Select a document from the choices below by clicking on the title. If you cannot find what you are looking for, please email the Office of Research Safety: researchsafety@uga.edu.

**Authority, Responsibilities, and Duties:** Describes UGA’s governing structure for laboratory safety and environmental safety concerns

**Lab Safety Assessment Procedure:** Details how Chemical & Lab Safety Assessments and associated follow-ups are conducted. A copy of the current inspection form is also included.

**HAZARDOUS CHEMICAL MANAGEMENT**

**Compressed Gas Cylinder Safety:** General guidelines for the storage and management of all compressed gases

**Guidelines for Chemical Storage and Management:** Details chemical procurement, inventory tracking, container labeling, hazard communication, and storing of chemicals within the lab

**Spill Control Guidelines:** Know what to do in the event of a spill or exposure to a hazardous substance

**Asphyxiant Gases:** Examples include oxygen displacing gases such as nitrogen, argon, and helium

**Corrosive Flammables:** Examples include acetic anhydride and trimethylamine

**Corrosives:** Managing strong mineral acids and strong bases such as hydrochloric acid and sodium hydroxide

**Cryogens:** Managing cryogenic fluids such as liquid nitrogen

**Explosives:** Managing items such as nitrocellulose, dibenzoyl peroxide (dry), and picrate salts

**Flammable Gases:** Managing compressed gases such as hydrogen and acetylene

**Flammable Liquids:** Managing most flammable solvents (for solvents that could form explosive organic peroxides, see the Peroxide Forming Chemical document).
**Flammable Solids:** Managing items such as paraformaldehyde and cerium powder

**General Chemicals – Non Reactive:** Managing low hazard chemicals and minor irritants

**Oxidizers:** Managing oxidizing solids and liquids such as permanganates, chromates, and chlorates

**Oxidizing Corrosives:** Managing oxidizing substances with corrosive properties such as nitric acid, perchloric acid, and hypochlorites

**Oxidizing Gases:** Managing gases such as oxygen, chlorine, and nitrous oxide

**Peroxide-Forming Chemicals:** Managing peroxide forming organic solvents such as dioxane, diethyl ether, tetrahydrofuran, and concentrated isopropanol

**Poisons/Toxins:** Managing acutely toxic substances such as cyanides and azides. Toxic compressed gases such as phosgene are also covered by this document.

**Pyrophoric and Self-Heating Materials:** Managing chemicals that can self-ignite upon exposure to air. Examples include butyl-lithium and some metal dusts.

**Water Reactives:** Managing chemicals that can produce flammable or toxic gas and heat upon exposure to water. Examples include hydrides and alkali metals

**MANAGING OTHER LABORATORY HAZARDS**

**3D Printer Safety:** Provides an overview of associated hazards and precautions that should be taken when setting up and operating a 3D printer

**Electrical Safety:** Describes the appropriate uses and potential hazards of extension cords, power strips, and surge protectors

**Laboratory Housekeeping:** General guidelines for ensuring a safe and organized laboratory environment

**Nanomaterials & Nanotechnology:** Provides an overview of associated hazards and precautions that should be taken when conducting research with nanomaterials

**Pesticide Storage and Use:** Details how to manage, store, and dispose of pesticides

**Refrigerators, Freezers, and Environmental Chambers:** Describes the appropriate uses of these types of devices and potential hazards associated with misuse
Sharps, Glassware, and Pointed Plastics: Managing and disposing of sharps, glassware, and pointed plastics such as disposable pipette tips

LABORATORY SAFETY EQUIPMENT AND SPECIAL SAFETY INITIATIVES

Eyewashes and Safety Showers: Details the requirements for location and testing frequency of safety plumbing

Fume Hood Guidelines and Safe Usage: Provides guidelines for how to safely and effectively make use of your fume hood whether for general protection or specialty uses

Laboratory Safety Postings: Describes the safety postings placed around laboratories at UGA and how to fill them out and keep them updated

Mercury Thermometer Reduction: A University initiative to reduce the amount of mercury containing equipment on campus, particularly mercury thermometers

Personal Protective Equipment (PPE): Details the types and uses of laboratory PPE and describes what is considered appropriate laboratory attire. A tool for performing a formal hazard assessment for a process or area is also included.

Unit Safety Officer Program: A University initiative to enlist department and unit level volunteers and contacts to assist with managing safety and compliance throughout campus

CLOSING OR RELOCATING A LAB

Laboratory Decommissioning Guidelines: Guidance and steps that must be followed in order to properly decommission a lab at UGA

Laboratory Equipment Decontamination Guidelines: Guidance for proper decontamination of laboratory equipment that is being set aside for surplus or for relocating to a new lab

Relocating Hazardous Materials: Guidance for packaging and physically relocating hazardous materials in or between campus buildings
Authority, Responsibilities, & Duties
Version: December 2019

I. Environmental Health & Safety Management System Committees

UGA’s Comprehensive Environmental Health and Safety Management System (EHSMS) was established in accordance with Academic Affairs Policies 6.01 and 6.02 and is intended to govern how UGA manages all aspects of environmental health and safety. The EHSMS serves as an integrated set of processes and procedures for managing the day-to-day EHS compliance operations to enhance the level of compliance and to increase efficiency of operations in a comprehensive manner. The EHSMS shall use a process-driven approach to track information, identify safety risks, set safety goals, take action to ensure safety, assess results of those actions, and adjust processes as necessary to produce the intended results. As described below, the EHSMS is governed by oversight, steering, and other committees with execution by a variety of operational units.

A. Executive Committee

The EHSMS Executive Committee reviews and provides guidance on the design, development, and implementation of the EHSMS. The Executive Committee will also meet periodically to review and provide oversight on the EHSMS. In accordance with Academic Affairs Policy 6.02, the Executive Committee is also tasked with forming and charging standing and ad hoc committees as needed.

B. Academic/Research Steering Committee

The EHSMS Academic/Research Steering Committee guides the development and implementation of those aspects of the EHSMS that improve Environmental Health & Safety (EHS) programs and research compliance at UGA.

C. Administrative/Operations Steering Committee

The EHSMS Administrative/Operations Steering Committee guides the development and implementation of those aspects of the EHSMS that improve EHS programs and the compliance of administrative operations at UGA.

D. Research Safety Committee

The Research Safety Committee (RSC) is a standing committee within the EHSMS and
is charged with guiding the development and implementation of campus-wide Environmental Health and Safety programs consistent with Academic Affairs Policies 6.01 and 6.02. Per Academic Affairs Policy 6.02, the RSC is appointed by the President of UGA through the EHSMS Executive Committee. The RSC will be advisory to the Vice President for Research (VPR), and work directly with the Office of Research Integrity & Safety (ORIS), the Environmental Safety Division (ESD), and their respective leaders.

The RSC is charged to review safety trends regarding chemical and laboratory safety and definitively address and mitigate unresolved issues of non-compliance. The RSC will work in collaboration with ad hoc working groups and the existing research compliance committees for Animal Care and Use, Biosafety, Radiation Safety, and Human Subjects. The RSC reports to the VPR through the Associate Vice President for Research Integrity & Safety. Also, consistent with Academic Affairs Policy 6.02, the RSC will keep the VPR and EHSMS Executive Committee informed of its findings, conclusions, actions or non-actions, and recommendations. Other responsibilities include:

1. Establishing and reviewing laboratory safety policies, procedures, and safety survey audit forms. Policies and procedures will be set forth in the UGA Chemical and Laboratory Safety Manual (CLSM) and other documents. No changes shall be made to the CLSM, appendices, or portions of the manual contained on the web site without RSC approval. The RSC shall approve all procedures used to evaluate laboratory safety and ensure accountability.

2. Designing policies to:
   a. Protect and ensure safety for all faculty, staff, students, visitors, and members of the public from hazardous agents
   b. Keep the University in compliance with local, state, and federal regulations regarding laboratory safety, the purchase, transportation, use, handling, storage, and disposal of all chemicals and hazardous agents

3. Recommending and providing oversight of training programs on laboratory safety practices that will result in faculty, staff, and students having a thorough awareness and application of safe laboratory practices, chemical storage, chemical use, and chemical disposal.

4. Reviewing and advising on corrective actions recommended by the ORS laboratory safety staff. During the review process, principal investigators can contact the RSC directly at: RSC@uga.edu.
   a. Principal investigators may appeal decisions made by ORS in the...
implementation of the laboratory safety program to the RSC. (See Appendix B, Unsafe Laboratory Closure Policy.)

b. When laboratories fail to implement corrective actions and are non-compliant with this manual, the ORS, may bring these to the attention of the RSC for resolution as described in the Office of Research Policy & Procedure for Responding to Allegations of Research Non-Compliance.

5. Notifying UGA administration through the EHSMS executive and steering committees of any problems that need to be addressed through institutional level administrative procedures or policies and advise them accordingly.

6. Closing any laboratory determined to be unsafe per the laboratory closure policy after informing the EHSMS executive and steering committee chairs. Any closed laboratory will be reopened for use only after a follow-up inspection from ORS and RSC review. A determination of the RSC to not close a laboratory reviewed for unsafe practices will also be reported to the EHSMS executive and steering committee chairs. The EHSMS executive committee has the authority to impose more stringent sanctions than those recommended by the RSC.

7. Investigating any incident that causes an excessive chemical, hazardous agent exposure or other non-compliance in accord with the Policy & Procedure for Responding to Allegations of Research Non-Compliance and reporting outcomes to the EHSMS executive and steering committee chairs.

II. Programs for Research Environmental Health and Safety

The Programs for Research Environmental Health and Safety (PREHS) include all programs and services provided by the Office of Research Safety, located within the Office of Research, and the Environmental Safety Division, located within the Office of Finance and Administration.

A. Office of Research Safety (ORS)

The Associate Vice President (AVP) for Research Integrity & Safety has been designated by the Vice President for Research as the central point of coordination for Environmental Health & Safety (EHS) matters within research areas at UGA. They communicate to the EHSMS Executive Committee as needed regarding EHS matters. ORS staff report directly to the AVP for Research Integrity & Safety and provide guidance to UGA faculty, staff, and students on general laboratory safety and the safe use of chemical agents, radiation safety, and laser safety. The program is committed to safety, health, environmental protection, and compliance based on
current government regulations, guidelines, and best practices. Responsibilities include:

1. Providing advice and consultation to the RSC which is solely responsible for establishing university policies for chemical and laboratory safety as presented in this manual

2. Providing advice, consultation, and assistance to Principal Investigators (PIs) and laboratory personnel in complying with the policies and guidelines of this manual

3. Maintaining a level of expertise in designated EHS regulatory and program areas

4. Implementing the UGA Standard Operating Procedures for Laboratory Safety Inspections

5. Informing the RSC of continuing noncompliant or unsafe conditions in University laboratories using the guidelines and procedures provided for in the Policy & Procedure for Responding to Allegations of Research Non-Compliance

6. Taking immediate and necessary action to protect the health and safety of University employees, the public, and the environment in those situations that pose an immediate threat to life and health. These actions shall be governed using the provisions and guidelines of the laboratory closure procedure and the Policy & Procedure for Responding to Allegations of Research Non-Compliance

7. Inspecting university laboratories for compliance with the policies and provisions of this manual and appendices

8. Advising, as appropriate, PIs, deans, department/unit heads, and the RSC of problems found in individual laboratories

9. Providing technical assistance to laboratory personnel in establishing safety programs in their individual laboratories

10. Providing consultation on the safe design of chemical laboratories and their associated safety equipment
11. Responding to chemical emergencies, providing guidance, consultation, and appropriate assistance

12. Assisting ESD in the further development and maintenance of a central chemical container inventory system (Chematix)

13. Assisting departments and laboratories in developing plans for the use, storage, and disposal of hazardous chemicals and for the training of laboratory workers, ensuring that those plans are compatible with University policy

14. Supporting the RSC in developing, updating, and implementing the Chemical & Laboratory Safety Manual

B. Environmental Safety Division

The Associate Vice President for Environmental Safety has been designated by the President as the primary point of contact and communication both within non-research areas at the University of Georgia and with external environmental regulatory bodies. The Environmental Safety Division (ESD) reports directly to the AVP for Environmental Safety and provides guidance to UGA faculty, staff, and students in laboratories on engineered safety features and equipment, chemical exposure monitoring, respiratory equipment fit testing, fire and life safety, hazardous waste management, and worker right-to-know. Responsibilities include:

1. Providing advice and consultation to the RSC which is solely responsible for establishing University policies for chemical and laboratory safety as presented in this manual

2. Advising, consulting with, and assisting PIs and laboratory personnel in complying with the policies and guidelines of this manual with regard to engineered safety features and equipment, chemical exposure monitoring, respiratory equipment fit testing, fire and life safety, hazardous waste management, and worker right-to-know

3. Maintaining a level of expertise in designated EHS regulatory and program areas

4. Implementing the UGA Standard Operating Procedures for Non-Chemical Laboratory Safety Inspections

5. Informing the RSC of continuing noncompliant or unsafe conditions in
University laboratories using the guidelines and procedures provided for in the Policy & Procedure for Responding to Allegations of Research Non-Compliance

6. Inspecting University laboratories designated as non-chemical Laboratories for compliance with the policies and provisions of this manual

7. Inspecting University laboratories for compliance with State and Federal laws and standards for the management of hazardous waste

8. Advising, as appropriate, PIs, deans, department/unit heads, and the RSC of problems found in individual laboratories

9. Providing technical assistance to laboratory personnel in establishing safety and compliance programs in their individual laboratories

10. Providing consultation on the safe design of chemical laboratories and their associated safety equipment

11. Responding to chemical emergencies, providing guidance, consultation, and appropriate assistance

12. Taking immediate and necessary action to protect the health and safety of University employees, the public, and the environment in those situations that pose an immediate threat to life and health. These actions shall be governed using the provisions and guidelines of the laboratory closure procedure and the Policy & Procedure for Responding to Allegations of Research Non-Compliance.

13. Providing testing and/or quality assurance control for proper operation of safety equipment in chemical laboratories (i.e., safety showers, eyewash stations, chemical fume hoods)

14. Providing programs for chemical exposure monitoring, respiratory equipment issuance and fit testing, right to know, and other relevant safety education

15. Providing pickup of hazardous and non-hazardous chemical waste from laboratories

16. Developing and maintaining a central chemical container inventory system (Chematix)
17. Assisting departments and laboratories in developing plans for the use, storage, and disposal of hazardous chemicals and for the training of laboratory workers, ensuring that those plans are compatible with University policy.

18. Supporting the RSC in the developing, updating, and implementing the Chemical & Laboratory Safety Manual.

III. Academic and Research Units

A. Deans
Responsibilities include:

1. Ensuring that all research and activities in the college or school are conducted in compliance with all applicable EHS regulations and UGA policies and procedures

2. Ensuring all laboratory and non-laboratory spaces under their direction are properly maintained while in use and closed appropriately and safely cleaned before transfer to a new occupant

3. Remediying all non-compliance matters within all laboratory spaces that they oversee

B. Department Head/Center & Institute Director
Responsibilities include:

1. Ensuring that all research and activities in the department or Center/Institute are conducted in compliance with all applicable EHS regulations and UGA policies and procedures

2. Ensuring all laboratory and non-laboratory spaces under their direction are properly maintained while in use and closed appropriately and safely cleaned before transfer to a new occupant

3. Remediying all non-compliance matters within all laboratory spaces that they oversee and manage overall financial responsibility on such matters.

4. Assuming accountability for any hazardous material left temporarily in any laboratory without proper supervision and assigning to a new PI or initiating
disposition by ESD.

5. In the event that hazardous materials are abandoned in any laboratory, the department head will immediately initiate disposition by ESD upon becoming aware of the situation.

C. Principal Investigator (PI)
A principal investigator is defined as a faculty member (assistant professor, associate professor, professor, or instructor), a research professional, an academic professional, or laboratory director who is associated with or provides guidance to a laboratory or laboratories using chemicals or hazardous materials. Graduate students and postdoctoral associates will not be considered a PI except under special circumstances at the discretion of the unit head. Responsibilities include:

1. The PI shall train or provide for the training of all new personnel before allowing them to work in a laboratory using hazardous materials. Training shall include the following:
   a. Reading of this manual including the Laboratory Specific Chemical Safety Plan
   b. Successful completion of all required laboratory safety training
   c. Development of process specific safety protocol for chemicals and equipment.
   d. The proper use of job-specific personal protective equipment (PPE)
   e. Notifying the proper authorities in the event of an emergency or accident

2. The PI shall ensure that all laboratory personnel are entered into the Chematix database and this database is maintained and updated regularly.

3. The PI shall see that records are kept as required by this manual.

4. The PI shall remove chemical and biological substances under his/her control that may pose a hazard prior to maintenance personnel working on furnishings, equipment, or laboratory systems.

5. When leaving the University, or terminating his/her PI position, the PI shall relinquish all hazardous chemicals in his/her possession by disposal or transfer to another principal investigator who has facilities capable of safely handling the material in question.

6. The PI on leave or absent more than 60 calendar days:
a. May assign responsibility for his/her program to a temporary designee who will be in charge of the laboratory in his/her absence. This person will be: a faculty member, a laboratory director, a research professional, or an academic professional who agrees, in writing, to accept responsibility for the laboratory.

b. If the PI does not choose the option listed above in 6.a., his/her laboratory will be placed under the temporary supervision of another faculty member, research professional, academic professional, or laboratory director selected by the department head.

c. The departing PI will ensure that all door signs reflect the change in supervisory status.

d. The temporary designee may not be utilized for a period exceeding 12 months without approval of the department head.

7. Upon PI retirement, with or without emeritus status, his/her status as principal investigator will terminate. The retiring PI must safely dispose of or transfer the chemicals and hazardous waste inventory prior to retirement per the laboratory closing procedures. In the event that this is not possible, the PI may apply to the department head for continued principal investigator status until all chemicals and hazardous materials are safely disposed.

D. Laboratory Supervisor/Laboratory Coordinator
Responsibilities include:

1. Provide day-to-day supervision of research and activities in the laboratory ensuring that those activities comply with all applicable EHS regulations and UGA policies and procedures

2. Keep the PI informed of any potential compliance issues and assist the PI with all EHS matters.

E. Laboratory Personnel
Laboratory personnel are any persons who work, teach, or observe activities within a designated research or instructional laboratory or field environment. This includes students, visitors, teaching assistants, and instructors. Responsibilities include:

1. Conduct activities in compliance with all laboratory-specific procedures,
applicable EHS regulations, and UGA policies and procedures

2. Assist the PI or their designee with all EHS matters

IV. Contacts
Environmental Safety Division: 706-542-5801
Office of Research Safety: 706-542-5288
I. Purpose & Scope

This SOP describes the internal policies and procedures guiding the frequency and scope of chemical laboratory safety assessments at the University of Georgia (UGA). These assessments, along with assessments conducted by other safety groups, ensure that laboratory users are kept safe, improve regulatory compliance, and further the development of initiatives to improve the efficiency and effectiveness of the program.

These risk based assessments are intended to be comprehensive chemical and laboratory safety assessments. They are conducted by a team of safety professionals and fundamental aspects of biosafety, radiation safety, and laser safety will be informally evaluated simultaneously. Formal evaluations of these areas are performed by separate compliance groups.

II. Responsibilities

A. Research Safety Committee

The Research Safety Committee (RSC) is a faculty-led committee charged with reviewing safety trends regarding chemical and laboratory safety and definitively addressing and mitigating issues of non-compliance.

B. Associate Vice President for Research Integrity & Safety

The Associate Vice President for Research Integrity and Safety (AVP-ORIS) is responsible for reviewing the laboratory risk assignments prepared by the Office of Research Safety (ORS) to ensure resource adequacy. The AVP-ORIS is also responsible for facilitating communication between ORS and the Environmental Safety Division (ESD).

C. Director of Office of Research Safety

The Director of the Office of Research Safety (DORS) is responsible for managing laboratory specific Chemical Safety Plans for all laboratories and overseeing the safety assessments conducted by both the Chemical/Laboratory Safety and Radiation Safety groups.

D. Senior Safety & Compliance Officer

The Senior Safety & Compliance Officer (SSCO) oversees the team of chemical lab safety professionals, coordinates the scheduling of assessments, develops training
seminars to help researchers prepare for assessments, and serves as the RSC coordinator. The SSCO also analyzes assessment data providing periodic reports to the DORS, AVP-ORIS, department heads and center directors, and the RSC.

E. Laboratory Safety Professionals
The laboratory safety professionals (LSPs) are responsible for performing safety assessments within their assigned laboratories in accordance with the schedule provided by the SSCO in conformance with the procedures and requirements outlined in this SOP and in UGA’s Chemical and Laboratory Safety Manual. LSPs also manage and monitor corrective actions submitted by laboratories to address their safety deficiencies.

F. Principal Investigator (PI)
The PI is charged with overseeing the safety of those guests, students, staff, and faculty working within their laboratory. The PI holds ultimate responsibility for ensuring that all federal, state, and university policies are followed and that any necessary corrective actions are completed within established time frames.

III. Chemical Safety Levels and Assessment Scoring
Chemical Safety Levels are assigned to each laboratory space listed as active in the Chematix database based upon their chemical inventory. Rooms are assigned a safety level based off the information provided in Table 1 below and are evaluated at the beginning of each fiscal year and more frequently as necessary.

Each lab area under a PI’s jurisdiction receives its own safety level independently of chemical use in other areas. These safety levels, in conjunction with safety assessment scoring, determine the frequency and scope of visits as described in Table 1. Appendix A of this document lists each inspection item and the score assigned to each. A lower score on a routine safety assessment indicates a safer laboratory.

If laboratories document corrective actions for their deficiencies it is possible that they may be able to forego some of the annual requirements.
### Lab Safety Assessments

#### Chemical Safety Level Information and Scoring

<table>
<thead>
<tr>
<th>Chemicals present</th>
<th>Annual requirements</th>
<th>Score 10 or less on routine assessment or document corrective actions</th>
<th>Score 30 or more on routine assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSL-1 Combustible liquids and/or slightly corrosive or slightly toxic chemicals</td>
<td>One routine safety assessment conducted by ORS</td>
<td>No additional requirements</td>
<td>An in-person follow up conducted by ORS approximately 2-4 weeks after the original assessment.</td>
</tr>
<tr>
<td>CSL-2 Corrosive substances, flammable gases, liquids, or solids, weak oxidizers, carcinogens, mutagens, reproductive toxins, and/or moderately toxic chemicals</td>
<td>One routine safety assessment conducted by ORS plus one self-assessment conducted by lab personnel</td>
<td>Skip the self-assessment for that year</td>
<td></td>
</tr>
<tr>
<td>CSL-3 Highly flammable gases, liquids, or solids, pyrophoric and water reactive materials, strong oxidizers, and/or highly toxic chemicals</td>
<td>Two routine safety assessments conducted by ORS approximately 6 months apart.</td>
<td>Skip the second safety assessment for that year</td>
<td></td>
</tr>
</tbody>
</table>

*Table 1: Chemical safety level information and scoring.*

#### IV. Scheduling Routine Assessments

All laboratories on campus are scheduled for a routine safety assessment based on the calendar put together by the SSCO. The inspection calendar begins on July 1st and ends on June 30th to coincide with the fiscal year. Additional assessments are required by other compliance groups.

