	0	EHS	FSP 2012 EHS0005

References

The following sources were consulted during the development of the UCF Chemical Hygiene Plan:

- Hazard Communication Standard (OSHA) 29 CFR 1910.1200, Chapter 442,F.S., Rule 38I-20.003 F.A.C., Hazardous Waste Management (EPA) 40 CFR§260-299, Rule 62-730, F.A.C.
- Occupational Exposure to Hazardous Chemicals in Laboratories (OSHA) 29 CFR§1910.1450, Rule 38I-20.003 F.A.C.
- "Safety in Academic Chemistry Laboratories"; American Chemical Society, Washington D.C., 1994
- Prudent Practices in Laboratories, Handling and Disposal of Chemicals; National Academy of Sciences, Washington D.C., 2011.
- "Flammable and Combustible Liquids Code"; NFPA Standard 30, National Fire Protection Association, Quincy, MA, 1993
- “Managing Spent Fluorescent and High Intensity Discharge (HID) Lamps, A Fact Sheet for Florida Businesses and Government Facilities”; Florida Department of Environmental Protection, Tallahassee FL, 2008.
- Universal Pharmaceutical Waste, Rule 62-730.186, F.A.C.
- Used Oil Management, Rule 62-710, F.A.C.
- "Lists of Carcinogens and Reproductive Toxins," Seventh Annual Report on Carcinogens, Summary 1994, U.S. Dept. of Public Health Services

The following peer manuals and documented chemical hygiene plans were consulted used as reference:

- Johns Hopkins University Safety Manual
- The Florida Atlantic University Chemical Hygiene Plan
- The University of Florida Chemical Hygiene Plan
- The Florida State University Chemical Hygiene Plan
- The University of West Florida Chemical Hygiene Plan
- The University of South Florida Chemical Hygiene Plan
- The University of Miami Laboratory Safety Manual
- The Harvard University, Longwood Area, Chemical Hygiene Plan
- The University of Southern California Laboratory Safety Program
- The University of California Los Angeles Chemical Hygiene Plan
- The University of Illinois Champagne-Urbana Chemical Hygiene Plan
- The Illinois State University Chemical Hygiene Plan
- The New York University Laboratory Safety Manual
- The Arizona State University Chemical Hygiene Plan

Environmental Health and Safety	Effective Date: 03/15/2023	Procedure Number: Appendix Z UCF Laboratory Safety Manual
	Revision: 0	**Page** 1 of 5
TITLE: Personal Protective Equipment For Laboratories	**Approved by** Chemical Hygiene Officer Sean Brennan **Date**:	

1. APPLICABILITY

This policy applies to all faculty members, visiting scholars, staff members, students, volunteers, and affiliates whose activities involve potential exposure to physical, chemical, biological, or radiological hazards in a laboratory setting.

2. PROCEDURE STATEMENT

Personal protective equipment shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, biological hazards, chemical hazards or irritants, radiological hazards, or mechanical hazards encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.

3. DEFINITIONS

Personal Protective Equipment (PPE): Equipment to protect the eyes, face, head, and extremities. Including (but not limited to) protective clothing, hearing protection, respiratory devices, and protective shields and barriers.

Hazardous Materials: For the purposes of this policy, the following materials are defined as hazardous:

- Any unsealed radioactive material.
- Biological materials in Risk Group 2, or greater.
- Chemicals listed as Select Carcinogens and Regulated Carcinogens.
- Chemicals listed as Reproductive Toxins.
- Chemicals listed as Toxic or Highly Toxic.(See OSHA Guidance on identifying Highly Toxic Chemicals)

- Flammable chemicals in excess of one (1) liter by volume, or any amount of violently air-reactive or water-reactive chemicals.

- Corrosive chemicals in concentrations of one (1) molar or greater.

- Known significant skin or eye irritants.

4. RESPONSIBILITY

Preventing workplace injuries and illnesses is the responsibility of every member of the campus community. Specific responsibilities are assigned to higher-level members of the research and teaching community in order to implement and ensure compliance with this policy.

Departments are responsible for planning and budgeting for PPE purchases, maintenance, laundry services, and any medical surveillance associated with the use of PPE. PIs, are responsible for the execution of PPE policies in all research laboratories in coordination with EHS.

Principal Investigators (PI) and laboratory managers are responsible for assessing the site-specific hazards likely to be encountered by employees, visitors, and students in their areas and ensuring the appropriate personal protective equipment (PPE) is available and in use.

Employees, students, and visitors working in laboratory areas are responsible for following laboratory safety requirements and for wearing PPE as outlined in this policy.

The Department of Environmental Health and Safety (EHS) is the designated authority for verifying that members of the UCF laboratory community are in compliance with this policy. EHS is responsible for recommending appropriate PPE based on hazard analysis and providing training for the use of PPE.