- All buildings are scheduled to be completed within a certain month during the year. On average, the SSCO aims to allow enough time for each LSP to complete and report two assessments per day.
- Each month, the assigned building(s) are split between the team of LSPs equally (or as equally as possible). All assessments in the building will be completed and results reported to researchers within the month.
- The master schedule is placed on the ORS website and copies are provided to the Director of Biosafety (DOB), the Radiation Safety Officer (RSO), and the DORS as requested.
- Approximately one month prior to the beginning of the assessments for a particular building, the SSCO or their designee sends a courtesy notification to all PIs and laboratory supervisors currently listed as having spaces in that building according to Chematix.
  - If the PI would like to schedule their assessment in order to be present, they may request a specific date and time and these will be accommodated if possible.
  - If no email is received, then it is assumed that the laboratory does not need to have someone present for the assessment and the assigned LSP will simply perform the assessment at some point within the month.
The SSCO or their designee also offers to host training seminars either by department, building, or for individual laboratories. For those that are interested, these seminars are held typically 1-2 weeks prior to the beginning of routine assessments.

V. Conducting Assessments
A typical laboratory safety assessment will take anywhere from 30 minutes to a few hours depending upon the type of hazards present in the laboratory. This includes travel time to the lab, time to complete the assessment, and reporting of the assessment findings to the PI.

Reports are typically filled out via electronic tablet or on paper and then entered into Chematix upon returning to the office.

The following items are reviewed as part of a typical laboratory safety assessment:

- Immediately dangerous to life and health (IDLH) conditions – a safety violation that poses an immediate threat to life or would interfere with an individual’s ability to escape from a dangerous situation. Labs with these types of deficiencies must either correct the issue or develop a detailed action plan for addressing the issue within 24-48 hours of receiving notice.

- Critical conditions – potentially dangerous conditions primarily resulting from physical hazards or blocked/inoperable safety equipment. Labs with these types of deficiencies are given 5-7 days to either correct the issue or develop a detailed action plan for addressing the issue.

- General laboratory conditions – includes ingress/egress concerns, safety postings, sink conditions, the presence of food/drink, personal protective equipment, and the use of appropriate lab attire.

- Chemical storage and documentation – includes chemical storage and labeling, including hazardous waste compliance

- Safety equipment – includes verifying the most recent assessment dates for safety showers, eyewashes, fume hoods, and fire extinguishers as well as the presence of first aid kits and spill kits, safety data sheets, and training documentation.

- Electrical safety – includes looking at all motors and oil-containing pumps to verify proper storage; LSPs also look for frayed wiring on equipment, proper use of extension cords, power strips, and ground fault circuit interrupters (GFCIs) on outlets near water sources.
- LSPs have also been cross-trained to notice obvious and/or immediately dangerous laboratory conditions that would typically fall under the purview of Biosafety or Radiation Safety. In the event that an unsatisfactory condition is found within either of these two subject areas, the respective office is notified by the LSP. The responsible office then follows up with the laboratory to verify compliance and develop a corrective action procedure for the lab.

Any items not meeting the safety standards as established by federal, state, and university policy are marked as “Unsatisfactory” on the report and explanatory information is provided within the report as necessary. This includes suggested corrective actions for the PI to take.

For those items that cannot be addressed by the PI (e.g., fume hood operation concerns, installation of GFCIs, safety shower or eye wash installation, etc.), the LSP will submit a work order to the Facilities Management Division (FMD). Work orders for these types of issues are typically resolved without laboratory funding.

Occasionally, a safety concern arises that falls within the jurisdiction of a program under ESD. These items include Fire Safety, Environmental Compliance, and Industrial Hygiene. During the assessment, if any concerns arise within these subject areas, the LSP notifies the appropriate ESD program.

Once the report has been entered into Chematix and any associated work orders have been accepted by FMD, the LSP and the SSCO each receive a copy of the report. The LSP forwards the report to the PI and laboratory supervisor within two business days and uses the email to provide any explanations and relevant attachments (including photos) to assist the lab with their corrective actions.

VI. Reporting and Managing Deficiencies

A. Deficiencies that are immediately dangerous to life and health (IDLH)

IDLH deficiencies are safety violations that pose an immediate threat to life and property or would interfere with an individual’s ability to escape from a dangerous situation. Labs with these types of deficiencies must either correct the issue or develop a detailed action plan for addressing the issue within 24-48 hours of receiving notice. If no such action is documented within 24-48 hours, LSPs will notify the RSC of the situation and the RSC may take one of the approved institutional responses outlined in Section VI.D of this SOP.

B. Deficiencies that are critical

Critical deficiencies are potentially dangerous conditions primarily resulting from physical hazards or blocked/inoperable safety equipment. Labs with these types of deficiencies are given 5-7 days to either correct the issue or develop a detailed action
plan for addressing the issues. If no such action is documented within the 5-7 day window, LSPs will notify the RSC of the situation and the RSC may take one of the approved institutional responses outlined in Section VI.D of this SOP.

Additionally, a lab will be considered to be in a critical state if any combination of deficiencies causes it to score 30 or more on its safety assessment. For these situations the 5-7 day corrective action calendar be applied as well.

C. Other deficiencies
For non-IDLH and non-critical deficiencies, laboratories are provided approximately 30 days from the date of the assessment to document corrective actions within Chematix; additional time may be needed for corrective actions associated with an FMD work order.

Once corrective actions have been completed, the LSP can choose to either approve the corrective action within Chematix or they can follow up with the lab if there’s a question regarding what has been done.

If no corrective actions have been documented for a deficiency after approximately 30 days, the LSP will send an email reminder to the lab. If, after approximately 60 days, no corrective actions have been entered, the LSP will document that no corrective action was taken for the deficiency and the lab may be referred to the RSC if the lab had an overall score greater than 10 on the safety assessment.

D. Possible institutional Responses of the RSC
The RSC utilizes three types of letters to communicate with laboratories. These can be used in escalating fashion or the Committee may decide that a situation is serious enough to warrant an immediate Letter of Warning or Reprimand.

Letters of Concern express a general sense of concern for the safety of lab occupants and are usually only meant as communication between the RSC and the PI.

Letters of Warning explicitly state a possible action by the Committee if corrective actions are not taken. They usually include a hard deadline and are copied to a department head or unit director as appropriate.

Letters of Reprimand are issued when the Committee has decided to take formal action. These will include a detailed description of the Committee’s action, a hard deadline to complete the Committee’s required corrective actions, and are also copied to a department head or unit director as appropriate. Additionally, the AVP-ORIS will inform the EHSMS Executive Committee of the RSC’s decision to take official action.
Any of the decisions listed below may be taken by the RSC and would be communicated to the lab in the form of a letter.

- Require the completion of formal training courses
- Require changes in research procedures or laboratory practices
- Place conditions upon ongoing research or require enhanced monitoring
- Recommending to AVP-ORIS that the investigator not use the data collected for publication
- Issue a stop work order for the lab until deficiencies are corrected

VII. **After Routine Assessments are Completed**

Once reports from a building have all been entered, the SSCO uses the data to compile assessment summaries for department heads and center directors as requested. Assessment summaries are also provided to the RSC and the AVP-ORIS as requested.

The SSCO also utilizes the assessment data to develop training tools and to make recommendations regarding assessment frequency. Laboratories that score greater than 10 on their routine annual assessment may be subject to additional requirements and visits as described earlier in this document.

In addition, the SSCO sends out a link to all researchers within the building to gauge the perception amongst researchers of the process and to gather comments and suggestions to perhaps improve the relevance and helpfulness of the laboratory assessment program.
APPENDIX A: Inspection items with scores in parentheses

A. IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (4)
   1. The primary means of egress out of the lab is at least 36 inches wide.
   2. Gas cylinders (including lecture cylinders) are upright and secured with a chain, strap, or some other device specifically designed for securing of cylinders.
   3. Pyrophoric gases and toxic gases (including carbon monoxide) present in the lab are kept in an NFPA compliant gas room, approved gas cabinet or exhausted enclosure.
   4. No untended or unidentified spills on lab benches, floors, storage cabinets, or within fumehoods.

B. CRITICAL DEFICIENCIES (3)
   1. Appropriate personal protective equipment is available and utilized when necessary.
   2. No evidence of sink disposal of chemicals, unless the lab has written permission from the Environmental Safety Division.
   3. Liquid corrosives are stored in appropriate secondary containment.
   4. Chemicals are segregated and stored according to hazard class.
   5. Peroxide forming chemicals are found with proper labels indicating a receipt date, opening date, and testing information if applicable.
   6. Fire extinguishers, eyewashes and safety showers are unobstructed.
   7. Electrical panels and gas shutoff valves in the lab are unobstructed.

C. LABORATORY CONDITIONS
   1. Door windows to exterior corridors are uncovered (1).
   2. Unless stored along walls, items are not stored within 18 inches of the ceiling in sprinklered rooms or within two feet in non-sprinklered rooms (2).
   3. The lab is free of slip, trip, and fall hazards in main areas of egress/ingress (2).
   4. The laboratory caution sign is present on all main entrances into the lab or lab suite and accurately reflects the current emergency contact information (2).
   5. All Research Safety provided laboratory postings and labels are visible and legible (emergencyphone numbers, refrigerator stickers, eyewash/safety shower, spill kit, first aid kit, safety information sign). (0).
   6. No evidence of food and/or beverage preparation or consumption (2).
   7. Laboratory personnel are wearing appropriate laboratory attire (3).
   8. Hand washing facilities with sufficient towels and soap are present in the lab or lab suite (1).
   9. Furniture at the lab benches is made of or covered with non-porous materials (1).
10. Sharps, pointed plastics, and glass are being disposed of in appropriate containers (3).

D. CHEMICAL STORAGE
   1. All chemical containers within the lab are clearly labeled with either the full chemical name or an acceptable abbreviation (3).
   2. No hazardous liquids are stored above shoulder height (2).
3. The lab’s chemical inventory accurately reflects the hazards present in the lab (2).
4. Unused cylinders have safety caps in place (3).
5. All cylinders are tagged as “Full”, “In Use”, or “Empty” (1).
6. Cylinders in storage containing incompatible gases are separated by the required distance (3).
7. There is no evidence of stockpiling gas cylinders within the lab (3).
8. The volume and density of flammable liquids being stored and used in the laboratory does not exceed the limits established by the National Fire Protection Agency (3).
9. Flammable liquids requiring refrigeration are being stored in an intrinsically safe or explosionproof unit (3).
10. Hazardous waste containers are labeled with the words “Hazardous Waste”, the associated hazard class or other indication of hazard (e.g., original container label), and a sufficient description of contents (4).
11. Hazardous waste containers are kept tightly closed unless adding waste (4).
12. Liquid hazardous waste is being stored either in secondary containment or in a container rated for transport on public roads (2).
13. Incompatible waste is separated by a physical barrier (4).
14. No inherently waste-like containers are being stored (3).

E. SAFETY EQUIPMENT AND DOCUMENTATION
1. Fire extinguishers, eyewashes, and safety showers are available and have been certified within the last 12 months (0).
2. A first aid kit and spill kit are present and appropriately stocked in the lab or lab suite (2).
3. Safety data sheets for all hazardous materials in the lab or lab suite are readily available to all laboratory personnel either electronically or via hard copy (4).
4. Training records for all laboratory personnel are up to date (3).
5. Fume hoods are not being used for long term storage of hazardous chemicals or lab equipment unless storage is the sole purpose of the hood (2).
6. Fume hoods have been certified within the last 12 months and appear to be operating within the parameters required for maximum protection (0).
7. Fume hood lights, alarms, sashes, sash locks, and vented cabinets are operating appropriately (0).

F. ELECTRICAL EQUIPMENT
1. Extension cords are not run under doors, through windows, or through ceiling panels (2).
2. Electrical cords are not frayed or damaged (4).
3. Electrical equipment is properly grounded (3).
4. Outlets within six feet of a water source are equipped with GFCI protection (0).
5. Only UL rated power strips are used to power electronic equipment (2).
6. Power strips and extension cords are plugged directly into a permanent wall receptacle and not plugged into one another (3).
7. Power strips and extension cords being used in the lab are not being overloaded (3).
8. Any motors and pumps with moving belts are equipped with belt guards (3).
9. All equipment containing oil is being stored within secondary containment or on a spill pad if near a floor drain or sink (3).

---

1 Numbers in parentheses indicate the score given to each inspection item on a scale of 1-4 with 4 being the most severe and 1 being the least severe. All IDLH conditions are scored 4. All critical deficiencies are scored 3. Other items are scored 1-4 depending on compliance severity. Note that there are some non-IDLH and non-critical items that are scored 4 or 3. These were kept at this score because some items (e.g., hazardous waste items) are considered a severe compliance issue but in most cases would not present an immediate threat or injury.
UNIVERSITY OF GEORGIA
Office of Research

Start: Day 1
ORS conducts Laboratory Inspection and sends report within 2 business days.

IDLH?
Yes

Deficiencies found?
No

Yes

Day 1
ORS issues inspection report and lab is given 24 hours to resolve IDLH deficiency.

Resolved?
No

Issue escalated to RSC.

No

Day 1
ORS issues inspection report within 1 business day. Deficiencies must be resolved within one week.

Are there critical deficiencies?
Yes

were non-critical deficiencies corrected?
No

Day 30-45
Reminder sent to PI and lab manager to correct deficiencies in Chematix.

were critical deficiencies corrected?
No

Day 60
Additional reminder sent to PI and lab manager to correct deficiencies.

If lab scores >10 issues escalated to RSC, otherwise force close deficiencies.

No

Day 5-7
Issue escalated to RSC for further evaluation.

No further action needed.

Key:
ORS: Office of Research Safety
RSC: Research Safety Committee
IDLH: Immediately Dangerous to Life and Health

Return to Table of Contents
Compressed Gas Cylinder General Safety
Version: May 2020

I. Purpose & Scope

The purpose of this document is to outline how students, faculty, and staff should properly procure and safely use, handle, store, transport, and remove compressed gas cylinders. The scope of this document is designed to make all University of Georgia personnel aware of how to protect themselves from the hazards related to the use, handling, and storage of compressed gas cylinders.

II. Responsibilities

A. Office of Research Safety
   - Ensure that gas cylinders are being used, handled, and stored safely.
   - Provide hazard analysis for Principal Investigators and Lab Supervisors bringing in new hazardous gases to their lab areas as requested.
   - Correct any issues and deficiencies regarding compressed gas cylinder safety as necessary.

B. Principal Investigators and Lab Supervisors
   - Follow all usage, handling, and storage guidelines as outlined in this document.
   - Train other lab workers and students on the safety guidelines.
   - Ensure all lab personnel are following the guidelines established by this document.
   - Track and document the gas cylinders that are used within the lab. This should include type and quantity of each cylinder.

III. Procedures

A. Procurement of gas cylinders
   - Before purchasing compressed gases, each researcher should determine if they have the minimum engineering requirements necessary for storage and use of the gas. Some gases require continuous ventilation while others may require minimum segregation from incompatible gases. Please contact the Office of Research Safety (ORS) for any questions about these requirements.
• When receiving a gas cylinder do not accept it until the following items are verified:
  o The contents are identified either by labels or stencils,
  o It contains the appropriate DOT label, and
  o It contains a valve protection cap (if so designed).
• Do not remove any labels or other form of identification from any gas cylinder.

B. Proper storage of gas cylinders

• Cylinders should be stored in a dry and well-ventilated area away from direct heat. Individual storage areas shall be evaluated in the lab area on a case by case basis. Laboratories using toxic or highly toxic compressed gases shall have a continuous mechanically vented storage area (e.g., a fume hood or gas cylinder storage cabinet) per the USG Board of Regents. Pyrophoric gases shall also be stored in such an area which must be equipped with a sprinkler system.
• Storage areas shall not exceed 125 degrees Fahrenheit (52°C), and cylinders shall be stored nowhere near any source of ignition and flammable and combustible materials. Oxygen and oxidizing gas cylinders shall not be stored within 20 feet of flammable gases or highly combustible materials unless separated by a non-combustible barrier.
• Indoor storage areas shall not block any elevator, gangway, stair well, evacuation route, or any other passageway. Outdoor storage areas shall be on an elevated, level, and covered platform to prevent deterioration from rain, snow, ice, and full sun exposure.
• Storage areas need to have applicable signs with quantities, hazards, and gases listed. To request these signs or for assistance with filling them out, contact ORS.
• Programmable oxygen level or toxic gas sensing devices may be needed in certain areas where specified by code (i.e., poorly ventilated areas, toxic gas storage areas). The warning for hazardous gas exposure provided shall be both visually and audibly distinguishable. If you suspect that your area may need a monitor of any kind, contact ORS.
• Cylinders should be individually secured and strapped to a permanent structure approximately 1/2 to 3/4 of the way up the cylinder to prevent them from falling or being knocked over.
• Cylinders should always be stored with the valves closed. Regulators must be removed from all cylinders that are not being actively used and the safety caps should be put in place. Regulators should be stored in a clean and dust free environment, and either labeled or clearly marked in some other way in order to easily identify the types of compressed gases for which they are intended to be used.
• Gas cylinders should be stored in accordance with their chemical and physical properties. Consult the Safety Data Sheet (SDS) provided by the vendor if questions arise about their storage.
C. Proper use and handling of gas cylinders

- Any cylinder with unknown or unmarked contents should not be used and be taken out of service immediately.
- All applicable PPE as referred to in the safety data sheet (SDS) of each individual cylinder should be donned while working with the cylinder.
- Only cylinders that are in use shall be kept in the laboratory unit. These include cylinders that are actively delivering gas to a laboratory operation or a single cylinder that is being kept on hand as a backup for the operation. When cylinders are not being used the main valve shall be tightened and the regulator should be promptly removed and replaced with a protective cap.
- Tags designating whether a cylinder is full, in use, or empty should be found on all cylinders. These tags can be found here.
- Regulators should only be used for the type of cylinder for which they were made as they are incompatible with other types of cylinders. Cylinders without regulators or properly fitted regulators should never be used.
- Where permanent connection hoses and lines are in place for cylinder gases, they must be marked to identify the specific gas contained and the direction of flow per the USG Board of Regents.
- Teflon tape should never be used in connections as this can cause faults and leaks in the connection. Always use a wrench to properly tighten connections. Never tamper or modify connections of a cylinder or regulator.
- No open flame or hot work should take place around any cylinder under any circumstance to prevent an explosive atmosphere. Please contact a member of ORS if this type of work must be conducted around compressed gas cylinders.
- Leak detection should be performed by researchers when working with compressed gas cylinders, particularly those that present other hazards aside from simply being compressed gas (e.g., flammable, toxic, or corrosive). Primary methods for performing leak detection include one of the following methods:
  - A direct reading instrument or sensor
  - A liquid solution sprayed onto connections to see if bubbles appear. When using this method, it is imperative to make sure that the solution being used is compatible with the compressed gas being tested.
- If a leak is ever detected in a connection of a cylinder or the cylinder bottle itself then it shall be taken out of service immediately. If a leak is suspected in a flammable or toxic gas, evacuate the area immediately and inform the appropriate emergency response personnel.
- Never try to perform any self-repairs to connection or bottle leaks.
D. **Transportation of gas cylinders**
   - While transporting cylinders they should be secured with a strap or chain and remain upright at all times.
   - Protective caps need to be kept in place while moving cylinders for any purpose.
   - Never roll cylinders on their sides as a transportation method.
   - Never lift cylinders using the valve cap or stem.
   - Cylinders should be transported using hand trucks. Stairs should never be used to transport cylinders of any size between floors. Only utilize elevators or lifts when transport between floors is necessary.
   - Full and empty cylinders must be separated while transporting by vehicle.
   - Different hazard class cylinders shall be separated while being transported by a vehicle.

E. **Removal of gas cylinders**
   - Cylinders that are tagged as “EMPTY” should be removed from the lab area and picked up by the vendor in a timely fashion.
   - Even when empty, compressed gases should still be separated and stored according to this document as they are still hazardous and can still contain a certain volume of gas in the canister.
   - Small, disposable, empty lecture cylinders may be discarded in the lab trash after the valve stem has been removed. Small disposable lecture cylinders that are not empty may either be reacted off to render them empty, returned to the supplier or disposed of by a licensed gas cylinder disposal company. ESD shall be consulted prior to disposing of a cylinder using the preceding methods. Non-disposable cylinders must be returned to the supplier.

F. **Emergency Situations**
   - Never try to handle the situation yourself if you have not had proper training or feel that you are in imminent danger at any time.
   - During any leak or potential leak of hazardous gases that cannot be stopped by closing the cylinder on the container valve, immediately evacuate the area to avoid any exposure and inform the appropriate emergency response personnel. See emergency contacts below.

G. **Training**
   - Lab personnel should be trained on the procedures set forth in this document during a lab opening, or if the types of compressed gases used in the lab is changing significantly.
   - All new lab personnel should be trained on the procedures set forth in this document.
personnel should be re-trained whenever there are deficiencies found in a lab’s usage, handling, or storage of cylinders.

IV. Contacts
Office of Research Safety – 706-542-5288
Environmental Safety Division – 706-542-5801
Airgas Emergency Response Number (for use with emergency leaks from Airgas supplied cylinders): 800-523-9374

V. References


Design Criteria for Laboratories, 5th Ed., Board of Regents of the University System of Georgia, 2019
I. Purpose & Scope

Proper chemical management and storage is essential in assuring a safe work environment for students, staff, faculty, and visitors. These guidelines will help you manage and store chemicals safely in your workplace.

II. Chemical Procurement, Distribution, and Storage

A. Procurement

The procurement of any hazardous chemical associated with on-campus research, science laboratories and academic units of the University must be shipped through Central Research Stores (CRS) for proper inventorying and tracking.

B. Distribution

CRS is responsible for barcode-labeling and entering initial chemical information into the CHEMATIX database upon purchase by lab personnel, and for distributing purchased chemicals throughout campus.

C. Storage

- Chemicals in the laboratory shall be segregated by hazard class and compatibility.
- All incoming containers of chemicals must have appropriate manufacturers’ labels that are not missing or defaced.
- It is recommended to label each chemical container with the date it was received and the date it was opened (this is a requirement for peroxide forming chemicals)
- Work areas should not be used for long-term storage. Storage of glass chemical containers on the laboratory work area floor shall be strictly prohibited.
- If space does not allow each chemical hazard class to be kept in their own storage cabinet, each group should be separated by secondary containment (e.g., plastic trays), with extra care taken to provide stable, uncrowded, and carefully monitored conditions. At a minimum, always store fuels away from oxidizers.
- Avoid storing hazardous chemicals (except cleaners) under sinks. Use approved flammable storage lockers, corrosive storage lockers, shelves or cabinets.
- Open shelves used for the storage of hazardous chemicals shall be well-anchored, painted, made of, or covered with, chemical-resistant materials. The higher shelves shall be used for chemicals presenting little to no hazard.
Please use the chart below as a general guide for storage of chemicals by hazard class. This chart is not meant to be exhaustive. Safety Data Sheets should be consulted for detailed storage guidelines and chemical incompatibilities.

<table>
<thead>
<tr>
<th>Chemical Hazard Class</th>
<th>GHS Pictograms</th>
<th>Storage Method</th>
<th>Chemical Examples</th>
<th>Incompatibles (See SDS in all cases)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrosives - Organic Acids</td>
<td>![image]</td>
<td>Store in a lined acid storage cabinet or deep corrosion resistant trays. Do not store directly on metal shelves or in non-vented cabinets under fume hoods. All liquid corrosives should be placed in a secondary containment.</td>
<td>Acetic acid&lt;br&gt;Trichloracetic acid&lt;br&gt;Lactic acid&lt;br&gt;Formic acid</td>
<td>Inorganic acids and bases, and all other hazard classes, particularly away from chemicals that can generate toxic gases on contact such as cyanides and sulfides, and active metals such as sodium, magnesium and potassium metal.</td>
</tr>
<tr>
<td>Corrosives - Inorganic Acids</td>
<td>![image]</td>
<td>Stored in a lined acid storage cabinet or deep corrosion resistant trays. Do not store directly on metal shelves or in non-vented cabinets under fume hoods. All liquid corrosives should be placed in a secondary containment.</td>
<td>Oxidizing&lt;br&gt;Chromic acid&lt;br&gt;Nitric acid&lt;br&gt;Perchloric acid&lt;br&gt;Non-oxidizing&lt;br&gt;Phosphoric acid&lt;br&gt;Hydrofluoric acid&lt;br&gt;Hydrochloric acid</td>
<td>Organic acids and bases, and all other hazard classes, particularly away from chemicals that can generate toxic gases on contact such as cyanides and sulfides, and active metals such as sodium, magnesium and potassium metal.</td>
</tr>
<tr>
<td>Corrosives - Bases</td>
<td>![image]</td>
<td>Store in a lined acid storage cabinet or deep corrosion resistant trays. All liquid corrosives should be placed in a secondary containment.</td>
<td>Ammonium hydroxide&lt;br&gt;Sodium hydroxide&lt;br&gt;Potassium hydroxide</td>
<td>Acids and all other hazard classes.</td>
</tr>
<tr>
<td>Flammable Liquids</td>
<td>![image]</td>
<td>Store in a flammable storage cabinet.</td>
<td>Acetone&lt;br&gt;Benzene&lt;br&gt;Toluene&lt;br&gt;Methanol&lt;br&gt;Hexanes</td>
<td>Corrosives, oxidizers, poisons/toxic, explosives.</td>
</tr>
<tr>
<td>Flammable Solids</td>
<td>![image]</td>
<td>Store in a dry, cool area. Keep water and air from entering the container.</td>
<td>Lithium aluminum hydride&lt;br&gt;Calcium hydride&lt;br&gt;Phosphorus&lt;br&gt;Sodium borohydride</td>
<td>Corrosives, oxidizers, poisons/toxic, explosives.</td>
</tr>
<tr>
<td>Peroxide Forming Chemicals</td>
<td>![image]</td>
<td>Store in an air tight container in a dark, cool area alone with flammable liquids.</td>
<td>Diethyl ether&lt;br&gt;Tetrahydrofuran (THF)&lt;br&gt;1,4-Dioxane&lt;br&gt;2-Propanol</td>
<td>Corrosives, oxidizers, poisons/toxic, explosives and water reactive.</td>
</tr>
<tr>
<td>Oxidizers</td>
<td>![image]</td>
<td>Store in a spill containment tray.</td>
<td>Peroxides&lt;br&gt;Superoxides&lt;br&gt;Chlorates&lt;br&gt;Nitrates&lt;br&gt;Bromates</td>
<td>Most other hazard classes, particularly organic material, corrosives, flammables/combustibles, and reducing agents such as zinc, alkali metals and alkaline earth metals.</td>
</tr>
<tr>
<td>Poisons │ Toxic</td>
<td>![image]</td>
<td>Store in cool, dry, ventilated area away from other hazard classes. Poisons] Toxic liquids should be in chemically resistant secondary containment. Toxic chemicals shall be stored according to the nature of the chemical, with appropriate warnings and security.</td>
<td>Cyanides&lt;br&gt;Cadmium&lt;br&gt;Sodium azide&lt;br&gt;Phenol&lt;br&gt;Mercury</td>
<td>Most other hazard classes, particularly acids, bases, and oxidizers.</td>
</tr>
<tr>
<td>Explosives</td>
<td>![image]</td>
<td>Store in a secure location where they would not be subject to shocks or falls.</td>
<td>Ammonium nitrate&lt;br&gt;Nitro urea&lt;br&gt;Sodium amide&lt;br&gt;Trinitrobenzene</td>
<td>Away from all other chemicals and sources of ignition.</td>
</tr>
<tr>
<td>Water Reactive</td>
<td>![image]</td>
<td>Store in a dry, cool area.</td>
<td>Sodium metal&lt;br&gt;Potassium metal&lt;br&gt;Sodium hydride&lt;br&gt;Thionyl Chloride</td>
<td>Separate from all aqueous solutions and oxidizers, and protected from a sprinkler system and other water sources.</td>
</tr>
<tr>
<td>General Chemicals Non-Reactive</td>
<td>NO IMAGE</td>
<td>Store on general laboratory shelves.</td>
<td>Agar&lt;br&gt;Citric acid&lt;br&gt;Sodium chloride&lt;br&gt;Sodium bicarbonate</td>
<td>Consult SDS</td>
</tr>
</tbody>
</table>
III. Secondary Container Labelling Guidelines (squeeze bottles, etc.)

- All chemicals intended for use in less than one day by a single user should be labeled with at least the identity of the chemical.
- Secondary containers for non-hazardous chemicals shall be affixed with labels listing the identities of their contents.
- Secondary containers for hazardous chemicals intended for storage and use for a period greater than one day shall be affixed with labels listing: the identity of the hazardous chemical, the date filled, & the hazard(s). The chemical identity given on a chemical label must be in plain English, and must list the chemical’s common name given on the SDS or manufacturer’s label, or a name listed on the accepted UGA abbreviation and acronym list. If other abbreviations are used on any chemical labeling, all abbreviations and acronyms used must be posted in the lab. (See Appendix I for Accepted Abbreviations and Acronyms for Chemical Secondary Container Labeling)
- Batches of vials or test tubes containing chemicals of the same hazard class may have the hazard labels affixed to a common carrier or box. All other such secondary containers must be appropriately labeled as noted above.
- The chemical’s hazard warning may be provided by use of either the Globally Harmonized System of Classification and Labelling of Chemicals (GHS), the National Fire Protection Association (NFPA) hazard warning system, or the Hazardous Materials Identification System (HMIS).

IV. Records

A. Laboratory’s Chemical Inventory

A hazardous chemical list for each laboratory will be maintained by the laboratory staff utilizing Chematix, updated periodically (at least annually) and made accessible to laboratory personnel. The chemical inventory database maintained by the Environmental Safety Division (ESD) will provide information regarding chemicals purchased and delivered to the labs and should serve as the basis for the hazardous chemical list. Contact ESD for details on accessing and modifying this database.

ESD is charged with setting up and maintaining a centralized inventory system of chemicals for campus units. The Associate Vice President-Environmental Safety is directed to ensure that the individual units’ inventory reporting practices are coordinated with the Chematix inventory system to ensure that all compliance requirements are met. ESD has the responsibility and authority for conducting internal audits of the centralized inventory system and filing the results of such audits.

B. Safety Data Sheets (SDS)

Access and record keeping of Safety Data Sheets (SDSs) can be accomplished either by hard copy or electronically:

- Hard copies of SDSs are to be alphabetized and available for each hazardous chemical
present in the laboratory. SDS materials shall be placed within a labeled binder and easily accessible to employees.

- Electronic copies of SDSs are provided via a paid subscription to MSDS Online accessible through Chematix or the UGA Environmental Safety Division Website. The laboratory shall have a desktop computer, laptop computer, or other mobile device for employee access to chemical safety information. The computer or mobile device does not have to be used exclusively for SDS access.

PIs are required to train laboratory personnel on how to find SDS information relevant to the chemical hazards found within their lab.

V. Contacts
Office of Research Safety: 706-542-5288
Environmental Safety Division: 706-542-5801
Radiation Safety: 706-542-0107

VI. References

Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, 2011

Design Criteria for Laboratories, 5th Ed., Board of Regents of the University System of Georgia, 2019
## APPENDIX I

### Accepted Abbreviations and Acronyms for Chemical Secondary Container Labeling

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic Acid: C2H4O2</td>
<td>4-(2-hydroxyethyl)-1-</td>
</tr>
<tr>
<td>Benzene: C6H6</td>
<td>piperazineethanesulfonic acid: HEPES</td>
</tr>
<tr>
<td>Calcium Chloride: CaCl2</td>
<td>Hydrochloric Acid HCl</td>
</tr>
<tr>
<td>Carbon Tetrachloride: CCl4</td>
<td>Hypochlorous Acid: HOCl</td>
</tr>
<tr>
<td>Chloroform: CHCl3</td>
<td>Hydrofluoric Acid: HF</td>
</tr>
<tr>
<td>Cupric Chloride CuCl2</td>
<td>Isopropanol: IPA</td>
</tr>
<tr>
<td>Ethidium Bromide: EtBr</td>
<td>Magnesium Chloride: MgCl2</td>
</tr>
<tr>
<td>Ethyl Acetate: EtOAc</td>
<td>Magnesium Sulfate: MgSO4</td>
</tr>
<tr>
<td>Ethylene Diamine Tetraacetic Acid: EDTA</td>
<td>Methylene Chloride: MeCl2 or CH2Cl2</td>
</tr>
<tr>
<td>Ethanol: EtOH</td>
<td>Methanol: MeOH</td>
</tr>
<tr>
<td>Water: H2O</td>
<td>Methyl tert-butyl Ether: MTBE</td>
</tr>
<tr>
<td>Hydrogen Peroxide: H2O2</td>
<td>4-Morpholinepropanesulfonic Acid: MOPS</td>
</tr>
<tr>
<td>4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid: HEPES</td>
<td>Nitric Acid: HNO3</td>
</tr>
<tr>
<td>Hydrochloric Acid HCl</td>
<td>Perchloric Acid: HClO4</td>
</tr>
<tr>
<td>Hypochlorous Acid: HOCl</td>
<td>Phenol/Chloroform/IsoAmyl: PCI</td>
</tr>
<tr>
<td>Hydrofluoric Acid: HF</td>
<td>Phosphate Buffered Saline: PBS</td>
</tr>
<tr>
<td>Isopropanol: IPA</td>
<td>Potassium Nitrate: KNO3</td>
</tr>
<tr>
<td>Magnesium Chloride: MgCl2</td>
<td>Potassium Hydroxide: KOH</td>
</tr>
<tr>
<td>Magnesium Sulfate: MgSO4</td>
<td>Potassium Phosphate: K3PO4</td>
</tr>
<tr>
<td>Methylene Chloride: MeCl2 or CH2Cl2</td>
<td>Potassium Chloride: KCl</td>
</tr>
<tr>
<td>Methanol: MeOH</td>
<td>Potassium Chlorate: KClO3</td>
</tr>
<tr>
<td>Methyl tert-butyl Ether: MTBE</td>
<td>Potassium Nitrite: KNO2</td>
</tr>
<tr>
<td>4-Morpholinepropanesulfonic Acid: MOPS</td>
<td>Sodium Chloride: NaCl</td>
</tr>
<tr>
<td>Nitric Acid: HNO3</td>
<td>Sodium Chlorate: NaClO3</td>
</tr>
<tr>
<td>Perchloric Acid: HClO4</td>
<td>Sodium Nitrite: NaNO2</td>
</tr>
<tr>
<td>Phenol/Chloroform/IsoAmyl: PCI</td>
<td>Sodium Dodecyl Sulfate: SDS</td>
</tr>
<tr>
<td>Phosphate Buffered Saline: PBS</td>
<td>Sodium Nitrate: NaNO3</td>
</tr>
<tr>
<td>Potassium Nitrate: KNO3</td>
<td>Sodium Hydroxide: NaOH</td>
</tr>
<tr>
<td>Potassium Hydroxide: KOH</td>
<td>Sodium Phosphate: Na3PO4</td>
</tr>
<tr>
<td>Potassium Phosphate: K3PO4</td>
<td>Sulfuric Acid: H2SO4</td>
</tr>
<tr>
<td>Potassium Chloride: KCl</td>
<td>Tris-Hydroxymethylaminomethane: TRIS</td>
</tr>
<tr>
<td>Potassium Chlorate: KClO3</td>
<td>Tris-Acetate-EDTA Buffer: TAE</td>
</tr>
<tr>
<td>Potassium Nitrite: KNO2</td>
<td>Tris-Borate-EDTA Buffer: TBE</td>
</tr>
<tr>
<td>Sodium Chloride: NaCl</td>
<td>Tris-EDTA Buffer: TE</td>
</tr>
<tr>
<td>Sodium Chlorate: NaClO3</td>
<td></td>
</tr>
<tr>
<td>Sodium Nitrite: NaNO2</td>
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<td>Sodium Dodecyl Sulfate: SDS</td>
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<td>Sodium Nitrate: NaNO3</td>
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<td>Sodium Hydroxide: NaOH</td>
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<tr>
<td>Sodium Phosphate: Na3PO4</td>
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</table>
I. Purpose & Scope

This document is meant to provide an overview of the University’s requirements and recommendations for handling incidental and major spills within the laboratory. Improper or negligent use of personal protective equipment (PPE) during a spill cleanup could result in serious injury to yourself or others. Please refer to individual chemical safety data sheets (SDS) and/or internal laboratory standard operating procedures (SOPs) for appropriate spill mitigation procedures specific to a given chemical.

II. Incidental Spills

For the purposes of this document, an incidental spill is defined as a spill that meets the following criteria:

- A spill of any substance that is classified as non-hazardous under the Globally Harmonized System (GHS). These substances will not have any pictograms, signal words, or hazard statements listed in Section 2 of their SDS.
- A spill of a substance that is classified as hazardous under the GHS but which does not pose a significant safety or health hazard to employees in the immediate vicinity or to the employee cleaning up the spill nor does it have the potential to become an emergency within a short time frame.
- A spill of a mixture or working reagent that according to the Principal Investigator (PI) or lab supervisor’s discretion does not pose a significant safety or health hazard to employees in the immediate vicinity or to the employee cleaning up the spill nor does it have the potential to become an emergency within a short time frame.

Incidental spills are limited in quantity, exposure potential, and toxicity and present only minor safety or health hazards to employees in the immediate work area. Incidental spills can usually be cleaned up by laboratory personnel provided that appropriate PPE, spill kit, and proper spill absorbents are kept on hand. If lab personnel feel ill-prepared or uncomfortable cleaning up the spill, contact the Office of Research Safety (ORS) for assistance. If the spill occurs outside of normal business hours, dialing 911 will reach UGA dispatch and they will then contact the ORS on-call personnel.

- Most incidental spills of flammable liquids, caustic solutions, and some toxic solutions can be absorbed utilizing an inert absorbent or absorbent pads.
• Incidental spills of strong acids may be absorbed and then neutralized with an aqueous solution of sodium bicarbonate or sodium carbonate. **NOTE:** Any spill of hydrofluoric acid should be reported to the Office of Research Safety and an attempt to clean up the spill should only be done by personnel familiar with proper neutralization techniques for hydrofluoric acid.

• For mercury spills from broken equipment in which the volume is less than 25mL (e.g., a mercury thermometer), laboratories can utilize a mercury spill kit to clean the mercury beads. Any mercury spill larger than 25mL or a mercury spill in a lab that does not have a mercury spill kit, should be reported to ORS. For information on how to purchase a mercury spill kit, please contact ORS.

• Spills of solid substances that are toxic should be cleaned using dampened absorbent pads (**NOTE:** if the substance is water reactive, the use of dampened absorbents is not recommended; contact ORS for assistance). Avoid using brushes or brooms to clean up solid spills of toxic material as these can generate airborne particles, making laboratory personnel susceptible to inhalation hazards.

• Any materials and disposable PPE used during the cleanup of a spill should be disposed of as hazardous waste. Gather all spent materials together, properly label them as hazardous waste, and set aside in the laboratory’s satellite accumulation area. For assistance with labeling and with pickup, please contact the Environmental Safety Division.

### III. Major Spills

For the purposes of this document, a **major** spill is defined as a spill that meets any of the following criteria:

• A spill or release of a hazardous substance or mixture which may cause high levels of exposure to toxic or corrosive substances.

• A spill or release that requires the evacuation of an area and/or poses conditions that, in the discretion of the PI or lab supervisor, creates a situation that is immediately dangerous to life and health.

• A spill or release that creates a fire or explosion hazard.

• A spill or release in which lab personnel have either been exposed to a hazardous substance or injured so as to require more than basic first aid or in which damage to university property has occurred.

• A spill or release of a hazardous substance or mixture as defined by GHS that has resulted in a discharge to the sewer system.

• Any other spill which lab personnel do not feel comfortable cleaning up without assistance.

For any major spill, laboratory personnel should not attempt to clean up the spill and should contact the Office of Research Safety as soon as possible. If the spill occurs outside of normal business hours, dialing 911 will reach UGA dispatch who will then contact the ORS on-call personnel.

### IV. Additional Considerations

*Spill Control Guidelines | 2*
The principal investigator must ensure that all serious injuries requiring medical attention be reported by calling 911. All incidents that result in an injury to students, visitors, staff, or faculty must report the injury by following the Supervisor’s Guide to the Worker’s Compensation Process made available by UGA Human Resources.

Proper first aid for a chemical exposure or chemical related injury will be highly dependent upon the type of chemical to which personnel have been exposed. Please contact ORS and consult the SDS for the specific substance for guidance regarding appropriate first aid procedures in the event of an injury or exposure.

All laboratories that handle hazardous chemicals shall have an appropriate supply of spill cleanup supplies prominently displayed or with the kit’s location clearly posted. Additionally, new lab personnel should be familiarized with the location of any spill kit as part of their orientation and training by the Principal Investigator or lab manager. The supply must be capable of containing or cleaning up incidental spills and limiting the spread of major spills if feasible. Laboratory personnel should not attempt to clean up a spill of hazardous chemicals if appropriate spill cleanup supplies and protective equipment are not available, or if the spill would be considered major based on the criteria within this SOP. In these cases, contact the Office of Research Safety for assistance.

V. Contacts
Environmental Safety Division: 706-542-5801
Office of Research Safety: 706-542-5288

VI. References

UC, Center for Laboratory Safety

Asphyxiant Gases
Version: July 2020

Potential asphyxiants are compressed gases that have the potential to displace a large enough amount of oxygen in the event of a release, that breathing becomes difficult or impossible. These become particularly hazardous in smaller or poorly ventilated spaces.

Examples of common asphyxiant gases include carbon dioxide and noble gases such as Argon or Helium.

Personal Protective Equipment & Personnel Monitoring

- **Lab Coat**: Traditional white lab coat.
- **Gloves**: Nitrile gloves
- **Eye Protection**: ANSI Z87.1-compliant safety glasses or safety goggles.

Labeling & Storage

Store upright in a cool, dry location.

Compressed gas cylinders should be individually anchored to a stable structure such as a wall with a chain or strap approximately ½ to ¾ of the way up the cylinder. Additionally, cylinders should be tagged as full, in-use, or empty. Untagged cylinders are assumed to be full. Cylinders not in use should have regulators removed and safety caps in place.

Engineering Controls, Equipment & Materials

- **Fume Hood**: Typically a fume hood is not feasible or necessary for the handling of these materials. If you have a question about a lab-specific protocol or procedure involving the use of asphyxiant gases and proper engineering controls, please contact the Office of Research Safety at 706-542-5288.

First Aid & Emergencies

- **Skin or Eye Contact**: Remove contaminated clothing and accessories; flush affected area with water. If symptoms persist, get medical attention.
- **Inhalation**: Move person into fresh air. If symptoms persist, get medical attention.
Contacts

Office of Research Safety: 706-542-5288
Environmental Safety Division: 706-542-5801
Corrosive flammables are materials that can cause injury to exposed tissues and are defined by the National Fire Protection Agency (NFPA) as having a flashpoint below 100°F (37.8°C). Examples include: acetic acid, triethylamine, and N,N,N’,N’-tetramethylethylenediamine (TEMED or TMEDA).

For more information on each individual hazard type, please refer to the respective ‘single hazard’ SOP.

Personal Protective Equipment & Personnel Monitoring

- **Lab Coat**: Traditional lab coat or flame resistant lab coat or a chemical-resistant lab apron.
- **Gloves**: Nitrile or neoprene gloves. Consult glove selection chart for heavy handling of corrosives.
- **Eye Protection**: ANSI Z87.1-compliant safety glasses or safety goggles, or face shield if a splash hazard is present.
- **Face Shield**: Do not wear latex gloves.

Labeling & Storage

Corrosive flammables should be stored in a flammable storage cabinet with self-closing hinges or in a refrigerator rated for flammable storage, particularly if in the liquid phase. There are limitations on the maximum allowable volume of flammable liquids in a laboratory as well (these limitations vary; for an assessment, please contact the Office of Research Safety at 706-542-5288). Keep corrosive flammables away from oxidizers, and incompatible corrosives (e.g. segregate acids and bases). Always store liquid concentrated acids and bases in chemically-resistant secondary containers (e.g. polypropylene trays or tubs). Containers holding corrosives must be stored below eye level.

Engineering Controls, Equipment & Materials

- **Fume Hood**: Use a fume hood to keep exposure to corrosives as low as possible. If the use of a fume hood is impossible or impractical, please contact the Office of Research Safety (ORS) to determine whether additional respiratory protection is required.
Housekeeping

Spills
Keep acid and/or base neutralizer in your spill kit to use or provide to the Office of Research Safety during spill cleanup. Notify others in the area of the spill, including your supervisor. Laboratory personnel should refer to the Spill Control Guidelines document for additional information.

Decontamination
Decontamination methods vary based on the materials handled and equipment being used. Please review the chemical Safety Data Sheet for guidance on cleaning materials.

Waste
Any waste from this chemical class should be disposed of through the UGA Hazardous Waste Program. For assistance with arranging a waste pickup, you may contact the Environmental Safety Division (ESD) at 706-542-5801. Prior to pickup, any container used to hold hazardous waste should be labeled with the following:

- “Hazardous Waste”
- Chemical contents: Enough detail should be provided so that the full contents of the container are readily apparent. Labeling may include any of the following:
  - Percentages (Ex: 70% water, 30% hydrochloric acid)
  - Volumes (Ex: 1L of acetone, 500mL of water)
  - Chemical classes (Ex: halogenated solvents)
  - Method (Ex: EPA 515.1 Herbicide Extraction Solvent Waste)
  - Referenced Log (Ex: See Laboratory Waste Log, Volume 2)
  - Utilizing Chematix waste profiles
  - Any other labeling method providing enough detail to accomplish this requirement
- One or more of the following waste characteristics recognized by EPA: Ignitable, Corrosive, Reactive, or Toxic.
**First Aid & Emergencies**

**Fire**
Use a dry chemical or CO2 extinguisher (ABC or BC) to put out a small fire.

**Skin or Eye Contact**
Remove contaminated clothing and accessories; flush affected area with plenty of water. If symptoms persist, get medical attention.

**Inhalation**
Move the affected person into an area with fresh air. If symptoms persist, get medical attention.

**Ingestion**
Rinse mouth with plenty of water. If symptoms persist, get medical attention.

**References**

Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, 2011

UC Center for Laboratory Safety

**Contacts**

Office of Research Safety: 706-542-5288
Environmental Safety Division: 706-542-5801
**Corrosives**

Version: May 2020

**Corrosives** are materials that cause injury to exposed tissues. They are available as solids, pure liquids, solutions, or gases. Strong corrosive solutions typically have a pH <2.5 (acids) or >11 (bases), and include inorganic or organic substances dissolved in water. Corrosives cause damage either through the generation of hydronium (H$_3$O$^+$) or hydroxide (OH$^-$) ions in solution, reaction with skin and eye moisture to generate these same ions, or by damaging cell membranes through lipophilic action (e.g. certain detergents). All corrosives can cause serious eye damage or skin burns in the event of an exposure.