5. ASSOCIATED DOCUMENTS

EHS_SOP346_INST001 Personal Protective Equipment
EHS_SOP346_FORM001 Laboratory PPE Checklist

6. PROCEDURE

- Eye protection, or equivalent engineering controls, must be used at all times while inside the laboratory. Accidents are unforeseen and typical lab environments have potential hazards from flying objects, projectile particles, and chemical spills even when chemicals are not in use.

- When transferring or pouring acidic or caustic materials, chemical splash goggles or safety glasses with side shields covered by a face shield are required.

- When handling cryogenic hazards, chemical splash goggles or safety glasses with side shield covered by a face shield are required.

- All eye protection equipment must be American National Standards Institute (ANSI) approved and appropriate for the work being done.

- Protective gloves must be worn while utilizing any hazardous chemical, biological or unsealed radiological material. These gloves must be appropriate for the material being used. The Material Safety Data Sheet (MSDS) or Safety Data Sheet (SDS) for the material should be referenced when determining the effectiveness of the type of glove to be used along with the glove manufactures chemical compatibility chart. Additionally, EHS offers guidance on glove selection based on material handling as well as links to other resources. This requirement does not apply when working with non-hazardous materials and an open flame or other heat source that might cause injury by melting plastic gloves.

- Protective gloves must not be worn in any public area outside of the laboratory (i.e., hallways, elevators, offices). Gloves should also be removed prior to handling any equipment that could likely result in cross-contamination (e.g., telephones, computer work stations, etc.).

- Cryogenic gloves are required while handling cryogenic materials.

- Footwear that fully encloses the foot must be worn at all times by all individuals entering the laboratory area.

- Full length pants, or equivalent, are required to be worn while in the laboratory.

- Laboratory coats, or equivalent, are required to be worn while working on, or adjacent to, all bench top procedures utilizing hazardous chemicals, biological or unsealed radiological materials. These laboratory coats must be appropriately sized for the individual and be buttoned. Laboratory coat sleeves must be of a sufficient length to prevent skin exposure while wearing gloves.

- Flame resistant laboratory coats must be worn when working with pyrophoric materials or large amounts (greater than four (4) liters) of flammable liquids. It is recommended that cotton (or other non-synthetic material) clothing be worn during these procedures to minimize injury in the case of a fire emergency.

- Laboratory coats may not be worn outside of a laboratory unless the individual is traveling directly to an adjacent laboratory.

- Each department or research unit shall be responsible for providing professional laundry services as needed to maintain the hygiene of laboratory coats. They may not be cleaned at private residences or public laundry facilities. Any clothing that becomes grossly contaminated with hazardous materials must be decontaminated before it leaves the laboratory.

- When handling cryogenic hazards, protective clothing that covers the arms and core of the body is required.

- Before each use, PPE is to be inspected for damage, deterioration, contamination. If deficiencies are noted, the equipment should be cleaned, repaired, or replaced before use.

- Variances from these requirements, including delineation of specific hazardous materials use areas within rooms, may be permitted. PIs or laboratory managers should document these variances using the EHS_SOP346_INST001 PPE Standard Operating Procedure. The form must be kept with the laboratory safety records, reviewed with laboratory members, and updated whenever hazardous processes or engineering controls change.

- EHS will assess the efficacy of the variance based on hazard assessment during routine visits to the laboratory. If the variance does not provide adequate protection from observed hazards, EHS will assist the PI or lab manager with updating the PPE SOP.

- This policy allows for some areas to be reclassified as a shop or studio not covered under this policy.

- This policy does not supersede accepted safe work practices for specific materials.

7. RECORD KEEPING

8. ARCHIVES

9. DISTRIBUTION

This document is shared through:

□ EHS only □ Facility and Safety ☑ UCF community
□ Secured Document □ Contractor ☑ EHS Web site
□ Other: _____

10. REVIEW

	Name	Signature	Date
Chemical Hygiene Officer	Sean Brennan	*Sean Brennan*	03/15/2023

11. DOCUMENT HISTORY

Date	**Revision number**	**Author**	**Modifications**
07/01/2019	0	Casey Brock	Format based on EHS_SOP001

UCF Environmental Health and Safety	**Variances to PPE Policy Standard Operating Procedure for Personal Protective Equipment**		
Department:		**Room:**	
Lab Manager:		**Building:**	
Revision Number:		**Date:**	
Revision made by:		**Approved by:**	

1. **Circumstances of Use:**

This SOP details the Personal Protective Equipment (PPE) requirements for work in the (name) Laboratory. The Laboratory Manger / PI has conducted a risk assessment for hazards, selected appropriate PPE and provided equipment to employees. Use of PPE as described in this procedure and in the PPE program will be enforced in this Laboratory by the Laboratory Manager/Principal Investigator (LM/PI). This SOP identifies PPE needs and requirements in this laboratory.