Chemicals covered by this SOP **do not** include corrosives with additional hazardous properties (e.g. oxidizing acids or corrosive flammables)

### Personal Protective Equipment & Personnel Monitoring

- **Lab Coat**
  - Traditional white lab coat and chemical-resistant apron when working with large volumes.

- **Gloves**
  - Nitrile or neoprene gloves.
  - Consult glove selection chart for heavy handling of corrosives.

- **Eye Protection**
  - ANSI Z87.1-compliant safety glasses or safety goggles, or face shield if a splash hazard is present.

- **Face Shield**
  - Do not wear latex gloves.

### Labeling & Storage

Store upright & tightly closed in a dry and well-ventilated place. Keep away from incompatible materials (e.g. segregate acids and bases). Consult the safety data sheet for additional storage compatibility information. Always store liquid acids and bases in chemically-resistant secondary containers (e.g. polypropylene trays or tubs). Containers holding corrosives must be stored below eye level. Under most circumstances, it is not recommended to store strong corrosives in metal cabinets, particularly if they are not ventilated (e.g. flammables cabinets). Over time such storage will corrode these cabinets due to vapor buildup and inadvertent leaks.

### Engineering Controls, Equipment, & Materials

- **Fume Hood**
  - Use a fume hood to keep exposure to corrosives as low as possible. If the use of a fume hood is impossible or impractical, please contact the Office of Research Safety (ORS) to determine whether additional respiratory protection is required.
**Spills**

Keep acid and/or base neutralizer (e.g. sodium bicarbonate and/or citric acid) in your spill kit. Notify others in the area of the spill, including your supervisor. Laboratory personnel should refer to the Spill Control Guidelines document for additional information.

**Decontamination**

Absorb any corrosive chemicals with absorbent material from the lab’s spill kit and dispose of contaminated absorbent material as hazardous waste.

Any waste from this chemical class should be disposed of through the UGA Hazardous Waste Program. For assistance with arranging a waste pickup, you may contact the Environmental Safety Division (ESD) at 706-542-5801. Prior to pickup, any container used to hold hazardous waste should be labeled with the following:

- “Hazardous Waste”
- Chemical contents: Enough detail should be provided so that the full contents of the container are readily apparent. Labeling may include any of the following:
  - Percentages (Ex: 70% water, 30% hydrochloric acid)
  - Volumes (Ex: 1L of acetone, 500mL of water)
  - Chemical classes (Ex: halogenated solvents)
  - Method (Ex: EPA 515.1 Herbicide Extraction Solvent Waste)
  - Referenced Log (Ex: See Laboratory Waste Log, Volume 2)
  - Utilizing Chematix waste profiles
  - Any other labeling method providing enough detail to accomplish this requirement
    - One or more of the following waste characteristics recognized by EPA: Ignitable, Corrosive, Reactive, or Toxic.

**Waste**

**First Aid & Emergencies**

**Skin or Eye Contact**

Remove contaminated clothing and accessories; flush affected area with a large volume of water. Get medical attention.

**Inhalation**

Move the affected person to an area with fresh air. Get medical attention.
Ingestion

Rinse mouth repeatedly with water. Get medical attention.

References

Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, 2011

UC Center for Laboratory Safety

Contacts

Office of Research Safety: 706-542-5288
Environmental Safety Division: 706-542-5801
Cryogens

Version: January 2020

Cryogens are fluids that exist in the vapor phase above -73°C (-99°F) at an absolute pressure of 101.3 kPa (14.7 psi). They are handled, stored, and used in the liquid state at or below -73°C (-99°F) while at any pressure. Additionally, they can displace oxygen creating a hazardous atmosphere in small or poorly ventilated areas. A common cryogen is liquid nitrogen.

Personal Protective Equipment & Personnel Monitoring

- **Lab Coat**: Traditional white lab coat.
- **Gloves**: Insulated cryo-gloves
- **Eye Protection**: ANSI Z87.1-compliant safety glasses or safety goggles.

Labeling & Storage

Containers of cryogens should be stored in a cool, dry location with no carpet or with an impermeable barrier between the container and the carpet. If a large volume of cryogens is stored in a small or poorly ventilated area, an oxygen sensor may be needed. Please contact the Office of Research Safety for additional information.

Pressure relief valves on cryogen containers should not be closed or blocked. Doing so can result in a dangerous buildup of pressure. Periodic off gassing from the relief value is a normal function.

Cryogens should not be disposed of by pouring down a sink. Doing so can destroy the sink and the plumbing system. Small amounts of cryogens can be allowed to evaporate at room temperature, preferably under a fume hood or some other type of localized ventilation control.

Engineering Controls, Equipment & Materials

Typically, a fume hood is not necessary for the handling of cryogenic materials. However, cryogens can displace oxygen, so having an oxygen monitor present in the space is advisable if the room is small or poorly ventilated and containers of cryogenic liquids have to be used or stored outside of any engineering controls such as a fume hood. If you have a question about a lab-specific protocol or procedure involving the use of cryogens and proper engineering controls, please contact the Office of Research Safety at 706-542-5288.

First Aid & Emergencies

- **Skin or Eye Contact**: Remove contaminated clothing and accessories and flush affected area with lukewarm water. Get medical attention.
- **Inhalation**: Move affected person to an area with fresh air. Get medical attention.
References

Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, 2011

University of California – Center for Laboratory Safety

Contacts

Office of Research Safety: 706-542-5288
Environmental Safety Division: 706-542-5801
Explosives
Version: March 2020

Explosives are liquid or solid materials that can undergo a sudden release of pressure, gas, and heat when subjected to an initiating mechanism such as friction, impact, catalysts, light, or heat. Examples include: nitrocellulose, dibenzoyl peroxide, picrate salts, and most ‘trinitro-‘ compounds. Chemicals covered by this SOP do not include peroxide-forming chemicals.

Personal Protective Equipment & Personnel Monitoring

Flame resistant lab coat. Nitrile or neoprene gloves. ANSI Z87.1-compliant safety goggles and face shields. Consider using a blast shield for extra protection.

Labeling & Storage

Store at the manufacturer’s recommended temperature in an explosion-proof refrigerator/freezer or an explosion-proof cabinet that does not contain flammables or chemically incompatible materials. Keep away from heat, light, and any potential initiating mechanisms.

Engineering Controls, Equipment & Materials

Fume Hood Work in a chemical fume hood, glove box, or dry box whenever possible. For fume hoods, keep the sash at the lowest practical height while working, and close the sash when the fume hood is not in use.

Blast Shield When working with explosives the use of a portable blast shield inside the fume hood is highly recommended.

Cautions and Considerations

Before working with any potentially explosive chemicals, determine the initiating mechanism that could lead to an explosion: friction, impact, catalysts, light, or heat. Refer to the chemical safety data sheets (SDS) for this information. Also consider working with equipment that cannot generate static electricity or sparks.
Administrative Controls

When working with potentially explosive compounds, avoid changing approved protocol parameters by adjusting reagent concentrations, volumes, environmental conditions, or designed supplies, equipment, and instrumentation. If changes are necessary, protocol modifications must be formally approved by the Principal Investigator prior to the onset of new conditions.

Housekeeping

Spills

Notify others in the area of the spill, including your supervisor. Remove sources of ignition if possible. Laboratory personnel should refer to the Spill Control Guidelines for additional information.

Decontamination

Decontamination methods vary based on the materials handled and equipment being used. Please review the chemical Safety Data Sheet for guidance on cleaning materials.

Waste

Any waste from this chemical class should be disposed of through the UGA Hazardous Waste Program. For assistance with arranging a waste pickup, you may contact the Environmental Safety Division (ESD) at 706-542-5801. Prior to pickup, any container used to hold hazardous waste should be labeled with the following:

- “Hazardous Waste”

- Chemical contents: Enough detail should be provided so that the full contents of the container are readily apparent. Labeling may include any of the following:

  - Percentages (Ex: 70% water, 30% hydrochloric acid)
  - Volumes (Ex: 1L of acetone, 500mL of water)
  - Chemical classes (Ex: halogenated solvents)
  - Method (Ex: EPA 515.1 Herbicide Extraction Solvent Waste)
  - Referenced Log (Ex: See Laboratory Waste Log, Volume 2)
  - Utilizing Chematix waste profiles
  - Any other labeling method providing enough detail to
accomplish this requirement
- One or more of the following waste characteristics recognized by EPA: Ignitable, Corrosive, Reactive, or Toxic.

### First Aid & Emergencies

**Fire**
Use a dry chemical or CO2 extinguisher (ABC or BC) to put out a small fire.

**Skin or Eye Contact**
Remove contaminated clothing and accessories; flush affected area with water. If symptoms persist, get medical attention.

**Inhalation**
Move person into fresh air. If symptoms persist, get medical attention.

**Ingestion**
Rinse mouth with water. If symptoms persist, get medical attention.

### References

Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, 2011

### Contacts

Office of Research Safety: 706-542-5288
Environmental Safety Division: 706-542-5801
Flammable gases are any substance that exists in the gaseous state at normal atmospheric temperature and pressure and are capable of being ignited and burned when mixed with the proper proportions of air, oxygen or other oxidizers.

Examples of flammable gases include Acetylene and Hydrogen.

### Personal Protective Equipment & Personnel Monitoring

- **Lab Coat**: Flame resistant lab coat.
- **Gloves**: For proper glove selection, review the chemical safety data sheet and consult glove manufacturer recommendations with your PI or supervisor.
- **Eye Protection**: ANSI Z87.1-compliant safety glasses or safety goggles.

### Labeling & Storage

Store flammable gases away from oxidizing materials. Fire code requires that cylinders of flammable gases in storage be separated from oxidizing gas cylinders or other oxidizing materials by a minimum distance of 20 feet unless separated by a noncombustible barrier at least five feet high and with a fire resistance rating of at least one-half hour.

Compressed gas cylinders should be individually anchored to a stable structure such as a wall with a chain or strap approximately ¼ to ½ of the way up the cylinder. Additionally, cylinders should be tagged as full, in-use, or empty. Untagged cylinders are assumed to be full. Cylinders not in use should have regulators removed and safety caps in place.

### Engineering Controls, Equipment & Materials

**Fume Hood**: Typically a fume hood is not feasible for the handling of these materials. If you have a question about a lab-specific protocol or procedure involving the use of flammable gases and proper engineering controls, please contact the Office of Research Safety at 706-542-5288.
Cautions & Considerations

Static Electricity
There have been cases of static buildup igniting cylinders of flammable gases. Consequently, use spark proof equipment to attach or disconnect regulators and consider using an intrinsically safe pressure-gauge should your protocol require it.

Leaks
In the event that there is a potential leak coming from the gas cylinder do not try to make any self-repairs. Clear the room and call 911 and the Office of Research Safety at 706-542-5288.

First Aid & Emergencies

Fire
Do not attempt to extinguish a leaking gas fire unless the leak can be stopped. Use a dry chemical or CO₂ extinguisher (ABC or BC). If the fire is beyond the capabilities of the lab, evacuate the area and contact 911. Stay near the scene to answer questions once first responders arrive.

Skin or Eye Contact
Remove contaminated clothing and accessories; flush affected area with water. If symptoms persist, get medical attention.

Inhalation
Move the affected person to an area with fresh air. If symptoms persist, get medical attention.

References


Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, 2011

Contacts

Office of Research Safety: 706-542-5288
Environmental Safety Division: 706-542-5801
A flammable liquid is defined by the National Fire Protection Agency (NFPA) as having a flashpoint below 100°F (37.8°C). The flashpoint is the lowest temperature at which a material can form an ignitable mixture with air and produce a flame when an ignition source is present. The lower the flashpoint, the more easily the liquid can be ignited.

**Personal Protective Equipment & Personnel Monitoring**

Standard lab coats are required. Flame resistant lab coats should be considered when handling flammable liquids and other hazardous materials that are easily ignited.

Nitrile or neoprene gloves typically provide adequate protection against minor splashes. Consult with your PI or supervisor to determine whether any materials involved in your process require alternative hand protection.

ANSI Z87.1 - Compliant safety glasses or safety goggles if a splash hazard is present.

**Labeling & Storage**

1. Flammable liquids should be stored in a flammable storage cabinet with self-closing hinges or in a refrigerator/freezer rated for flammable storage. These refrigerators and freezers have a spark-proof interior that separates the contents from the compressor and motor, preventing ignition of flammable vapors inside the storage compartment. Storage of flammable liquids in refrigerators/freezers not specifically designed and approved for that use shall be strictly prohibited.

2. Flammable liquids should be kept away from oxidizers, and incompatible corrosives.

3. It is recommended the total amount of flammable and combustible liquids, including waste, in research laboratories shall not exceed the quantities presented below:
   - 20 gallons of flammable liquids per 100 ft² of laboratory unit.
- 120 gallons of flammable liquids in a single laboratory unit.
- Up to 35 gallons of flammable liquids outside flammable storage cabinet. Of this amount, 25 gallons must be contained in 2 gallon or smaller approved safety cans. Chemical quantities outside of storage shall be maintained at the lowest possible level necessary for the work performed.
- Quantities recommended within an instructional laboratory unit shall be limited to 50% of the quantities recommended for research laboratory units.

*These limitations vary; for an assessment, please contact the Office of Research Safety at 706-542-5288.*

### Engineering Controls, Equipment & Materials

#### Fume Hood
It is advisable to use a fume hood when working with these materials. If the use of a fume hood is impossible or impractical, please contact the Office of Research Safety (ORS) to determine whether additional respiratory protection is required.

#### Cautions & Considerations

#### Static Electricity
When transferring flammable liquids between containers greater than 4L (1 gallon) containers should be grounded, and the source container should be bonded to the receiving container during transfer. If possible, transfer flammable chemicals from glass containers to glassware or from glass container/glassware to plastic. Transferring these types of chemicals between plastic containers or unbonded metal containers may lead to a fire hazard due to static electricity.

#### Housekeeping

#### Spills
Notify others in the area of the spill, including your supervisor. Remove sources of ignition if possible. Laboratory personnel should refer to the Spill Control Guidelines for additional information.

#### Decontamination
Decontamination methods vary based on the materials handled and equipment being used. Please review the chemical Safety Data Sheet for guidance on cleaning materials.
Any waste from this chemical class should be disposed of through the UGA Hazardous Waste Program. For assistance with arranging a waste pickup, you may contact the Environmental Safety Division (ESD) at 706-542-5801. Prior to pickup, any container used to hold hazardous waste should be labeled with the following:

- “Hazardous Waste”
- Chemical contents: Enough detail should be provided so that the full contents of the container are readily apparent. Labeling may include any of the following:
  
  - Percentages (Ex: 70% water, 30% hydrochloric acid)
  - Volumes (Ex: 1L of acetone, 500mL of water)
  - Chemical classes (Ex: halogenated solvents)
  - Method (Ex: EPA 515.1 Herbicide Extraction Solvent Waste)
  - Referenced Log (Ex: See Laboratory Waste Log, Volume 2)
  - Utilizing Chematix waste profiles
  - Any other labeling method providing enough detail to accomplish this requirement
  - One or more of the following waste characteristics recognized by EPA: Ignitable, Corrosive, Reactive, or Toxic.

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**First Aid & Emergencies**

**Fire**

Use a dry chemical or CO₂ extinguisher (ABC or BC) to put out a small fire.

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**Skin | Eye Contact**

Remove contaminated clothing and accessories; flush affected area with water.

If symptoms persist, get medical attention.

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**Inhalation**

Move person into fresh air. If symptoms persist, get medical attention.

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**Ingestion**

Rinse mouth with water. If symptoms persist, get medical attention.
Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, 2011


Contacts

Office of Research Safety: 706-542-5288
Environmental Safety Division: 706-542-5801
A flammable solid is defined as a solid which is readily combustible or which may cause or contribute to fire through friction. They can be powdered, granular, or pasty chemicals which can be ignited after brief contact with an ignition source and if the flame spreads rapidly.

Examples include paraformaldehyde and cerium powder.

**Personal Protective Equipment & Personnel Monitoring**

- **Lab Coat**: Standard lab coats are required. Flame resistant lab coats should be considered if handling large amounts.

- **Gloves**: Nitrile gloves typically provide adequate protection. Consult with your PI or supervisor to determine whether any materials involved in your process require alternative hand protection.

- **Eye Protection**: ANSI Z87.1-compliant safety glasses or safety goggles.

**Labeling & Storage**

Flammable solids should be stored in a cool, dry location and separated from oxidizers and incompatible corrosives. It is advisable to keep them in a flammables cabinet or in a refrigerator rated for flammables storage.

**Engineering Controls, Equipment & Materials**

- **Fume Hood**: It is advisable to use a fume hood when working with these materials. If the use of a fume hood is impossible or impractical, please contact the Office of Research Safety (ORS) to determine whether additional respiratory protection is required.
Housekeeping

| Spills | Notify others in the area of the spill, including your supervisor. Eliminate all ignition sources and clean using spark proof tools. Laboratory personnel should refer to the Spill Control Guidelines document for additional information. |
| Decontamination | Decontamination methods vary based on the materials handled and equipment being used. Please review the chemical Safety Data Sheet for guidance on cleaning materials. |

Waste

Any waste from this chemical class should be disposed of through the UGA Hazardous Waste Program. For assistance with arranging a waste pickup, you may contact the Environmental Safety Division (ESD) at 706-542-5801. Prior to pickup, any container used to hold hazardous waste should be labeled with the following:

- "Hazardous Waste"
- Chemical contents: Enough detail should be provided so that the full contents of the container are readily apparent. Labeling may include any of the following:
  - Percentages (Ex: 70% water, 30% hydrochloric acid)
  - Volumes (Ex: 1L of acetone, 500mL of water)
  - Chemical classes (Ex: halogenated solvents)
  - Method (Ex: EPA 515.1 Herbicide Extraction Solvent Waste)
  - Referenced Log (Ex: See Laboratory Waste Log, Volume 2)
  - Utilizing Chematix waste profiles
  - Any other labeling method providing enough detail to accomplish this requirement
  - One or more of the following waste characteristics recognized by EPA: Ignitable, Corrosive, Reactive, or Toxic.
**First Aid & Emergencies**

**Fire**
Use a dry chemical or CO₂ extinguisher (ABC or BC) to put out a small fire.

**Skin or Eye Contact**
First aid measures will vary greatly based on the individual chemicals hazard properties. Consult the specific chemical’s manufacturer’s SDS and, when necessary, a medical professional for the appropriate first aid procedures.

**Inhalation**
Move person into fresh air. If symptoms persist, get medical attention.

**Ingestion**
First aid measures will vary greatly based on the individual chemicals hazard properties. Consult the specific chemical’s manufacturer’s SDS and, when necessary, a medical professional for the appropriate first aid procedures.

**References**


**Contacts**

Office of Research Safety: 706-542-5288
Environmental Safety Division: 706-542-5801
General Chemicals – Non Reactive

This is a broad class of chemicals that generally present no hazards beyond perhaps minor contact irritation or mild allergic reaction in sensitive populations. These include common salts like sodium chloride or sugars such as sucrose.

Personal Protective Equipment & Personnel Monitoring

- **Lab Coat**: Traditional white lab coat.
- **Gloves**: Nitrile gloves are sufficient.
- **Eye Protection**: ANSI Z87.1 - Compliant safety glasses

Labeling & Storage

Store in a cool dry away from incompatible substances and preferably away from any hazardous materials to avoid inadvertent contact. Consult the safety data sheet for additional storage compatibility information.

Engineering Controls, Equipment & Materials

- **Fume Hood**: Generally, nothing more than adequate laboratory ventilation is needed. If you are concerned that your lab is not appropriately ventilated, contact the Office of Research Safety (ORS) to determine whether additional respiratory protection is warranted.

Housekeeping

- **Spills**: Spills of these kinds of material can typically be swept up or cleaned with absorbent materials. If there is any concern about the material being hazardous, please contact ESD (706-542-5801) to request a waste characterization. Notify others in the area of the spill, including your supervisor. Any exposure resulting in the need for medical attention must be reported to ORS at 706-542-5288.

- **Decontamination**: Once any standing material has been wiped away, clean contaminated surfaces with soap and water.

Waste

Many chemicals within this class would not meet the criteria to be classified as a hazardous waste by EPA. However, they may become mixed with other chemicals over the course of general laboratory work that would then make them part of a hazardous waste stream. For assistance with performing a waste characterization or arranging a waste pickup, you may contact the Environmental Safety Division (ESD) at 706-542-5801. Prior to pickup, any container used to hold hazardous waste should be labeled with the following:

- “Hazardous Waste”
- Chemical contents: Enough detail should be provided so that the full contents of the container are readily apparent. Labeling may include any of the following:
  
  - Percentages (Ex: 70% water, 30% hydrochloric acid)
  - Volumes (Ex: 1L of acetone, 500mL of water)
  - Chemical classes (Ex: halogenated solvents)
  - Method (Ex: EPA 515.1 Herbicide Extraction Solvent Waste)
  - Referenced Log (Ex: See Laboratory Waste Log, Volume 2)
  - Utilizing Chematix waste profiles
  - Any other labeling method providing enough detail to accomplish this requirement

- One or more of the following waste characteristics recognized by EPA: Ignitable, Corrosive, Reactive, or Toxic.

First Aid & Emergencies

**Skin or Eye Contact**
Remove contaminated clothing and accessories, flush affected area with water. If symptoms persist, get medical attention.

**Inhalation**
Move person into fresh air. If symptoms persist, get medical attention.

**Ingestion**
Rinse mouth with water. If symptoms persist, get medical attention.

Contacts

Office of Research Safety: 706-542-5288
Environmental Safety Division: 706-542-5801
Oxidizing chemicals are liquid or solid materials that promote combustion. They may spontaneously give off oxygen at room temperature or with slight heating. Strong oxidizers are capable of forming explosive mixtures when mixed with combustible, organic or easily oxidized materials. Examples include concentrated hydrogen peroxide, permanganates, chromates, and chlorates.

### Personal Protective Equipment & Personnel Monitoring

**Lab Coat**
Regular lab coat. A flame resistant lab coat is recommended if working with oxidizers in close proximity with flammable materials.

**Gloves**
Neoprene or butyl rubber gloves typically provide adequate protection against minor splashes. Consult with your PI or supervisor to determine whether any materials involved in your process require alternative hand protection.

**Eye Protection**
ANSI Z87.1-compliant safety glasses or safety goggles if a splash hazard is present.

### Labeling & Storage

Store away from organics, flammables, reducing agents, and any other materials that may be chemically incompatible. **Do not** store oxidizers in untreated wooden cabinets. It is a best practice to segregate oxidizers from all other chemical classes because of their high reactivity potential with a broad range of chemicals. Consult the safety data sheet for additional storage compatibility information.

### Engineering Controls, Equipment & Materials

**Fume Hood**
At a minimum, adequate general laboratory ventilation must be provided to maintain exposure below any regulatory limits. Use of a fume hood is recommended. If you are concerned that your lab is not appropriately ventilated, contact the Office of Research Safety (ORS) to determine whether additional respiratory protection is warranted.
# Housekeeping

## Spills

Most spills of oxidizers can be cleaned up using non-combustible absorbents and disposed of as hazardous waste. Laboratory personnel should refer to the Spill Control Guidelines document for additional information.

## Decontamination

Once any standing material has been wiped away, clean contaminated surfaces with soap and water. Dispose of contaminated paper towels as solid hazardous waste.

## Waste

Any waste from this chemical class should be disposed of through the UGA Hazardous Waste Program. For assistance with arranging a waste pickup, you may contact the Environmental Safety Division (ESD) at 706-542-5801. Prior to pickup, any container used to hold hazardous waste should be labeled with the following:

- "Hazardous Waste"
- Chemical contents: Enough detail should be provided so that the full contents of the container are readily apparent. Labeling may include any of the following:
  - Percentages (Ex: 70% water, 30% hydrochloric acid)
  - Volumes (Ex: 1L of acetone, 500mL of water)
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  - Utilizing Chematix waste profiles
  - Any other labeling method providing enough detail to accomplish this requirement
  - One or more of the following waste characteristics recognized by EPA: Ignitable, Corrosive, Reactive, or Toxic.

# First Aid & Emergencies

## Skin or Eye Contact

Remove contaminated clothing and accessories; flush affected area with water. If symptoms persist, get medical attention.
Inhalation  Move person into fresh air. If symptoms persist, get medical attention.
Ingestion  Rinse mouth with water. If symptoms persist, get medical attention.

References

Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, 2011

University of California – Center for Laboratory Safety

Contacts

Office of Research Safety: 706-542-5288
Environmental Safety Division: 706-542-5801
Oxidizing Corrosives

Oxidizing corrosives are materials that can contribute to combustion by acting as an oxygen source and can also cause destruction of exposed tissues. Examples of this type of substance include sodium peroxide, calcium hypochlorite, nitric acid, and perchloric acid.

Personal Protective Equipment & Personnel Monitoring

Traditional lab coat. A chemical-resistant lab apron should be used when handling large quantities.

Nitrile or neoprene gloves typically provide adequate protection against minor splashes. Consult glove selection chart for heavy handling of corrosives.

Do not wear latex gloves.

ANSI Z87.1-compliant safety glasses or safety goggles, or face shield if a splash hazard is present.

Labeling & Storage

Store upright & tightly closed in a dry and well-ventilated place, preferably a shelf or cabinet that is lined with corrosion-resistant material. Keep away from bases, organic materials, flammables, reducing agents, and any other incompatible chemicals. Do not store in wooden cabinets; storage in metal cabinets is acceptable if the cabinet is ventilated (e.g., a ventilated fume hood cabinet). Containers must be stored below eye level and in secondary containment if in a liquid phase.

Engineering Controls, Equipment & Materials

Ventilation

At a minimum, adequate general laboratory ventilation must be provided to maintain exposure below any regulatory limits. Use of a fume hood is expected when working with substances with corrosive vapors. If the use of a fume hood is impossible or impractical, please contact the Office of Research Safety (ORS) to determine whether additional respiratory protection is required.
Hot Digestions

Hot acid digestions using perchloric acid will need to be done in a specialized fume hood with wash down capabilities. Performing these digestions in a general purpose fume hood can create shock sensitive metal perchlorates in the ductwork and create explosion hazards.

Spills

Notify others in the area of the spill, including your supervisor. Laboratory personnel should refer to the Spill Control Guidelines document for additional information.

Decontamination

Decontamination methods vary based on the materials handled and equipment being used. Please review the chemical Safety Data Sheet for guidance on cleaning materials.

Waste

Any waste from this chemical class should be disposed of through the UGA Hazardous Waste Program. For assistance with arranging a waste pickup, you may contact the Environmental Safety Division (ESD) at 706-542-5801. Prior to pickup, any container used to hold hazardous waste should be labeled with the following:

- “Hazardous Waste”
- Chemical contents: Enough detail should be provided so that the full contents of the container are readily apparent. Labeling may include any of the following:
  - Percentages (Ex: 70% water, 30% hydrochloric acid)
  - Volumes (Ex: 1L of acetone, 500mL of water)
  - Chemical classes (Ex: halogenated solvents)
  - Method (Ex: EPA 515.1 Herbicide Extraction Solvent Waste)
  - Referenced Log (Ex: See Laboratory Waste Log, Volume 2)
  - Utilizing Chematix waste profiles
  - Any other labeling method providing enough detail to accomplish this requirement
- One or more of the following waste characteristics recognized by EPA: Ignitable, Corrosive, Reactive, or Toxic.
First Aid & Emergencies

**Skin or Eye Contact**  
Remove contaminated clothing and accessories; flush affected area with water. If symptoms persist, get medical attention.

**Inhalation**  
Move person into fresh air. If symptoms persist, get medical attention.

**Ingestion**  
Rinse mouth with water. If symptoms persist, get medical attention.

References

Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, 2011

University of California – Center for Laboratory Safety

Contacts

Office of Research Safety: 706-542-5288  
Environmental Safety Division: 706-542-5801
Oxidizing gases are gases which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does. These gases can react rapidly and violently with combustible materials or flammable vapors. Examples of oxidizing gases include halogens (especially chlorine), nitrous oxide, and oxygen.

### Personal Protective Equipment & Personnel Monitoring

- **Lab Coat**: Standard lab coats are required. Flame resistant lab coats should be considered when handling oxidizers around combustible substances.
- **Gloves**: For proper glove selection, review the chemical safety data sheet and consult glove manufacturer recommendations with your PI or supervisor.
- **Eye Protection**: ANSI Z87.1 - Compliant safety glasses or safety goggles.

### Labeling & Storage

Store oxidizing gases away from combustible materials, flammable gases, flammable and combustible liquids, finely-divided metals, and other easily oxidized substances such as hydrides, sulfur and sulfur compounds, silicon, and ammonia and amine compounds. Fire code requires that cylinders of oxidizing gases in storage be separated from fuel-gas cylinders or combustible materials by a minimum distance of 20 feet unless separated by a noncombustible barrier at least five feet high and with a fire resistance rating of least one-half hour.

Compressed gas cylinders should be individually anchored to a stable structure such as a wall with a chain or strap approximately ½ to ¾ of the way up the cylinder. Additionally, cylinders should be tagged as full, in-use, or empty. Untagged cylinders are assumed to be full. Cylinders not in use should have regulators removed and safety caps in place.
Fume Hood  Typically a fume hood is not necessary for the handling of oxygen, but could be necessary if handling halogens or nitrogen dioxide due to their dual hazard of being both oxidizing gases and toxic gases. If you have a question about a lab-specific protocol or procedure involving the use of oxidizing gases and proper engineering controls, please contact the Office of Research Safety at 706-542-5288.

First Aid & Emergencies

<table>
<thead>
<tr>
<th>Category</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire</td>
<td>Do not attempt to extinguish a leaking gas fire unless the leak can be stopped. Use a dry chemical or Class BC extinguisher. If the fire is beyond the capabilities of the lab, immediately evacuate the area and contact 911. Stay near the scene to answer questions once first responders arrive.</td>
</tr>
<tr>
<td>Skin or Eye Contact</td>
<td>Remove contaminated clothing and accessories; flush affected area with water. If symptoms persist, get medical attention.</td>
</tr>
<tr>
<td>Inhalation</td>
<td>Move person into fresh air. If symptoms persist, get medical attention.</td>
</tr>
</tbody>
</table>

References

- Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, 2011

Contacts

- Office of Research Safety: 706-542-5288
- Environmental Safety Division: 706-542-5801
Peroxide-forming chemicals (PFCs) are some of the most potentially hazardous substances handled in laboratories. PFCs are most often flammable organic liquids which are capable of forming potentially explosive R-O-O-R’ peroxide bonds (where R = organic group) upon exposure to air or oxidizing impurities. Peroxides formed in a chemical container are particularly likely to accumulate within the threads of the screw cap, and may explode when subjected to heat, light, friction or mechanical shock (e.g., unscrewing the cap).

It is particularly dangerous to allow these materials to evaporate to dryness, such as during distillation, leaving the crystals of peroxide on the surfaces of the container. In order to stabilize peroxide forming chemicals and to increase the permissible storage length, inhibitors are often added. 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. Distillation of solvents may act to concentrate peroxides to explosive levels and must not be carried out until the liquid has been tested and proven to be peroxide free. If you notice the formation of crystals on or within a solvent bottle:

- Do not move or open the container.
- Alert others in lab as to the potential hazard.
- Post a sign warning others not to disturb the container.
- Contact the ESD Hazardous Materials Group at (706) 542-5801 for disposal assistance.

Georgia Fire Code requires that all peroxide-forming chemicals be dated upon opening. UGA policy also dictates that these chemicals be dated upon receipt. Peroxide levels should be checked regularly and a log of test results maintained.

**Please note:** Peroxides may form on the surface of alkali metals and their amides (e.g., lithium, sodium amide). Since they are water reactive, standard peroxide tests should not be performed on these materials. Alkali metals & their amides should be purchased in small quantities and used up as soon as possible.

Types of compounds known to auto-oxidize to form peroxides:
- Aldehydes
- Ethers, especially cyclic ethers and those containing primary and secondary alkyl groups
- Compounds containing benzylic hydrogens
- Compounds containing allylic hydrogens (C=CCH), including most alkenes, vinyl and vinylidene compounds
- Compounds containing a tertiary CH group (e.g., decalin, 2,5-dimethylhexane)

### Personal Protective Equipment

<table>
<thead>
<tr>
<th>Lab Coat</th>
<th>Gloves</th>
<th>Eye Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard lab coats are required. Flame resistant lab coats should be considered when handling flammable liquids and other hazardous materials that are easily ignited.</td>
<td>Nitrile or chloroprene gloves typically provide adequate protection against minor splashes. Consult with your PI or supervisor to determine whether any materials involved in your process require alternative hand protection.</td>
<td>ANSI Z87.1 - Compliant safety glasses or safety goggles if a splash hazard is present.</td>
</tr>
</tbody>
</table>

### Labeling & Storage

PFCs should be stored in a flammable storage cabinet with self-closing hinges or in a refrigerator rated for flammable storage. All PFCs must be stored away from oxidizers and should be marked with receiving date and opening date. If the receiving and opening date is not known, promptly dispose of as hazardous waste. They should be managed in accordance with the following guidelines:

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

**Safe storage period:** If unopened from manufacturer, up to 18 months or stamped expiration date, if stored in accordance with manufacturer guidelines. After opening, chemicals with inhibitors should not be stored for longer than 12 months; chemicals without inhibitors should be discarded as hazardous waste as soon as possible after the container is opened.

<table>
<thead>
<tr>
<th>Acrylic acid</th>
<th>Methyl methacrylate</th>
<th>Vinyl acetylene</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acrylonitrile</td>
<td>Styrene</td>
<td>Vinyl chloride</td>
</tr>
<tr>
<td>Butadiene</td>
<td>Tetrafluoroethylene</td>
<td>Vinyl pyridine</td>
</tr>
</tbody>
</table>
Chloroprene  Vinyl acetate  Vinlylidene chloride
Chlorotrifluoroethylene

**Class II:** The following chemicals are a peroxide hazard upon concentration (distillation/evaporation).

**Safe Storage period:** If unopened from manufacturer, up to 18 months or stamped expiration date, if stored in accordance with manufacturer guidelines. After opening, materials should be discarded or evaluated for peroxides within **12 months** and every 6 months thereafter. If crystals are visible in the solvent or around the cap, call the ESD hazardous materials group (706) 542-5801 immediately to schedule removal of the container from lab.

<table>
<thead>
<tr>
<th>Acetal</th>
<th>Dicyclopentadiene</th>
<th>Isopropanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumene</td>
<td>Diethylene glycol dimethyl ether</td>
<td>Methyl acetylene</td>
</tr>
<tr>
<td>Cyclohexene</td>
<td>Diethyl ether</td>
<td>Methyl cyclopentane</td>
</tr>
<tr>
<td>Cyclooctene</td>
<td>Dioxane (p-dioxane)</td>
<td>Methyl -I-butyl ketone</td>
</tr>
<tr>
<td>Cyclopentene</td>
<td>Ethylene glycol dimethyl ether</td>
<td>Tetrahydrofuran</td>
</tr>
<tr>
<td>Diacetylene</td>
<td>Furan</td>
<td>Tetrahydronaphthalene</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vinyl ether</td>
</tr>
</tbody>
</table>

**Class III:** Peroxides derived from the following compounds may explode without concentration.

**Safe storage period:** If unopened from manufacturer, up to 18 months or stamped expiration date, if stored in accordance with manufacturer guidelines. After opening, it is recommended that these chemicals be discarded or evaluated for peroxides no more than **3 months** after opening.

<table>
<thead>
<tr>
<th>Organic</th>
<th>Inorganic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Divinyl ether</td>
<td>Potassium metal</td>
</tr>
<tr>
<td>Isopropyl ether</td>
<td>Potassium amide</td>
</tr>
<tr>
<td>Divinyl acetylene</td>
<td>Sodium amide (sodamide)</td>
</tr>
<tr>
<td>Vinlylidene chloride</td>
<td></td>
</tr>
</tbody>
</table>

**Peroxide Level Testing**

If test strips are to be employed to determine peroxide levels, they should cover the range from 0 – 100 ppm. The following peroxide levels should be used to determine activities that are deemed safe.

- **0-25 ppm** - Material is safe to use or distill.
- **26-99 ppm** - Material is safe to use, but should not be distilled.
- **Above 100 ppm** - Material should be disposed of and not used in lab.
If a peroxide-forming chemical is found to be more than one year out of date for either storage or testing (3 months out of date for opened Class III peroxide formers), notification will be sent to the PI of record for the laboratory via their laboratory inspection report. PIs will also be notified that they have two weeks to either (1) test the material and verify that peroxide levels are below 100 ppm, or (2) dispose of the material properly. Failure to comply with this request may result in the material being removed for disposal. If the receipt date or opening date cannot be determined, then testing is not recommended. Please dispose of as hazardous waste.

The laboratory must keep record of the dates, and the results obtained in the different tests, regardless of the method used to carry this out. Peroxide-forming chemical labels are available through the Office of Research Safety, and can be provided upon request.

### Engineering Controls, Equipment & Materials

**Fume Hood**

Use a fume hood to keep exposure as low as possible when using these chemicals. If your protocol does not permit the handling of such materials in a fume hood, contact the Office of Research Safety (ORS) to determine whether additional respiratory protection is warranted.

**Static Electricity**

When transferring flammable liquids between containers greater than 4L (1 gallon) containers should be grounded, and the source container should be bonded to the receiving container during transfer. If possible, transfer flammable chemicals from glass containers to glassware or from glass container/glassware to plastic. Transferring these types of chemicals between plastic containers or unbonded metal containers may lead to a fire hazard due to static electricity.

**Spills**

Please refer to Spill Control Guidelines for detailed information.
Decontamination

Once any standing material has been wiped away, clean contaminated surfaces with soap and water. Dispose of contaminated paper towels as solid hazardous waste.

Any waste from this chemical class should be disposed of through the UGA Hazardous Waste Program. For assistance with arranging a waste pickup, you may contact the Environmental Safety Division (ESD) at 706-542-5801. Prior to pickup, any container used to hold hazardous waste should be labeled with the following:

- “Hazardous Waste”
- Chemical contents: Enough detail should be provided so that the full contents of the container are readily apparent. Labeling may include any of the following:
  - Percentages (Ex: 70% water, 30% hydrochloric acid)
  - Volumes (Ex: 1L of acetone, 500mL of water)
  - Chemical classes (Ex: halogenated solvents)
  - Method (Ex: EPA 515.1 Herbicide Extraction Solvent Waste)
  - Referenced Log (Ex: See Laboratory Waste Log, Volume 2)
  - Utilizing Chematix waste profiles
  - Any other labeling method providing enough detail to accomplish this requirement
  - One or more of the following waste characteristics recognized by EPA: Ignitable, Corrosive, Reactive, or Toxic.

First Aid & Emergencies

Fire

Use a Class BC or CO₂ extinguisher to put out a small fire.

Skin | Eye Contact

Remove contaminated clothing and accessories; flush affected area with water.
If symptoms persist, get medical attention.

Inhalation

Move person into fresh air. If symptoms persist, get medical attention.
Ingestion  Rinse mouth with water. If symptoms persist, get medical attention.

References

Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, 2011


University of California – Center for Laboratory Safety

Contacts

Office of Research Safety: 706-542-5288
Environmental Safety Division: 706-542-5801
This SOP covers chemicals in a solid, liquid, or gas phase that pose a health risk to individuals upon exposure via four routes: ingestion, skin absorption, injection, and inhalation. With each route of exposure, the likelihood of injury depends on the toxicity of the chemical involved, the concentration of the material, and the duration of contact. Under the Globally Harmonized System (GHS), they are classified as Category 1, 2, 3 or 4 Acute Toxins.

Please note that the use of Category 1 or 2 Acute Toxins might require additional precautions and safeguards that are beyond the scope of this SOP. For more information, please contact the Office of Research Safety at 706-542-5288.

<table>
<thead>
<tr>
<th>Toxicity range</th>
<th>Oral (mg/kg body weight)</th>
<th>Dermal (mg/kg body weight)</th>
<th>Inhalation</th>
<th>Hazard statement</th>
<th>Pictogram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 1</td>
<td>0 &lt; LD_{50} ≤ 5</td>
<td>0 &lt; LD_{50} ≤ 50</td>
<td>0 &lt; LD_{50} ≤ 100</td>
<td>0 &lt; LD_{50} ≤ 0.5</td>
<td>Danger: Fatal if swallowed, or Fatal in contact with skin, or Fatal if inhaled.</td>
</tr>
<tr>
<td>Category 2</td>
<td>5 &lt; LD_{50} ≤ 50</td>
<td>50 &lt; LD_{50} ≤ 200</td>
<td>100 &lt; LD_{50} ≤ 500</td>
<td>0.5 &lt; LD_{50} ≤ 2.0</td>
<td>Danger: Fatal if swallowed, or Fatal in contact with skin, or Fatal if inhaled.</td>
</tr>
<tr>
<td>Category 3</td>
<td>50 &lt; LD_{50} ≤ 300</td>
<td>200 &lt; LD_{50} ≤ 1000</td>
<td>500 &lt; LD_{50} ≤ 2500</td>
<td>2.0 &lt; LD_{50} ≤ 10.0</td>
<td>Danger: Toxic if swallowed, or Toxic in contact with skin, or Toxic if inhaled.</td>
</tr>
<tr>
<td>Category 4</td>
<td>300 &lt; LD_{50} ≤ 2000</td>
<td>1000 &lt; LD_{50} ≤ 2000</td>
<td>2500 &lt; LD_{50} ≤ 20000</td>
<td>10.0 &lt; LD_{50} ≤ 20.0</td>
<td>Warning: Harmful if swallowed, or Harmful in contact with skin.</td>
</tr>
</tbody>
</table>

Harmful if inhaled.
Traditional lab coat or flame resistant lab coat when working with flammable materials. Nitrile or neoprene gloves typically provide adequate protection against minor splashes. Consult with your PI or supervisor to determine whether any materials involved in your process require alternative hand protection. ANSI Z87.1 - Compliant safety glasses, or safety goggles if a splash hazard is present.

Store upright & tightly closed away from materials that are not particularly hazardous or which may be incompatible. Each container holding one of these items should comply with OSHA/GHS regulations. It is recommended that storage locations holding these items be labeled as a storage location for poisons/toxins to avoid an accidental encounter.

For poisons and toxins in a compressed gas cylinder, the cylinders should be individually anchored to a stable structure such as a wall with a chain or strap approximately ½ to ¾ of the way up the cylinder. Additionally, cylinders should be tagged as full, in-use, or empty. Untagged cylinders are assumed to be full. Cylinders not in use should have regulators removed and safety caps in place. A gas detection system should be installed when feasible in order to quickly detect leaks.

Use of a fume hood when working with these substances is expected, particularly if the hazard is toxic by inhalation. If the use of a fume hood is impossible or impractical, please contact the Office of Research Safety (ORS) to determine whether additional respiratory protection is required. Respirators may be needed, particularly for sensitive populations.
Spills

Please refer to the Spill Control Guidelines for detailed information.

Decontamination

Decontamination methods vary based on the materials handled and equipment being used. Please review the chemical Safety Data Sheet for guidance on cleaning materials.

Any waste from this chemical class should be disposed of through the UGA Hazardous Waste Program. For assistance with arranging a waste pickup, you may contact the Environmental Safety Division (ESD) at 706-542-5801. Prior to pickup, any container used to hold hazardous waste should be labeled with the following:

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  - Volumes (Ex: 1L of acetone, 500mL of water)
  - Chemical classes (Ex: halogenated solvents)
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  - Referenced Log (Ex: See Laboratory Waste Log, Volume 2)
  - Utilizing Chematix waste profiles
  - Any other labeling method providing enough detail to accomplish this requirement
  - One or more of the following waste characteristics recognized by EPA: Ignitable, Corrosive, Reactive, or Toxic.

Waste

Skin Contact

Immediately remove contaminated clothing and shoes; flush skin with water for at least 15 minutes. Get medical attention immediately.
### Eye Contact
Check for and remove contact lenses. Immediately flush eyes with water for at least 15 minutes. Get medical attention immediately.

### Inhalation
Move affected person into fresh air. Get medical attention immediately.

### Ingestion
Get medical attention immediately.

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### Contacts

Office of Research Safety: 706-542-5288  
Environmental Safety Division: 706-542-5801  
Poison Control: 800-222-1222

### References

A pyrophoric material is defined by the National Fire Protection Agency (NFPA) as having an autoignition temperature below 130°F (55°C). A self-heating material is one which reacts with air, in the absence of external energy, to produce heat. Self-heating materials may ignite if stored in large quantities. These materials typically also react violently with water. Because of this, pyrophoric and self-heating materials must always be handled under inert atmosphere.

**Personal Protective Equipment & Personnel Monitoring**

- **Lab Coat**: Flame resistant lab coat.
- **Gloves**: Fire-resistant hand protection (e.g. chloroprene gloves over flame-resistant glove liners).
- **Eye Protection**: ANSI Z87.1-compliant safety glasses or safety goggles if a splash hazard is present.

**Labeling & Storage**

Store upright & tightly closed in a desiccator, a flammable storage cabinet, or in a refrigerator rated for flammable storage away from incompatible materials (e.g., strong oxidizers, strong corrosives, and water/aqueous solutions). These materials should not be stored near any water source such as a sink, safety shower, eyewash, or out in the open on a lab bench if the laboratory has sprinkler heads. Consult the safety data sheet for additional storage compatibility information. Many pyrophorics will come from the manufacturer in plastic bags or metal cans; it is best to keep the reagents inside of these secondary containers even when these materials are designated for a hazardous waste pickup.