2. **Procedures:**

Variation Procedures: The following is a template that can be customized to the specific operations of your lab. Common variances to the PPE policy are found in the sections below. Please choose the variations that best fit your lab environment or edit to your specific hazards.

A. Eye Protection

Policy:

Eye protection or equivalent engineering controls must be used at all times while inside the laboratory. Accidents are unforeseen and typical lab environments have potential hazards from flying objects, projectile particles, and chemical spills even when chemicals are not in use.

When transferring or pouring acidic or caustic materials, chemical splash goggles or safety glasses with side shields covered by a face shield are required.

When handling cryogenic hazards, chemical splash goggles or safety glasses with side shield covered by a face shield are required.

All eye protection equipment must be American National Standards Institute (ANSI) approved and appropriate for the work being done.

Before each use, eye and face protection is to be inspected for damage (e.g., cracks, scratches),

cleanliness and proper operation. If deficiencies are noted, the equipment should be cleaned, repaired, or replaced before use.

Variances in effect for (room):

1. Safety glasses with side shields must be worn when handling hazardous material or in close proximity to others handling hazardous material.

2. Safety glasses with side shields or chemical safety goggles are required for employees or visitors who enter the laboratory and are potentially exposed to chemical or mechanical eye hazards.

3. Safety glasses with side shields under a face shield or chemical safety goggles are required when handling one (1) liter or more of acidic or caustic materials.

4. Chemical splash goggles must be worn over contact lenses.

The following eye protection will be used for the indicated tasks:

Task	Eyewear Type	Location
Fill in task information. *Examples follow:	Fill in eyewear type(s). Examples follow:	Fill in location where PE available. Examples foll
*extraction of acids with pipette or eyedropper	1. Safety glasses with sideshields 2. Splashproof goggles, or 3. Face shield	PPE cabinet in lab and personally-assigned
*dispensing acids to portable containers	1. Splashproof goggles, or 2. Safety glasses with sideshields and full face shield	PPE cabinet in lab and personally-assigned
*any other chemical-handling in lab	1. Safety glasses with sideshields 2. Splashproof goggles, or 3. Face shield	PPE cabinet in lab and personally-assigned
*entry into other labs for consultations, discussions, etc.	1. Safety glasses with sideshields, or 2. Splashproof goggles	PPE cabinet in lab and personally-assigned

*Response to incidental hazardous materials spills	1. Splashproof goggles, or 2. Full-face respirator	PPE cabinet in lab and personally-assigned	

B. Gloves

Policy:

Protective gloves must be worn while utilizing any hazardous chemical, biological or unsealed radiological material. These gloves must be appropriate for the material being used. The Material Safety Data Sheet (MSDS) or Safety Data Sheet (SDS) for the material should be referenced when determining the effectiveness of the type of glove to be used along with the glove manufactures chemical compatibility chart. Additionally, EHS offers guidance on glove selection based on material handling as well as links to other resources. This requirement does not apply when working with non-hazardous materials and an open flame or other heat source that might cause injury by melting plastic gloves.

Protective gloves must not be worn in any public area outside of the laboratory (i.e., hallways, elevators, offices). Gloves should also be removed prior to handling any equipment that could likely result in cross-contamination (e.g., telephones, computer work stations, etc.).

While handling cryogenic materials, cryogenic gloves are required.

Before each use, gloves are to be inspected for damage and contamination. If deficiencies are noted, the gloves should be cleaned, repaired, or replaced before use.

Variances in effect for (room):

1. Chemical resistant gloves shall be worn whenever the potential for hazardous skin contact exists. The safety data sheet for the substance or glove selection charts should be consulted to determine appropriate glove type/material.

2. Lab-specific standard operating procedures specify glove requirements for identified routine operations.

3. Heat resistant gloves shall be used for handling hot objects.

4. Abrasion resistant gloves (such as leather) should be worn for handling broken glass or for other potentially abrasive situations. They should NOT be used for handling chemicals. Gloves are not necessary if broken glass can be picked up with forceps, dustpan, etc.

The following types of gloves will be used for the indicated tasks:

Task	Glove Type	Location
Fill in task information. Examples follow*:	Fill in glove type(s). Examples follow:	Fill in location wh PPE is available. Examples follow:
*acidification of water & air samples	1. Two-mil nitrile, or 2. Neoprene, or 3. Viton	PPE cabinet in lab
*Response to incidental hazardous materials spills	gloves compatible with spilled chemical (e.g., butyl, neoprene, Silvershield, Viton, natural rubber, nitrile, 4H, etc.)	PPE cabinet in lab

C. Footwear

Policy:

Footwear that fully encloses the foot must be worn at all times by all individuals entering the laboratory area.