**Engineering Controls, Equipment & Materials**

- **Glove Box**: Whenever possible, pyrophorics should be handled inside of a glove box.
- **Fume Hood**: If work must be done in a fume hood, a Schlenck line inside of a fume hood may be used to provide an inert atmosphere for working with pyrophorics.
### Housekeeping

<table>
<thead>
<tr>
<th>Spills</th>
<th>If pyrophoric materials spill in a glove box, quench the spilled material slowly with isopropanol. Absorb with a non-combustible absorbent, and dispose as hazardous waste.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>If pyrophoric materials spill outside of a glove box, please refer to the Spill Control Guidelines for detailed information</td>
</tr>
</tbody>
</table>

| Quenching     | Do not return unused pyrophoric materials to their original container. Unused pyrophoric materials must be quenched under inert atmosphere with adequate cooling by slowly adding first isopropanol, then methanol, then water. These materials must then be disposed of as hazardous waste. |

<table>
<thead>
<tr>
<th>Waste</th>
<th>Any waste from this chemical class should be disposed of through the UGA Hazardous Waste Program. For assistance with arranging a waste pickup, you may contact the Environmental Safety Division (ESD) at 706-542-5801. Prior to pickup, any container used to hold hazardous waste should be labeled with the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- “Hazardous Waste”</td>
</tr>
<tr>
<td></td>
<td>- Chemical contents: Enough detail should be provided so that the full contents of the container are readily apparent. Labeling may include any of the following:</td>
</tr>
<tr>
<td></td>
<td>- Percentages (Ex: 70% water, 30% hydrochloric acid)</td>
</tr>
<tr>
<td></td>
<td>- Volumes (Ex: 1L of acetone, 500mL of water)</td>
</tr>
<tr>
<td></td>
<td>- Chemical classes (Ex: halogenated solvents)</td>
</tr>
<tr>
<td></td>
<td>- Method (Ex: EPA 515.1 Herbicide Extraction Solvent Waste)</td>
</tr>
<tr>
<td></td>
<td>- Referenced Log (Ex: See Laboratory Waste Log, Volume 2)</td>
</tr>
<tr>
<td></td>
<td>- Utilizing Chematix waste profiles</td>
</tr>
<tr>
<td></td>
<td>- Any other labeling method providing enough detail to accomplish this requirement</td>
</tr>
<tr>
<td></td>
<td>- One or more of the following waste characteristics recognized by EPA: Ignitable, Corrosive, Reactive, or Toxic.</td>
</tr>
</tbody>
</table>
## First Aid & Emergencies

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fire</strong></td>
<td>DO NOT use water to put out fire. Instead use a dry chemical extinguisher (Class ABC or BC). Class D fire extinguishers may be necessary if working with certain metals.</td>
</tr>
<tr>
<td><strong>Skin or Eye Contact</strong></td>
<td>Remove contaminated clothing and accessories; flush affected area with water. If symptoms persist, get medical attention.</td>
</tr>
<tr>
<td><strong>Inhalation</strong></td>
<td>Move person into fresh air. Get medical attention.</td>
</tr>
<tr>
<td><strong>Ingestion</strong></td>
<td>Rinse mouth with water. Get medical attention.</td>
</tr>
</tbody>
</table>

## Contacts

Office of Research Safety: 706-542-5288  
Environmental Safety Division: 706-542-5801
Water reactive chemicals are materials that may react violently with aqueous solutions or atmospheric moisture to produce a flammable or toxic gas and heat. Typical gases produced are: H₂, CH₄ and other low molecular weight hydrocarbons.

**Labeling & Storage**

Store upright & tightly closed in a desiccator, glove box, or some other dry place away from water/humid environments, heat sources, and any other chemically incompatible material. Many chemicals that fall within this class are incompatible with most other hazard classes so it is advisable to keep them away from all other chemicals (aside from compatible pyrophoric chemicals). These materials should not be stored near any water source such as a sink, safety shower, eyewash, or out in the open on a lab bench if the laboratory has sprinkler heads. Consult the safety data sheet for additional storage compatibility information. Many water reactive chemicals will come from the manufacturer in plastic bags or metal cans; it is best to keep the reagents inside of these secondary containers even when these materials are designated for a hazardous waste pickup.

**Engineering Controls, Equipment & Materials**

- **Glove Box**: Work under an inert atmosphere (e.g. argon, nitrogen) in a glove box.
- **Fume Hood**: If a glove box is unavailable or impractical, work in a chemical fume hood away from any water sources. If the use of a fume hood is impossible or impractical, please contact the Office of Research Safety (ORS) to determine whether additional respiratory protection is required.
### Spills
Notify others in the area. Please refer to the Spill Control Guidelines for additional information.

### Decontamination
Avoid using water. Please review the chemical Safety Data Sheets for guidance on cleaning specific materials.

---

Any waste from this chemical class should be disposed of through the UGA Hazardous Waste Program. For assistance with arranging a waste pickup, you may contact the Environmental Safety Division (ESD) at 706-542-5801. Prior to pickup, any container used to hold hazardous waste should be labeled with the following:

- "Hazardous Waste"
- Chemical contents: Enough detail should be provided so that the full contents of the container are readily apparent. Labeling may include any of the following:
  - Percentages (Ex: 70% water, 30% hydrochloric acid)
  - Volumes (Ex: 1L of acetone, 500mL of water)
  - Chemical classes (Ex: halogenated solvents)
  - Method (Ex: EPA 515.1 Herbicide Extraction Solvent Waste)
  - Referenced Log (Ex: See Laboratory Waste Log, Volume 2)
  - Utilizing Chematix waste profiles
  - Any other labeling method providing enough detail to accomplish this requirement
- One or more of the following waste characteristics recognized by EPA: Ignitable, Corrosive, Reactive, or Toxic.
**First Aid & Emergencies**

<table>
<thead>
<tr>
<th>Fire</th>
<th><strong>DO NOT</strong> use water to put out fire, instead use a dry chemical Class ABC or Class BC fire extinguisher. Class D extinguishers may be necessary in some cases.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin or Eye Contact</td>
<td>Remove contaminated clothing and accessories and wipe any particles from skin immediately; flush affected area with water for at least 20 minutes. Get medical attention. For eye contact, flush with water for 20 minutes. Get medical attention.</td>
</tr>
<tr>
<td>Inhalation</td>
<td>Move person into fresh air. If not breathing, give artificial respiration. Get medical attention.</td>
</tr>
<tr>
<td>Ingestion</td>
<td>Do not induce vomiting. Rinse mouth with water. Get medical attention.</td>
</tr>
</tbody>
</table>

**Contacts**

Office of Research Safety: 706-542-5288  
Environmental Safety Division: 706-542-5801
I. Purpose & Scope
This document is meant to provide an overview of the University’s requirements and recommendations for the safe placement and use of 3D printers in offices, workspaces, and laboratories around campus. In recent years, 3D printer technology has become ubiquitous around college campuses but the health and safety concerns inherent with this equipment have often been given little regard. Under normal conditions of use, 3D printers can emit coarse, fine, and ultra-fine particles as well as volatile organic compounds (VOCs), some of which are known to be hazardous.

II. Feedstock Types
The list below is not intended to be all-inclusive, but to give a general overview of some of the more commonly used feedstock (filament) types available for 3D printers. There are other types not shown on this list.

A current Safety Data Sheet (SDS) for each feedstock in use should be kept in the lab or at least in a location that is readily available to all users of the printer. It is important to understand the hazards posed by the filament you’re using prior to use. When not in use, feedstock should be stored in accordance with manufacturer’s instructions.

- Polyactic Acid (PLA) – Recognized to be generally safe and non-toxic in its natural form. Made from corn starch and sugar cane and is thus biodegradable.
- Acrylonitrile butadiene styrene (ABS) – Made from petroleum based products and one of the most commonly used feedstocks. Recognized as toxic due to the harmful microparticles it emits during the printing process. The feedstock also generates a strong smell but the material generates images that can withstand higher temperatures.
- Polyvinyl Alcohol (PVA) – Generally non-toxic and water soluble.
- Nylon Polyamide – Strong yet flexible material that is extremely sensitive to moisture and will emit toxic fumes when heated.
- Polycarbonate – Very strong filament resistant to impact but can emit toxic fumes when exposed to extremely high temperatures.

III. Safety Concerns

A. Toxic Emissions
Studies have shown that different filament types can emit ultrafine particles (UFP)
and VOCs during the printing process, some of which present a toxicity hazards to users and those in the immediate vicinity. Emitted substances include styrene and methymethacrylate, both of which are toxic by inhalation and can lead to bronchitis, eye irritation, and aggravate asthma symptoms for susceptible populations. Long term exposure can have detrimental effects on the brain and nervous system as well.

Therefore, all 3D printers should be set up in a well-ventilated space and if possible have local exhaust control available such as a snorkel hood (local exhaust ventilation would be a requirement if the printer needed to be set up in an area with poor general ventilation). Generally, offices, classrooms, and libraries do not provide the necessary ventilation for the safe operation of 3D printers. Large workrooms, shops, makerspaces, and laboratories usually have the appropriate ventilation and air turnover rates for appropriate use of 3D printers.

It is recommended that users contact the Office of Research Safety or the Environmental Safety Division prior to purchasing a 3D printer if they have questions about the ventilation in their space(s).

B. Heat
The extrusion temperatures for many of the feedstocks listed above is typically in the range of 190-260°C. Additionally, some 3D printers also have heated beds to keep the plastic at an elevated temperature during printing to prevent plastic warping. The bed temperatures are usually much lower than the extrusion temperatures but can still reach upwards of 120°C.

These temperatures can cause extreme burns; consequently, manipulation of the filament and/or printer during operation should be strictly prohibited. Any sort of adjustment to the printer that would necessitate handling of the bed or extrusion instrument should only be performed after powering down the printer and allowing for a cool down period.

Additionally, 3D printers should not be left on and unattended for an extended period of time as some heat beds have been known to catch fire under such circumstances.

Some 3D printers are kept within a complete enclosure, which mitigates the potential burn hazards. However, for printers that are not enclosed, extreme heat and burns should be a concern that is considered when setting up and operating the instrument.

C. Mechanical Risks/Moving Parts

3D printers contain several moving parts that while unlikely to cause serious injury can still entrap a user’s finger, hair, or loose clothing, particularly if the printer is not housed in an enclosure. For this reason, loose hair, clothing, scarves, and jewelry should be secured prior to working with a 3D printer.
IV. Other General Safety Considerations
Users should not alter or modify 3D printers in any way. All printers should be used as specified by the manufacturer. By removing instrument covers to make alterations or modify a printer, users can be exposed to dangerous electrical voltages.

Follow all personal protective equipment (PPE) recommendations on the SDS for the filament being utilized.

Uncured printing material is hazardous and should only be handled while wearing nitrile gloves. If any uncured material requires disposal, it should be disposed of as hazardous waste.

During post-processing, it is often necessary to use flammable solvents such as acetone or tetrahydrofuran, or corrosive baths made with sodium hydroxide. The use of these substances should only be done within a fume hood and with appropriate PPE including gloves, lab coats, and safety glasses.

V. Contacts
Environmental Safety Division: 706-542-5801
Office of Research Safety: 706-542-5288

VI. References

3D Printer Safety, Concordia University, Environmental Health & Safety Office, 2017.

I. Purpose & Scope
This document is meant to provide an overview of the University’s requirements and recommendations for the safe use of electrical equipment, including power strips, surge protectors, and extension cords. Improper use of these items can cause fires in the labs and adherence to the established procedures must be followed. Please note that individual research areas may have additional requirements not detailed in this document.

II. Definitions
Collectively, the following three items will be called “flexible cords and cables” throughout this SOP.

A. Extension Cords
An elongated power supplying device that allows for the safe distribution of power usually to a single piece of equipment located from a standard wall outlet.

B. Power Strips (Relocatable Power Tap)
Similar to an extension cord except that they are usually capable of powering more than one device. It should not be assumed that these items are providing surge protection unless otherwise indicated on the device itself.

C. Surge-Protective Device (SPD)
Electrical code defines this as a device for limiting transient voltages by diverting or limiting surge current. The most common type of SPD used in labs is a Type 3 meaning that the surge protection is provided at the point of use. A surge protected power strip with multiple outlets is commonly a Type 3. To tell if your device is an SPD, you will need to consult the packaging or look at the raised lettering or adhesive label on the bottom of the device. Note that the device may also say Transient Voltage Surge Suppressor and this is sufficient as well.

III. General Safety Guidelines
- Electrical panels and breaker boxes located in the lab should not be obstructed by equipment or lab supplies.
- Particular care should be given not to subject wiring or equipment to deteriorating agents such as gases, fumes, vapors, liquids, foot traffic, sharp edges, or damp
environments that may compromise the protective features of a piece of equipment of electrical cord powering a device.

- Any portion of an electrical device that during the course of normal operation may produce arcs, sparks, flames, or molten metal shall be enclosed or separated and isolated from all combustible material.
- Any wiring or electrical equipment used in a lab should have a label or tag indicating the voltage, current (amps), wattage, and other ratings as necessary.
- Minimize condensation that may enter electrical equipment that is placed in a cold room or large refrigerator. Cold rooms pose a particular risk in this respect because the atmosphere is frequently at a high relative humidity. Electrical equipment should only be used in these areas temporarily. If permanent or long-term storage is required, precautions should be taken to mount the equipment on a wall or vertical panel to minimize (though not eliminate) the effects of condensation.
- Always unplug electrical equipment before undertaking any adjustment, modification, or repair.
- Ensure that all personnel know the location and operation of power shutoffs located in the lab.
- If a person comes into contact with a live electrical conductor, disconnect the power source before removing the person from the contact and administering first aid.

IV. Wall Outlets

- All outlets within a laboratory should be grounded (three-pronged) outlets and all electrical equipment used in a laboratory should be outfitted with a grounding prong. No modifications should be made to either the outlet or the electrical cord to either add or remove a grounding wire or bypass a grounding receptacle.
- Any outlet that is within six feet of a water source must be outfitted with a ground fault circuit interrupter (GFCI). These GFCI outlets will usually have small Test/Reset buttons to test the functionality of the GFCI. These devices significantly reduce the risk of fatal electric shock.
- Outlets and light switches located underneath or near safety showers in particular may need additional protection of a plastic cover. When these items are in place, they should never be removed by laboratory personnel under any circumstances.

V. Use of Extension Cords, Power Strips, and Surge Protectors

- Only flexible cords and cables that have been certified by one of OSHA’s Nationally Recognized Testing Laboratories (NRTL) are allowed to be used in UGA laboratories. The most common NRTLs are UL and ETL. Both testing laboratories will place their symbol on the equipment that they have certified.
- Flexible cords and cables that are supplying power to operations within a fume hood should be plugged into power sources located outside of the fume hood. This location prevents the production of electrical sparks inside the hood when a device is being plugged in or disconnected and it also allows lab personnel to disconnect equipment from outside of the hood in the event of an accident. Additionally electrical cords should be placed in such a way that they do allow for the full closure of the sash.
When closed, the sash should always come into full contact with the airfoil.

- Keep these flexible cords and cables out of aisles or other high traffic areas. Install overhead racks or floor channel covers if wires must pass over or under walking areas.
- SPDs should be used in areas where the consistency of electrical current is vital (e.g., computers). Commonly, laboratories are found to be using power strips that do not provide surge protection. Ensure that the device you are using is rated as an SPD if current consistency is preferred.

VI. Limitations of Flexible Cord & Cable Use

- Extension cords should be limited to temporary use (90 days or less). They are not intended to permanently replace the fixed wiring of the building. If a lab determines that new fixed outlets may be needed in order to avoid utilizing extension cords for longer than 90 days, please contact the Office of Research Safety.
- Flexible cords and cables should not be run through holes in walls, structural ceilings, suspended ceilings, dropped ceilings, floors, doorways, windows, or similar openings. They should not be concealed by walls, floors, ceilings, or located above suspended or dropped ceilings.
- It is recommended that all cords be visually inspected monthly, especially in wet areas or in areas subject to flooding. Electrical equipment and flexible cords and cables where the insulating wire casing is frayed or ripped open should not be utilized. Electrical tape is not an acceptable repair solution. If the lab would like the cord replaced or repaired, please contact the UGA Instrument Design and Fabrication Shop.
- Flexible cords and cables should never be connected in series (i.e., multiple extension cords or power strips plugged into one another). Doing so can overload the device causing a fire hazard.
- Flexible cords and cables should never be overloaded. This can be a particular concern with power strips because of the likelihood that multiple pieces of equipment could be plugged into each device. Large pieces of equipment (e.g., refrigerators and freezers) that pull high amperage are not allowed to be plugged into power strips in most cases. If your lab needs the addition of wall outlets or some other solution to prevent having to use a power strip for these purposes, please contact the Office of Research Safety.

VII. Contacts

Environmental Safety Division: 706-542-5801
Office of Research Safety: 706-542-5288
Instrument Design and Fabrication Shop: 706-542-5993

VIII. References

Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, 2011

I. Purpose & Scope
Lack of proper organization and cleanliness in a workspace is one of the major contributing factors in most occupational incidents and injuries. The unique mixture of chemicals and equipment present in a laboratory can exacerbate the already hazardous conditions that disorder creates. Additionally, from a security standpoint, it is more difficult to notice when items are missing or out of place if a laboratory is disorganized and cluttered. This document is meant to provide an overview of the University’s requirements and recommendations for housekeeping and cleanliness within research, instructional, and clinical labs.

II. Responsibilities

- It is the responsibility of each lab worker to ensure that their workspace is kept clean and orderly. The following general guidelines should be followed and can be added to at the discretion of the Principal Investigator (PI) or lab supervisor.

  o Ensure that all samples, reagents, and working solutions are properly labeled and placed in a safe location when work is completed.
  o Ensure that all sharps, glass, pipette tips, biohazardous waste, and EPA regulated hazardous waste have been placed into their appropriate waste receptacles. There should be no open waste containers and no stray needles or pipette tips left on the work bench or floor when work is completed.
  o Any spills should be wiped clean as soon as feasibly possible after being noticed. If a spill creates a hazardous environment and/or the laboratory staff do not feel comfortable cleaning up the spill, please contact the Office of Research Safety during business hours (M-F, 8AM-5PM) or Campus Police (911) after business hours.
  o Similarly, measures should be taken to control and clean stains on work surfaces. Often, stains get left behind on lab benches or inside fume hoods and are later difficult to identify; this becomes especially problematic when new users move into a space or a lab gets remodeled. It is imperative that stains and spills be handled immediately by lab users that are familiar with the processes and reagents being used.
  o Any tools, cords, wires, and other materials should be removed from high
traffic areas where they could become slip, trip, and fall hazards.

- At no point should exits and primary egress aisles be blocked or obstructed in any way.
- Any deficiencies related to the University’s facilities (e.g., faulty wiring, HVAC concerns, or leaky sinks and pipes) should be reported immediately to facilities via a work request (see details below).

- For shared areas, the same general recommendations apply. For these areas, it may be necessary to institute a cleaning schedule or checklist and assign lab or department members to particular days or hours to ensure that these general guidelines are being followed by all users of the space.

- Although it is the responsibility of each individual lab user to ensure that their areas are kept clean and orderly, the ultimate responsibility for overseeing the safety and compliance of a given laboratory is the PI. The PI will be notified during annual lab safety inspections about any clutter or disorder in the lab that the Office of Research Safety (ORS) deems serious enough to pose a health and safety risk. PIs and lab managers should promote good laboratory housekeeping for all of the areas they oversee.

### III. Work Requests

On occasion, it may be necessary to submit a facilities work request to correct items such as faulty electrical wiring or leaky sinks and pipes. These issues will usually be noticed during the annual lab safety inspections and in those cases, ORS will submit a work order to have it corrected at no cost to the lab. If the lab notices an issue on their own, please reach out to ORS for assistance with getting a work order submitted.

### IV. Contacts

- Environmental Safety Division: 706-542-5801
- Office of Research Safety: 706-542-5288
- UGA Work Request Center: 706-542-7456

### V. References

- Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, 2011
- University of California – Center for Laboratory Safety
I. Purpose & Scope
This document is meant to provide best practices and university guidelines for laboratory work involving the use of manufactured nanomaterials. Since nanotechnology is a rapidly expanding area of research, new studies are published regularly that explore toxicity and possible routes of exposure to workers. Toxicity hazards posed by nanomaterials can vary widely depending upon the type being used. Certain nanomaterials can present health hazards not displayed by the items in their bulk form. Due to the lack of human studies for most nanomaterials, current recommendations are primarily based on in vitro or animal studies.

II. Nanomaterial Sources and Composition
The World Health Organization (WHO) uses the term nanomaterials as an all-encompassing term including nano-objects, nanoparticles, and nanotubes from all sources. These are all materials that have at least one primary dimension less than 100 nanometers (nm). For the purposes of this SOP, “nanomaterials” will be used to mean all of these items – including all variations of these materials both naturally occurring and anthropogenic.

Nanomaterials can be naturally occurring (such as volcanic ash), unintentional byproducts (such as automobile exhaust and industrial air pollution), or intentionally created (engineered or manufactured). The types of nanomaterials of most concern in a research laboratory setting are manufactured nanomaterials (MNMs).

MNMs can be spheres, rods, or tubes, and be handled as dry powder, attached to polymers, or placed into solution or suspension. Specific MNM hazards will depend on the shape and composition of the nanomaterial.

III. General Health & Safety Considerations

A. Health hazards posed by MNMs can be caused by inhalation, ingestion, or skin absorption; for most, the highest risk route of exposure is inhalation.
   • For this reason, exposure control should focus on preventing inhalation exposure with the aim of reducing it as much as possible by utilizing either localized ventilation or, in the absence of appropriate engineering controls, respiratory protection.
B. There are currently no specific regulatory occupational exposure levels (OELs) for MNMs in the workplace, and overall, toxicity is not well understood for the majority of them.

- Some have undergone more extensive evaluation and for which recommended exposure levels are available from the National Institute for Occupational Safety and Health (NIOSH). These include titanium dioxide and carbon nanotubes which have shown adverse pulmonary responses in exposed mice and rats.
- Appendix I of this SOP contains a table from the WHO that classifies the hazardous properties of common MNMs.

C. When determining the likelihood of exposure, it is important to consider whether the MNMs will be used in either an open or closed system. Open systems inevitably lead to more possibilities for exposure, and a risk assessment should be done prior to working with nanomaterials in an open system. Contact the Office of Research Safety for assistance with a risk assessment.

D. In some cases, the manufacture of commercially available nanomaterials involves the use of chemicals that are known to be hazardous. Be sure to obtain and review the safety data sheets (SDSs) for all MNMs purchased from outside vendors.

- Users should be aware that SDSs may not always provide complete information due to the item’s novelty. For this reason, it is always best to err on the side of caution when handling these items.

IV. Best Practices for Reducing Exposures

A. When possible, utilize nanomaterials that are in solution or suspension, or embedded in a matrix as this will reduce the generation of airborne particles subject to inhalation. Use of MNMs in dry or powder form should be limited as most inhalation exposures have taken place when handling them in this form.

B. Always utilize the smallest amount of MNMs necessary for a particular reaction or process.

C. When research involves work with MNMs for which toxicity is not yet known or is incomplete, it is always prudent to assume that the material is toxic.

D. To reduce dermal exposure it is recommended that any MNMs be handled with double nitrile gloves and the outer glove be removed within a fume hood or some other localized exhaust ventilation system. Additionally, placing the outer gloves inside of a bag or other sealed container will reduce the possibility of inhalation exposure.
E. When the production of airborne MNMs is possible, such processes must be performed inside of a general purpose chemical fume hood, HEPA-filtered local capture hood, or glovebox.

F. When work with MNMs is necessary outside of proper engineering controls such as fume hoods or glove boxes, users should be fit tested with a NIOSH-approved HEPA-filtered respirator and be enrolled in the university’s Respiratory Protection Program. You must contact the Office of Research Safety to enroll in this program.

G. Surface contamination with nanomaterials is always a concern and can often go undetected. For this reason, it is a best management practice to wipe down all work surfaces and equipment regularly even if no contamination is suspected. A dampened cloth or paper towel will usually be sufficient.

V. Spills & Waste

A. Any spill of MNMs should be cleaned up immediately. If lab personnel are uncomfortable or unprepared to clean up the spill themselves, they should contact the Office of Research Safety. If a lab chooses to clean the spill themselves, the following guidelines must be followed at a minimum.

- Double nitrile gloves, lab coats, and safety glasses must be worn.
- The area should either be vacuumed with a HEPA filtered vacuum dedicated specifically for nanomaterials or wet wiped, or both.
- For spills that might involve airborne nanomaterials, proper respiratory protection must be worn. If lab personnel are not enrolled in the Respiratory Protection Program, they must not attempt to clean up the spill themselves. Instead, contact the Office of Research Safety.
- Do not brush or sweep spilled or dried nanomaterials.
- If possible, place sticky mats at the room exit to reduce potential spread. Foot traffic must be reduced or eliminated in the area of the spill until proper cleanup procedures have taken place.

B. Waste resulting from either routine work with MNMs or from a spill must be treated as chemically hazardous waste unless the lab can definitively determine that the waste is non-hazardous. This includes all wipes, bench paper, gloves, and other potentially contaminated lab debris. For assistance with a waste determination and for help with waste disposal, contact the Environmental Safety Division.

VI. Contacts

Environmental Safety Division: 706-542-5801
Office of Research Safety: 706-542-5288
VII. References

Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, 2011

WHO Guidelines on Protecting Workers From Potential Risks of Manufactured Nanomaterials, World Health Organization, 2017

Protecting Workers During the Handling of Nanomaterials, National Institute Occupational Safety and Health (NIOSH), 2018.
# APPENDIX I: CLASSIFICATION OF HAZARDOUS PROPERTIES OF NANOMATERIALS

<table>
<thead>
<tr>
<th>MNM</th>
<th>Acute toxicity</th>
<th>Skin corrosion/irritation</th>
<th>Serious eye damage/eye irritation</th>
<th>Respiratory or skin sensitization</th>
<th>Germ cell mutagenicity</th>
<th>Carcinogenicity</th>
<th>Reproductive toxicity</th>
<th>Specific target organ toxicity (single exposure)</th>
<th>Specific target organ toxicity (repeated exposure)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fullerene ($C_{60}$)</td>
<td>No*</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No data*</td>
<td>No data</td>
<td>No data</td>
<td>No</td>
</tr>
<tr>
<td>SWCNT</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Cat 2B (L)*</td>
<td>No data</td>
<td>IARC 3</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td>MWCNT</td>
<td>No</td>
<td>No</td>
<td>Cat 2A (H)*</td>
<td>No</td>
<td>Cat 2 (H)</td>
<td>MWCNT-7: Cat 2 (M)*, IARC 2B</td>
<td>Other MWCNTs: IARC 3</td>
<td>No</td>
<td>No data</td>
</tr>
<tr>
<td>AgNP</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Cat 1B (M)</td>
<td>No</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>Cat 1 inhalation (H)</td>
</tr>
<tr>
<td>AuNP</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>Cat 1 inhalation (H)</td>
</tr>
<tr>
<td>SiO$_2$</td>
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<td>No</td>
<td>No</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>Cat 2 inhalation (H)</td>
</tr>
<tr>
<td>TiO$_2$</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No data</td>
<td>Cat 2B</td>
<td>No data</td>
<td>Cat 1 inhalation (H)</td>
</tr>
<tr>
<td>CeO$_3$</td>
<td>No</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td>Dendrimer</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td>Nanoclay</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td>ZnO</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
<td>Cat 1 inhalation (M)</td>
</tr>
</tbody>
</table>

AgNP: silver nanoparticles; AuNP: gold nanoparticles; CeO$_3$: cerium dioxide; MWCNT: multi-walled carbon nanotubes; SiO$_2$: silicon dioxide; SWCNT: single-walled carbon nanotubes; TiO$_2$: titanium dioxide; ZnO: zinc oxide.

* No: no hazard class assigned based on data.

* No data: no studies available in OECD dossier.

* GH5 categories: Cat 1 usually implies serious and/or irreversible damage; Cat 2 milder or reversible damage. Within a category, A implies more serious and 8 milder damage.

IARC categories of confidence in carcinogenicity: IARC Cat 2B = possibly carcinogenic; IARC Cat 3 = not enough evidence to draw conclusion.

H: high level of evidence.

WHO Guidelines on Protecting Workers From Potential Risks of Manufactured Nanomaterials
Pesticide Storage & Use
Version: January 2020

I. Purpose & Scope
This document is meant to provide an overview of the University’s requirements for the use of pesticides in both the laboratory and in the field/greenhouse. The scope of this document also covers the storage of pesticides and their disposal or recycling. Please note that individual research areas may have additional requirements not detailed in this document.

II. Pesticide Storage
Facilities being used for the long-term storage of pesticides should meet the following minimum requirements:

- Floor drains are prohibited.
- Floors and shelves should be impervious to moisture.
- Pesticide containers must be secured to keep them from tipping over.
- Facilities should be mechanically ventilated to prevent accidental respiratory exposure.
- Storage areas should be securely locked when not in use to prevent unauthorized access.
- Adequate electrical or natural lighting must be provided.
- If pesticides are mixed at the facility, potable water must be provided for readily accessible emergency eyewashes and showers and sinks for handwashing.
- If original pesticide containers are damaged a suitable secondary container must be used to hold the remainder of the pesticide and prevent accidental release. These containers must be labeled as clearly as the primary container to identify the pesticide and the hazards presented. Pesticides should never be stored in containers that have been used or could feasibly be used to store food or drink.

III. Pesticide Usage

A. Personal Protective Equipment

Personal protective equipment (PPE) must be provided and used as required by the pesticide label. PPE may vary widely between application and early re-entry. Store clean PPE away from personal clothing and do not take used PPE home.
When a respirator is required by product labeling, personnel must be enrolled in the Respiratory Protection Program which will usually require a medical evaluation, fit test, and training on the use of the respirator. Please contact the Office of Research Safety for enrollment information.

PPE that has been heavily contaminated with pesticide having a signal word of “Danger” or “Warning” (check Section 2 of the Safety Data Sheet or the product label) should be disposed of and not cleaned for reuse. The PPE may need to be disposed of as hazardous waste. For information on disposal, please contact the Environmental Safety Division.

B. Restricted use pesticides or pesticides with state restricted uses must be applied by a certified applicator registered with the state of Georgia. Uncertified persons may apply restricted use pesticides only if they are under the direct supervision of a certified applicator and only if the pesticide label does not restrict application to certified applicators. The certified applicator is responsible for the actions of all persons under their supervision. Unless otherwise required by the label, the certified applicator is not required to be present at the time of application but must be available through conventional means of communication during the application process.

C. Safety Data Sheets (SDS) for each of the pesticides being stored and/or used should be made available to all employees handling the substance or required to enter an area where pesticides have been recently applied.

Non-registered pesticides or experimental pesticides should not be accepted for trial or research unless the manufacturer can provide information equivalent to what is given in a Safety Data Sheet (SDS). This may include but is not limited to the following:

- Pesticide type
- Physical characteristics (flammability, incompatibilities, evaporation rates, etc.)
- Hazards (both acute and chronic) associated with exposure
- PPE required for use and application
- Field re-entry requirements

D. During pesticide applications, keep workers and everyone other than appropriately trained personnel out of the area being treated.

E. Restricted Entry Intervals

Do not direct or allow any worker to enter or remain in a treated area until the restricted-entry interval (REI) specified on the pesticide label has expired and all posted warning signs are removed or covered. There are certain situations during which re-entry into a treated area is allowed under the Environmental Protection
Agency’s Worker Protection Standard (WPS). A list of these types of situations is provided in Appendix A of this document.

Please keep in mind that while some pesticides will have a single REI, others will have REIs that vary depending upon the crop, method of application, or the post-application activity to be performed. Always consult the pesticide label for detailed information about the REI length and any necessary PPE.

REIs are listed on the label under the heading “Agricultural Use Requirements” in the “Directions for Use” section or next to the crop or application method to which it applies.

IV. Postings & Signage

A. All doors to areas where pesticides are stored or used should be marked with a yellow Caution sign provided by the Office of Research Safety indicating the hazards posed by the pesticides being stored or used in the space. Additional signage may be posted by laboratories or greenhouses if deemed necessary.

B. Warning signs must be posted if required by the pesticide label or if the REI is greater than 48 hours for outdoor applications or 4 hours for enclosed spaces (e.g., greenhouses). It is recommended that signs always be posted for any application or use regardless of the REI length. All signs must be updated to appropriately display the pesticides applied, the time and date of application, and the earliest time that re-entry is permitted.

V. Pesticide Disposal and Recycling

A. Disposal of Canceled or Suspended Pesticides

Pesticides which can no longer be legally applied or used in any way must be disposed of in accordance with all applicable federal and state regulations, most commonly as hazardous waste.

The State of Georgia offers free pesticide collections throughout the year during which old and expired pesticides may be dropped off and collected for disposal by the state Department of Agriculture at no cost to the user or the University. Please contact the Office of Research Safety for additional information about these Georgia Clean Days.

B. Disposal of Empty Pesticide Containers

Always refer to the label affixed to the pesticide container you are using for instructions on how to properly dispose of the container when emptied.
Many empty containers can be recycled through the Georgia Department of Agriculture free of charge. Please contact the Office of Research Safety for additional information about these Georgia Clean Days.

VI. Contacts
Environmental Safety Division: 706-542-5801
Office of Research Safety: 706-542-5288

VII. References
Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, 2011


____________________________
Appendix A: Under What Conditions is Early Entry Allowed?

Certain conditions must be met for early entry and even then early entry is only permitted for the following types of tasks:

- Short-term tasks - tasks lasting less than one hour and not involving hand labor (any activity performed by hand or with hand tools that might cause a worker to have substantial contact with surfaces that may contain pesticide residues).
- Limited contact tasks - tasks where worker contact is only with treated surfaces and limited to feet, lower legs, hands, and forearms
- Irrigation tasks - tasks related to irrigation or watering equipment where contact with treated surfaces is limited
- Emergency tasks - tasks that are necessary due to a forecasted or occurring natural event such as freeze, hurricane, hail, or flooding

Some examples of allowable conditions for early re-entry are provided by the EPA in the following table. Please note that this table is not meant to be exhaustive.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Short Term</th>
<th>Limited Contact</th>
<th>Irrigation</th>
<th>Agricultural Emergency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wait at least 4 hours after the pesticide application is completed?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Wait until inhalation exposure level on the pesticide label has been reached or any WPS ventilation criteria have been met?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Maximum amount of time allowed per 24-hour period?</td>
<td>1 hour</td>
<td>8 hours</td>
<td>8 hours</td>
<td>No limit</td>
</tr>
<tr>
<td>Allowed for pesticides whose labeling requires double notification (verbal notification and</td>
<td>Yes, allowed for all WPS pesticides</td>
<td>No</td>
<td>No</td>
<td>Yes, allowed for all WPS pesticides</td>
</tr>
<tr>
<td>posting signs)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Are hand labor tasks permitted?</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes, but must be related to the ag emergency</td>
</tr>
<tr>
<td>Employer provides special protections for early-entry workers regarding training, instructions, decontamination supplies and personal protective equipment (PPE)?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Need for entry could/could not have been anticipated</td>
<td>Doesn’t matter</td>
<td>Only if need could not have been foreseen</td>
<td>Only if need could not have been foreseen</td>
<td>Only if circumstances could not have been anticipated when pesticide was applied</td>
</tr>
<tr>
<td>Entry is/is not an economic necessity</td>
<td>Doesn’t matter</td>
<td>Only if delay would cause significant economic loss</td>
<td>Only if delay would cause significant economic loss</td>
<td>Early entry is only practice to prevent or reduce a substantial economic loss</td>
</tr>
</tbody>
</table>

Refrigerators, Freezers, & Environmental Chambers
Version: January 2020

I. Purpose & Scope
This document provides an overview of the University’s requirements and recommendations for the safe use of laboratory refrigerators, freezers, and environmental chambers meant primarily for reagent and sample storage within laboratory areas. This document briefly covers personal protective equipment and routine maintenance. Please note that individual research areas may have additional requirements not detailed in this document.

II. General Safety Guidelines

A. Food/Drink
Food and drink intended for human consumption shall not be stored inside a laboratory refrigerator, environmental chamber, or freezer for any reason. Every laboratory unit will have a sign similar to what is shown in Appendix A of this document posted on the door. Please contact Research Safety if you need any of these postings.

B. Cleaning/Disposal
All refrigerators and freezers are to be cleaned out on a regular basis by the lab group; old samples and reagents should be discarded or disposed of through the Environmental Safety Division’s Hazardous Waste group for chemicals. For non-chemical sample disposal contact the Office of Research Safety for instructions. One of the most common safety concerns found in laboratories are abandoned samples and reagents left in refrigerators, freezers, and cold rooms when lab personnel depart from UGA. Time and effort spent determining how to properly dispose of “old items” is wasteful.

Additionally, units should be defrosted regularly so as not to compromise the functioning of the unit. Accommodations will need to be made to prevent slip hazards around the unit as the ice melts. If there is a reason to believe that the melt water is contaminated in any way please contact Research Safety or Environmental Safety prior to disposal.

In the event of a lab closeout, or when refrigerators/freezers are sent to salvage, laboratory personnel should clean out the refrigerators/freezers and decontaminate.
them. A signed decontamination notice should be posted on each piece of equipment prior to being transferred to another lab on campus or being sent to salvage. Further instructions are outlined in the Laboratory Equipment Decontamination Guidelines.

C. Personal Protective Equipment
Standard laboratory PPE such as lab coats, gloves, and safety glasses should be worn when accessing items in refrigerators, freezers or environmental chambers. Stored items may have shifted, or retrieved items may be inadvertently dropped or other items pushed off a shelf during the retrieval of necessary items.

Additionally, cryogenic gloves are required when retrieving samples or other items from a -80°C freezer. Nitrile gloves are not appropriate substitutes for this purpose.

III. Types of Refrigerators and Freezers

A. General Purpose (Household-Type) Unit
- These units are easily identifiable as they will usually have a light or thermostat switch readily noticeable when you open the refrigerator or freezer.
- General purpose units are not appropriate for the storage of flammable materials or unstable chemicals. This includes samples dissolved in a flammable solvent. Vapors from these types of substances can build up within the unit and create a fire hazard.
- General purpose units are permitted for the storage of non-flammable aqueous solutions or other non-flammable or non-explosive material only.
- A yellow sign as shown in Appendix B of this document should be placed on each of these units. Please contact Research Safety if you need any of these signs.

B. Intrinsically-Safe Unit
- These units will usually have a placard or sign highly visible on the front of the unit; the sign should clearly indicate that this unit is acceptable for the storage of flammable materials, both liquid and solid.
- These units have no interior electrical components (e.g., lights) that can provide a source of ignition.
- Uninterruptable power supplies and automatic generators should be considered for freezers and refrigerators that are used to store unstable compounds.

C. Explosion Proof Unit
- These units are designed to prevent ignition of flammable vapors or gases inside the unit but also to protect items in the unit from potentially flammable atmospheres outside of the unit.
- These units may be necessary in solvent dispensing rooms or other locations where a flammable atmosphere may develop during work. The explosion-proof units also require special wiring rather than a simple plug-in power cord. Please consult with Research Safety or Fire Safety if you feel that you need one of these
units.

- Uninterruptable power supplies and automatic generators should be considered for freezers and refrigerators that are used to store unstable compounds.

D. **Environmental Chambers**

- Most environmental chambers have the same restrictions as general purpose (household) refrigerators and freezers. They should not be used for the storage of flammable and/or unstable materials. They must have a sign posted on the door as shown in Appendix B.
- Environmental chambers are closed systems that can lead to the buildup of potentially harmful vapors. For this reason, the storage or long-term use of corrosive and toxic materials are not recommended. Doing so can damage the room and pose a hazard to the user.
- Mold is a common problem in these areas. If you notice any leaks or condensation that could lead to mold concerns, please contact Research Safety or Environmental Safety.
- Restrict the use of paper or cardboard in these rooms or if such materials are needed, cover them in plastic.
- Dry ice and liquid nitrogen should not be stored in these chambers; Displacement of air in the room can create an asphyxiation hazard.

IV. **Other General Considerations**

- Use waterproof tape and markers to label items being stored for long periods of time in a refrigerator or freezer.
- Storage trays, racks, or secondary containment is recommended to minimize the distribution of material in the event of a leak. Chemical storage within these units is expected to adhere to the proper segregation of chemical hazard classes.
- If applicable, locks should be used to secure refrigerator and freezer contents. Examples of items that should always remain secure include radioisotopes, controlled substances, and biohazardous material.
- Refrigerators and freezers should be placed in the lab at locations so as not to impede egress in the event of an emergency.
- Never place uncapped containers of chemicals or biohazardous material in a refrigerator, environmental chamber or freezer. Coverings of aluminum foil, corks, or glass stoppers are not appropriate.
- Refer to the UGA Biosafety Manual for questions regarding the use of freezers storing biological samples.

V. **Contacts**

Environmental Safety Division: 706-542-5801
Office of Research Safety: 706-542-5288
VI. References

Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, 2011


University of California – Center for Laboratory Safety
Appendix A: Lab Use Only Label

NOTICE

LABORATORY USE ONLY

NO FOOD OR DRINK ALLOWED

DO NOT REMOVE THIS SIGN
Appendix B: No Flammable Material Storage Label

CAUTION
DO NOT STORE FLAMMABLE MATERIALS IN THIS BOX
I. **Purpose & Scope**

This policy is meant to provide waste management guidelines for the types of wastes typically generated in a laboratory, which can pose a health or physical hazard to waste handlers and other laboratory personnel, but are not necessarily considered hazardous waste by regulatory agencies. These types of waste include but are not limited to the following: non-hazardous laboratory glass (broken or unbroken), sharps, and pointed plastics. These items are further defined in Section 2. The management and disposal of these items must be in accordance with this policy, which is a reflection of the University of Georgia’s commitment to providing a safe and compliant workspace for all of its faculty and staff as outlined in Academic Affairs Policies 6.01 and 6.02.

II. **Definitions**

a. **Sharps** – by the State of Georgia Biomedical Waste Rules (Refer to O.C.G.A 391-3-4.15 [E]), a sharp is any discarded article that may cause punctures or cuts. Such waste includes, but is not limited to needles, IV tubing and syringes with needles attached, scalpels, razor blades, and X-acto blades. For UGA this includes contaminated glass Pasteur pipettes and glass slides.

b. **Pointed plastics** - Any item that is not glass or a “sharp” by the Biomedical Waste definition but that could potentially puncture a regular waste bag and pose a physical hazard to the waste handlers. These items must be free from biological, chemical and radiological contamination before going into the standard trash. Examples include syringes without needles attached and plastics such as vials, serological plastic pipettes, pipette tips, and other similar items that when placed in the regular trash can potentially pierce the plastic liner.

c. **Non-hazardous laboratory glass** – Uncontaminated glass items that are broken or have the potential to break when placed in a normal waste stream and consequently present a physical hazard to the waste handlers. Only glass that is not contaminated with chemical, biological, or radioactive materials is considered non-hazardous. These items include used lab glass such as microscope slides, Pasteur pipettes, glass vials, glass Petri dishes, empty reagent bottles, and ANY uncontaminated broken glass.

d. **Biohazardous Waste** – The Georgia Department of Natural Resources (DNR), Environmental Protection Division (EPD) manages State Solid Waste Regulations. Rule 391-3-4-.15, **Biomedical Waste**, defines disposal methods for biomedical wastes and provides definitions and disposal requirements for sharps (please refer to the current version of UGA’s Institutional Biosafety Manual).

e. **BSW** - Building Services Worker.
f. **Original Container** – The original rigid packaging that the product or material was delivered in.

g. **Common Trash** - Non-hazardous laboratory trash (no biological, chemical or radiological hazard) that under normal circumstances will not puncture the waste bag. Any item that is contaminated with biological, chemical, or radiological hazardous materials is not considered common trash.

h. **Glass Disposal Box** - A lined cardboard box that is used to dispose of non-hazardous laboratory glass (see definition above).

i. **Sharps Disposal Containers** – A container for storage, transportation, treatment and subsequent disposal, which is leak-proof, rigid, puncture-resistant and is capable of being taped closed or tightly lidded to prevent loss of contents. Rigid containers of discarded sharps are either red or orange in color OR are clearly identified with the universal biohazard symbol OR are clearly marked with the word “Biohazard”.

### III. Common Trash & Pointed Plastics Disposal

a. Non-hazardous pointed plastics that can readily penetrate a regular trash bag, such as plastic pipette tips and transfer pipettes, must be placed in a disposable rigid plastic container or lined cardboard container that can be securely sealed. Once full, the disposal container must be labeled “OK to trash, non-hazardous waste” and the lid securely closed. Then, the waste container can either be placed in the common trash receptacle or taken to the dumpster by laboratory personnel. The container must meet the specifications in Section III.b below. Laboratory glassware and sharps must never be discarded with non-hazardous pointed plastics disposal. Facilities Maintenance Division (FMD), upon request, will supply a consistent texture, moderately thick bag for laboratory wastes.

BSWs will receive orientation training appropriate for laboratory waste pick-up in the Building Service Worker Academy. If there are special waste considerations, please contact the building supervisor, or call the FMD Services Department at 2-0293. For biohazardous pointed plastics, please see the **Autoclave Waste Disposal** guidelines in Section IV of this document.

If pointed plastics have been used for radioactive materials, they must be packaged in disposable rigid containers and then those containers placed in an appropriate dry radioactive waste container. For more information, see the Radiation Safety Manual or contact the Radiation Safety Office.

b. **Acceptable Disposable Containers for Pointed Plastics**

- The ‘original container’ (refer to Definitions) with a black liner placed inside. Tape closed when full.

- Rigid cardboard with black plastic liner to prevent leaking. Double box or
tape seams with heavy-duty tape. Tape closed when full.

- Any rigid leak proof container with a lid.

c. **Common Trash**
Only common trash (refer to Definitions) will be picked up by the BSW for disposal. The BSW **will not** dispose of any trash that is placed inside of a sharps container. Biohazard bags will only be picked up if the bag has been managed following the autoclave waste disposal guidelines (see Section IV).

If a BSW encounters an obvious hazard while collecting common trash, they will request that a member of the laboratory staff remove the hazard before collecting the common trash.