Variances in effect for (room):

1. No sandals or open-toed shoes are to be worn in UCF lab facilities.

2. Shoes should have nonskid soles and should be chemical resistant and have a reasonable heel height.

3. Safety shoes must be worn if there is potential for injury from heavy objects (e.g., handling drums, cylinders).

4. Safety shoes must meet the requirements of ANSI Z41 (latest issue).

D. Clothing

Policy:

Full length pants or equivalent are required to be worn while in the laboratory.

Laboratory coats, or equivalent, are required to be worn while working on, or adjacent to, all bench top procedures utilizing hazardous chemicals, biological or unsealed radiological materials. These laboratory coats must be appropriately sized for the individual and be buttoned to their full length. Laboratory coat sleeves must be of a sufficient length to prevent skin exposure while wearing gloves.

Flame resistant laboratory coats must be worn when working with pyrophoric materials or large amounts (greater than four (4) liters) of flammable liquids. It is recommended that cotton (or other non-synthetic material) clothing be worn during these procedures to minimize injury in the case of a fire emergency.

Laboratory coats may not be worn outside of a laboratory unless the individual is traveling directly to an adjacent laboratory.

Each department or research unit shall be responsible for providing professional laundry services as needed to maintain the hygiene of laboratory coats. They may not be cleaned at private residences or public laundry facilities. Any clothing that becomes grossly contaminated with hazardous materials must be decontaminated before it leaves the laboratory.

When handling cryogenic hazards, protective clothing that cover the arms and core of the body is required.

Before each use, protective clothing is to be inspected for damage, deterioration, or contamination. If deficiencies are noted, the clothing should be cleaned, repaired, or replaced before use.

Variances in effect for (room):

1. Whenever there is potential for chemical exposure in the work area, laboratory coats or other suitable work apparel shall be worn by laboratory employees.

2. Disposable garments should be considered when working with highly toxic materials, carcinogens, mutagens, or teratogens. The LM/PI is responsible for determining the need for disposable clothing.

The following types of protective clothing will be used for the indicated tasks:

Task	Type	Location
Fill in task information. *Examples follow:	Fill in Clothing type(s). Examples follow:	Fill in location where PPE is available. Example follow:
*Response to incidental hazardous materials spills	Clothing compatible with spilled material and conditions of exposure. May include disposable Tyvek, poly- lined Tyvek	corner cabinet in lab
*handling any chemical with a NFPA rating greater than 3 in lab	lab coat	coat hooks in lab

E. Hearing Protection (Optional section if hearing conservation is a concern)

1. Hearing protection (earmuffs or plugs) is required whenever lab personal are exposed to noise levels of 85 decibels or greater as an 8-hour time weighted average (TWA).

2. Hearing protection is to be inspected before each use, for tears and contamination. If deficiencies are noted, the hearing protector should be cleaned, repaired, or replaced before use.

The following types of hearing protection will be used for the indicated tasks:

Task	Type	Location
Fill in task information.*Examples follow:	Fill in hearing protection type(s). Examples follow:	Fill in location where PPE is available.
*evacuation drills	foam plugs or muffs	PPE cabinet in lab
*assessment of possible high noise areas	foam plugs or muffs	PPE cabinet in lab

F. Respirators (Only if your lab activities require the use of a respirator)

Policy:

Under ordinary conditions, respirators should not be necessary in the laboratory. Consult with EHS before using respirators, including "dust masks." The wearer may need to enroll and complete a physical exam, fit testing and training. If a respirator is thought to be needed, call EHS to request a hazard assessment.

Variances in effect for (room):

The following types of respiratory protection will be used for the indicated tasks:

Task	Type	Location
*Fill in task information. *Examples follow:*	*Fill in Respirator type(s). Examples follow:*	*Fill in location where PPE is available. Examp follow:*
*incident response	full-face air-purifying respirator with cartridges selected for specific contaminant, or full-face powered air-purifying respirator with cartridges selected for specific contaminant	respirators are individually fitted assigned. Additior filters are availabl shelves in the lab.

3. **Training of personnel:**

- Employees using PPE must be trained in proper selection, care and use. The LM /PI are responsible for providing training for protective eyewear, footwear, gloves and clothing.
- Users of respirators, other than filtering face piece models, must be trained annually by the Department of Environmental Health and Safety.
- Users of hearing protection who are exposed to full-shift average noise levels over 85 dBA must be trained annually by the Department of Environmental Health and Safety.
- The LM/PI is responsible for ensuring that respiratory protection and hearing conservation training are provided when employees have a demonstrated need for entry into these programs.