**IV. Autoclave Waste Disposal**

a. This procedure applies only to the disposal of routine autoclave wastes that do not require special handling according to the UGA Biosafety Committee guidelines.

b. Materials that will be autoclaved must be placed in double autoclave bags, each 1.5 mil thick, and placed into secondary containment, prior to autoclaving. The name of the laboratory P.I. must be clearly identified - either written directly on the bag or on a piece of tape using permanent ink (i.e. written with “Sharpie”). Heat sterilization indicator tape must be placed on the waste bag before autoclaving. Autoclave bags must be put into a secondary container that is stable in an autoclave. Stainless steel pans are recommended for this use since they are stable to long term autoclave usage. The waste bag must not extend outside the pan when placed in the autoclave. The autoclave bag must remain open by at least 3 inches during autoclaving and should be closed with a tie after the bag is cooled, prior to disposal.

c. Autoclaved waste must be placed in the red portable autoclave waste cans, designated and labeled as “Autoclave Waste Only”, that are provided by Building Services. These cans will be located inside each autoclave room or in laboratories. The autoclave waste can must have a black liner in it prior to placing any autoclaved waste bags inside. Black liners will be provided by the BSW but must be placed in the autoclave waste cans by laboratory personnel. Sharps must not be placed in these autoclaved waste containers. Any waste bag that is waiting to be autoclaved must be stored in a way that prevents leaking (i.e. double-bagged and placed in a leak-proof Nalgene pan).

d. Red portable autoclave waste cans must never reach more than ¾ full prior to being emptied or replaced with another empty can. If the can is reaching its maximum capacity, please contact a BSW and set other autoclaved wastes aside until the trash can is emptied. Once the can is full, laboratory personnel are to tie up the black liner containing the autoclaved waste and transport the bag directly to a dumpster or, if allowed in the particular building, place the bag outside the autoclave room in the hallway for pickup by a BSW. BSWs will not enter an
autoclave room to gather wastes.

e. Autoclaved waste that is leaking, improperly contained, improperly labeled, or contains sharps, will not be picked up by a BSW.

f. Only inert, non-hazardous autoclaved waste will be picked up by BSW for disposal. Under no circumstances will a BSW dispose of any autoclave waste bags or containers that are not placed inside of a red trash bin lined with a black bag.

g. Biohazardous waste containers, boxes, bags, associated tape, and labels to be used for packaging are the responsibility of the laboratories. The BSWs are responsible for the retrieval, transport, and disposal of non-hazardous solid waste only.

h. The use of an autoclave with dispersible radioactive materials may only be approved by Radiation Safety on a case by case basis. Please see their website in Section 7.2 for contact information.

V. Non-hazardous Laboratory Glass Disposal

a. Non-hazardous laboratory glass must be drained of liquid and placed in a Glass Disposal Box lined with a strong plastic bag. Prior to transport, the container must be securely sealed, labeled “Glass” or “Broken Glass”, and taken to the dumpster by laboratory personnel when it is full. Do not overfill this container. BSWs do not handle Glass Disposal Boxes.

b. Laboratories will only discard non-hazardous glass (no biological, chemical or radiological contamination). Large amounts of biohazardous broken glass can be disposed of in an appropriate sharps container, or decontaminated via appropriate liquid disinfection or through autoclaving. Once decontaminated, the lab must follow the procedure outlined in section V.a.

VI. Sharps Disposal

a. **Non-hazardous Sharps** must be discarded in a rigid container, designed specifically for sharps. If biohazardous sharps are intended to be discarded, the sharps container must be clearly identified with the universal biohazard symbol OR clearly marked with the word “Biohazard”, and follow the instructions in section VI.b.

b. **Biohazardous sharps treatment and disposal** - The Biomedical Waste rules state that biohazardous sharps must be treated to render them noninfectious. For biohazardous sharps that do not require incineration, heat sterilization indicator tape must be placed on biohazardous sharps containers before sterilization, and the sharps must be steam sterilized in an autoclave at 121°C for a minimum of 30 minutes (or longer, as needed to inactivate the biological hazard). Once treated, contact an appropriate collection vendor for final disposal of sharps containers. For more information on biosafety regulations please
refer to the Office of Biosafety website listed in Section VII.

c. **Radioactive sharps disposal**: If sharps have been used with radioactive materials, they must be packaged in disposable rigid containers and then disposed of in an appropriate dry radioactive waste container. For more information, see the Radiation Safety Manual or contact the Radiation Safety Office.

### VII. Contact Information

<table>
<thead>
<tr>
<th>Service</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biosafety</td>
<td>706-542-7265</td>
</tr>
<tr>
<td>Radiation Safety</td>
<td>706-542-0107</td>
</tr>
<tr>
<td>Research Safety</td>
<td>706-542-9088</td>
</tr>
<tr>
<td>FMD Support Services</td>
<td>706-542-7584</td>
</tr>
</tbody>
</table>

### VIII. References

- **Solid Waste Management, Rule 391-3-4-.01**, Georgia Rules and Regulations.
Sharps, Pointed Plastics and Laboratory Glass Waste Management

**Sharps**—Any discarded article that may cause punctures or cuts in accordance with the Georgia Biomedical Waste Rules

**Examples:**
- Needles, Syringes with needles, Lancets, Scalpels and razor blades, biohazardous glass vials, hematocrit tubes

**Disposal Procedure**
- Collect all sharps in a sharps container (see image below) regardless of the use.
- When 3/4 full, seal the container, autoclave, and contact ESD or a sharps vendor for pickup.
- SHARPS SHOULD NEVER BE DISPOSED OF WITH COMMON TRASH.

**Pointed Plastics**—Item that is not glass or a sharp but that could potentially puncture a regular waste bag and pose a physical hazard to waste handlers.

**Examples:**
- Plastic serological pipettes, other pipettes and tips

**Disposal Procedure**
- Non-hazardous items must be emptied of liquid and placed in a disposable rigid container (such as a coffee can) or a lined cardboard box. When full, the container should be closed, sealed and placed in the common trash by lab personnel.
- Biohazardous items must be placed in double autoclave bags with the PI name written on the bag (or a piece of tape affixed to the bag). The bag should be autoclaved, and then placed into an autoclaved waste can lined with a black liner. When full, lab personnel are to tie up the black liner and then either take the bag to the dumpster or place the can in the hallway to be picked up by a BSW.

**Laboratory Glass**—Glass items that are broken or have the potential to break when placed in the trash.

**Examples:**
- Decontaminated petri dishes, slides and cover slips, empty bottles, glass tubes, glass pipettes

**Disposal Procedure**
- Empty items of liquid; if the container held an **acutely hazardous chemical**, it must be triple rinsed prior to disposal and the rinsate collected as hazardous waste. If it has been used with biohazards, then it should be autoclaved.
- Place into laboratory glass disposal container (see image below)
- When full, lab personnel will seal the box tightly and carry it out for disposal.

**Note:** If any item has been used with radioisotopes, it must be disposed of as radioactive waste. Contact Radiation Safety for additional information. (706-542-0107)
I. **Purpose & Scope**
This document is meant to provide an overview of the University’s requirements for safety plumbing devices such as eyewashes and safety showers. These requirements are for such features that are located within or in close proximity to both teaching labs and research labs.

II. **Eyewash & Safety Shower Location**

A. All emergency safety showers shall be located within a 10-second walking time from the location of any hazard within the lab. For teaching laboratories, emergency safety showers may be permitted in central locations such as hallways.

B. Emergency showers and eyewashes must be on the same floor as the hazard. Users must not be required to go up or down stairs or ramps to access the nearest unit.

C. Research laboratories involving work with chemical or hazardous processes (particularly those involving the use of corrosive substances and/or formaldehyde) should be equipped with at least one eyewash station per 350 square feet of laboratory space and one emergency safety shower within 10 seconds of walking distance from the hazard(s) provided that the path of travel does not go through more than one outwardly opening door from the laboratory space.

D. All preparation rooms with chemical storage used for academic laboratories shall be equipped with at least one permanently installed emergency shower and eyewash station.

E. Teaching laboratories with wet chemicals or other hazardous operations shall have at least two approved eyewash stations per 24 seats or student work stations.

III. **Operating Requirements**

A. All emergency safety showers and eyewashes shall meet the requirements of the latest ANSI Z358.1 standard.

B. The area surrounding both safety showers and eyewashes should be kept unobstructed and provide unimpeded access to the unit. The Office of Research Safety verifies that units are unobstructed during periodic safety assessments.

C. Safety showers
   - Floor drains located under safety showers are permitted at the University’s discretion.
• Safety showers shall be able to be activated in one second or less.
• Safety showers shall be capable of delivering water at a minimum rate of 20 gallons per minute (75.7 liters per minute) for a minimum of 15 minutes.
• The height of the shower activation handle shall at most be 69” above the surface of the floor. For this reason, it is a violation of UGA policy to move or alter the handle in any way that would place it higher than this maximum distance.

D. Eyewashes
• Eyewashes should be set up with mixing valves to deliver tepid water at a velocity low enough to be non-injurious to the user.
• Eyewashes shall be capable of delivering no less than 0.4 gallons per minute (1.5 liters per minute) of water for 15 minutes.
• Eyewashes shall be designed and installed in such a manner that, once activated, they can be used without requiring the use of the operator’s hands. The user’s hands should be free to hold the eyelids open.
• Eyewashes shall be capable of providing a flushing stream to both eyes simultaneously.
• Eyewashes should be able to be activated in one second or less.

E. Self-contained eyewashes (i.e., units that are not plumbed) are usually discouraged by the Office of Research Safety but if placed in a lab the following guidelines shall be followed.
• The unit must be set up per the manufacturer’s instructions.
• The unit should be filled with water or with the pre-packaged flushing fluid provided by the manufacturer.
• Units should be able to be activated in one second or less.
• Flushing fluid should be exchanged periodically for the unit in accordance with the manufacturer’s instructions or when expired.

F. Supplemental units such as drench hoses are acceptable as additional protection in the event of an emergency but are not intended to be replacements for actual safety showers and eyewashes.

G. Eyewashes of the Guardian™ type are equipped with foam filters underneath the eyewash spray head. These filters can disintegrate over time and must be periodically replaced. To check these filters, the eyewash spray head can be twisted off by hand and if a replacement filter is needed, a work order may be placed with UGA FMD.

IV. Postings & Signage
A. Each emergency safety shower and eyewash shall be marked with highly visible signs with both pictures and text to mark the location of the unit in a manner that should be highly noticeable to those working in the lab.
B. The Safety Information Sign (usually located on or near the back of each exit door from the main lab) should clearly indicate where in the room each eyewash and safety shower is located using simple directional phrases (e.g., to your left) or using highly visible landmarks within the lab (e.g., to the right of the fume hood).
V. Testing Requirements

A. Laboratories should flush eyewash stations weekly. To track the weekly tests, labs may use the Weekly Testing Log appended to this document. Additionally, eyewashes will be tested annually by the Environmental Safety Division.

B. Emergency safety showers will be tested annually by the University’s Environmental Safety Division.

C. Green tags should be attached to each safety shower and eyewash indicating the last date of annual testing by ESD and the initials of the tester.

D. All safety showers and eyewashes should be labeled with a unique identifying barcode beginning with UGAE. If a unit is found that is missing this label, please contact the Environmental Safety Division or the Office of Research Safety.

VI. Contacts

Environmental Safety Division: 706-542-5801
Office of Research Safety: 706-542-5288

VII. References

Design Criteria for Laboratories, 5th Ed., Board of Regents of the University System of Georgia, 2019

Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, 2011


## EYE WASH WEEKLY TESTING LOG

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<th>Notes</th>
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Fume Hood Guidelines & Safe Usage
Version: January 2020

I. Purpose & Scope
This document provides an overview of the University’s requirements for laboratory engineering controls that provide ventilation for laboratory spaces. These include chemical fume hoods, exhaust hoses, canopy hoods, and ventilated cabinets. Included are design specifications and best practices for utilizing these devices in order to maximize efficiency and effectiveness.

II. When to Use a Fume Hood
Fume hoods should be used with open containers of flammable solvents, corrosive materials, irritating vapors or dusts, asphyxiating gases or combustible concentrations of vapors, gases, or dusts.

Keep in mind that some hoods are inappropriate for certain types of operations. Specialized hoods should be used for hot acid digestions, procedures involving perchloric acid, or work with radioisotopes. See section III for additional information regarding fume hood types.

III. Fume Hood Types
A. General Purpose
General purpose chemical fume hoods provide adequate protection for the user from the buildup of toxic or flammable fumes, vapors, or particulates during the course of routine laboratory work. These hoods can be either high performance (low flow) or standard bypass hoods either at constant air volume (CAV) or variable air volume (VAV).

Perchloric acid, radioisotopes, and unstable explosive materials are excluded from use in these types of hoods. Perchloric acid use in these hoods can lead to the buildup of potentially explosive metal perchlorates in hood ductwork. It is also not appropriate to perform acid digestions in these types of hoods.

Name plates are recommended for general purpose hoods that state, “Do not use perchloric acid within hood.”
B. **Perchloric Acid Hoods**
A perchloric acid hood contains a canopy wash-down system and a stainless steel work surface. It is used for laboratory experiments with perchloric acid compounds. These hoods shall not be used for work with sulfuric acid, acetic acid, organic solvents, or any combustible or water-reactive materials. Reactions involving organic material may not be performed in these hoods as they may react violently with perchloric acid if the system is not routinely washed down.

Name plates are required for perchloric acid hoods reading: “Only reactions with perchloric acid are permitted in this fume hood.”

Perchloric acid hoods shall be equipped with an explosion-proof lamp fixture.

C. **Radioisotope Hoods**
Radioisotope hoods are similar to general purpose hoods but they have dedicated exhaust ducts and some may require HEPA filters to ensure that any discharges do not exceed legal release limits. These hoods are also marked with radioactivity symbols. For more information, please contact the Radiation Safety Office.

IV. **Prior to Working in a Fume Hood**

A. Check the blue certification placard to verify that the hood has been tested within the last 12 months and has met university standards. Most often, these placards are located above the sash of the fume hood. Please contact the Office of Research Safety to schedule testing if needed.

B. Know the hazard(s) of the materials used and processes being performed within the hood. Verify that the hood you are using is appropriate for the types of material you are intending to use.

C. Make note of the location of the nearest fire extinguishers, eyewashes, and safety showers. Be sure that pathways to this emergency equipment are unobstructed.

D. Verify that all doors to the laboratory from exterior hallways are closed. Fume hood operation can be compromised if doors to exterior hallways are left open.

E. Check that the fume hood is operating properly by monitoring the hood flow indicator. Depending on the type of hood present in your lab, this may be done in one of the following ways:

- Check the flow indicator light or the digital readout
- Compare the magnehelic gauge reading to a marked set-point. Most often for these gauges, the black needle is meant to fall between two red needles or within a small red circle on the gauge.
- For hoods without a flow indicator, digital readout, or magnehelic gauge reading, holding a tissue (e.g., kimwipe) or paper towel at the face of the hood is a good way to visualize that the hood is still drawing properly.
V. Working in the Fume Hood

A. When possible, elevate large pieces of equipment within the hood to allow air to flow underneath the equipment. Rubber stoppers and metal racks work well for most pieces of routine laboratory equipment.

B. Don appropriate personal protective equipment (PPE) such as gloves, safety glasses, and a lab coat. A fume hood supplements but does not replace PPE. PPE should still be worn when using a fume hood.

C. Reduce foot traffic in front of the hood to decrease turbulence.

D. Ensure that all work is done at least 6” inside the hood.

E. Keep the hood sash closed as much as possible. For vertical sashes, the sash should not be raised higher than 18” while work is being performed in the hood. For horizontal sashes, at least one pane of the sash should be between the user and the experiment at all times particularly if there is a risk of splashing, splattering, or explosion.

F. Never cross the plane of the hood sash with your head or face.

G. Clean the work surface of the hood after each use and wipe down walls, baffles, and sashes at least monthly. Cleaning minimizes the buildup of stains and residue within the hood that can be detrimental to performance and may create compatibility hazards with future uses.

H. If the hood’s low airflow alarm sounds, immediately cease all work in the hood and close any open containers if possible. Lower the sash and exit the area if the situation presents an immediate threat to life and health. As soon as practical, a work order should be submitted to correct the problem.

I. Alarms should never be silenced. Doing so is a safety deficiency that will be noted during a lab safety assessment.

VI. Additional Fume Hood Guidelines & Best Practices

A. Fume hoods should never be used for long-term storage. Doing so can compromise the air flow of the hood, and cause the unit to provide inadequate protection for users. Chemicals not in use should be stored in appropriate safety cabinets either under the hood or elsewhere in the lab.

B. If the hood is equipped with a corrosive storage cabinet, liquid acids should be stored in those cabinets. These cabinets are vented through the hood, limiting the chance of corrosive vapor buildup. Flammable cabinets located under fume hoods are usually not ventilated so the storage of acids in these cabinets can lead to premature corrosion within these cabinets.

C. Sashes should be kept closed when the hoods are not in use and dual horizontal and vertical sashes should not be used simultaneously. Users should determine which
sash would be best to use for each process.

D. Do not place sources of electrical power (power strips or extension cords) or other ignition sources inside the hood. Additionally, electrical cords should not be placed in such a way that they do not allow for the full closure of the sash. When closed the sash should always come into full contact with the airfoil.

VII. Annual Testing
A. UGA performs preventative maintenance and checks of all chemical fume hoods (general purpose, radioisotope, and perchloric acid) in use by suitable quantitative and qualitative testing in the as used condition. Annual tests verify that the hood is operating within university standards.
B. UGA provides full testing to the ASHRAE 110 standard every five years.
C. If a hood does not meet the appropriate standards for use, a visible notice will be placed on the sash describing the limitations on hood use and the reason(s) why the hood does not meet the required standards.

VIII. Specialty Uses
Questions concerning ventilated storage cabinets, canopy hoods, and snorkels should be directed to the Environmental Safety Division. Approved ventilated storage cabinets can be obtained from CRS.

IX. Contacts
Office of Research Safety: 706-542-5288
Environmental Safety Division: 706-542-5801
Radiation Safety: 706-542-0107

X. References
Design Criteria for Laboratories, 5th Ed., Board of Regents of the University System of Georgia, 2019

Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council, 2011
I. Purpose & Scope

This document is meant to provide an overview of the University’s required laboratory postings that are found within both teaching labs and research labs. Questions should be directed to ORS at 706-542-5288.

II. Required Postings

Below is a list of the University’s required laboratory postings. Durable, laminated copies are available from ORS. Other postings and stickers can be requested free of charge by submitting the Request Signs & Stickers Online form.

Always remember that the signs must be clear and easy to read.

A. Emergency Contact Numbers

This posting provides employees and visitors with the main phone numbers to call in the event of an emergency. The sign should be placed on or near the inside of the laboratory door, near eye level. If a landline phone is present in the lab, it is acceptable to post this sign near the phone as well.

B. Safety Information

This posting guides employees and visitors to the location of safety equipment inside or near the laboratory. The sign should be properly filled out and placed on or near the inside of the laboratory door near eye level. Short and easy to understand phrases should be used to indicate the location of the equipment (e.g., To Your Left, Over Your Right Shoulder, At Opposite Door, To the Right of
C. First Aid Kit & Spill Kit

These postings indicate the exact location where employees and visitors can find the first aid kits and the chemical spill kits. Signs should be mounted to walls, preferably at or above eye level, next to or above the kits themselves.

D. Caution/Hazard

In order to bring greater uniformity to safety signs throughout the University and to reduce clutter on laboratory doors and hallways, the University of Georgia provides all laboratories with appropriate door caution signs. These signs warn of potential physical injuries caused by harmful substances, or other unsafe practices. All information contained on the caution sign is helpful to emergency personnel responding to a reported fire, spill or injury in the lab.

All standard safety warnings are concentrated on one laminated 8.5 x 11-inch yellow and black
caution placard. These placards must be posted on all laboratory entrances and in lab service areas where hazardous materials are used or stored. Use a fine point permanent marker, such as a Sharpie®, to mark hazards, degree of hazard, quantities, contact information, date posted, etc. When the information on the sign needs updating, use isopropyl alcohol to erase the old information. DO NOT destroy or dispose of the sign. These placards are meant to be reused. If the lab is to be closed, please return the sign to ORS for reissue to another lab. ORS will verify the information on these signs annually during routine safety assessments.

How to Properly Complete a Caution Sign

Hazards section

The left hand section of the door caution sign is divided into GHS Ratings and Specific Hazards and is used to indicate that a chemical hazard is present in the laboratory. Each hazard is listed by type (health, flammable, reactive, corrosive, or gas cylinder). Place a dark check mark in the appropriate box to the left of the hazard symbol to indicate that a hazard is present. Next, indicate the approximate quantity of the hazard present by listing the amount in the space provided to the right of the hazard symbol. An exact amount is not required, and quantities may be estimated. For example, acetone is used in the lab and is ordered in a 20-liter container. Acetone is a flammable substance, so a check mark is placed in the box to the left of the flammable symbol. In the space to the right of the symbol place the quantity normally found in the lab; i.e., 20 liters. If compressed gas cylinders are present, check the box to the left and indicate the number of cylinders by product in the space to the right of the hazard symbol. For example, three cylinders of carbon dioxide would be written as 3-CO2. If there is not enough space to list all the types of gases present, then list the most hazardous gas(es). The degree of hazard for many commonly used lab chemicals can be found on the manufacturer’s label, on the safety data sheet (SDS), or on the manufacturer’s website.

If your laboratory employs biohazard materials, a biohazard label must be placed in the space provided to the right of the specific hazard box. Please call the Biosafety Office at 706-542-2697 to have the biosafety level in your laboratory assessed and to obtain the appropriate biohazard label for your caution sign.
If your laboratory employs radioisotopes, all radioisotopes listed on the laboratory license must also be listed in the space entitled “Other Hazards” on the caution sign. Additionally, a rad sticker must be placed on the door sign in the space provided to the right of the specific hazard box. Please call ORS at 706-542-5288 to obtain a rad sticker.

**The NFPA Diamond**

The NFPA (National Fire Protection Association) diamond, located on the right-hand side of the door caution sign, is used to record the Degree of Hazard (0 - 4) of all hazardous substances in the lab. The diamond gives a quick visual determination of the highest level of hazards present in a given laboratory and is important for first responders to quickly assess the hazards they may find if they ever need to enter the lab. The NFPA diamond is divided into four sections with the following designations:

- Blue – Health rating
- Red – Flammability rating
- Yellow – Reactivity rating
- White – Special warnings such as oxidizers or air or water reactive substances

Each of the first three sections should be filled in with a number from 0 to 4 to indicate the highest level of hazard found in your lab. For instance, if the most flammable substance in your laboratory has an NFPA flammability rating of 3, a large 3 should be placed in the red box of the NFPA diamond. If the most reactive substance in your lab has a rating of 2, a large 2 should be placed in the yellow reactivity box. Many reagent bottles labels contain NFPA diamonds indicating the associated hazards. In this instance, NFPA ratings are easily determined. If the ratings are not on the bottle, consult safety data sheets (SDS) or NFPA rating charts to get the appropriate ratings.

The white section or “Special Warnings” would contain the symbol A, W or OX indicating that air or water reactive or oxidizing chemicals are present in the laboratory.

**Contact Information**

In this section, list two people that may be contacted in case of an emergency in the laboratory. The first name recorded should be that of the professor who is the primary researcher for the laboratory. His/her department, office room number, home phone number should be recorded (this is preferably a 24-hour contact number). A second name (usually the laboratory supervisor) should be listed in the same manner in the event that the primary researcher cannot be contacted during an emergency. The second person listed should be someone who regularly works in the laboratory and can make responsible decisions in the event of an emergency.

**Date Posted**

Indicate the month followed by the year that the sign is posted to the right of this field. The placard and its contents should be reviewed annually. If any changes are made during the year, the sign should be updated to indicate current laboratory conditions. The date that the sign was updated should be indicated in the date posted section by placing the corresponding month followed by the year.

**III. Contacts**

Office of Research Safety: 706-542-5288  
Environmental Safety Division: 706-542-5801  
Biosafety: 706-542-2697
Radiation Safety: 706-542-5288
Mercury Thermometer Reduction
Version: January 2020

I. Purpose & Scope

Beginning in February 2018, the University of Georgia launched a campus initiative to phase out the use of elemental mercury thermometers. Due to the element’s toxicity and costly remediation, efforts are being made to replace these thermometers with an environmentally friendly equivalent. Though there are many other types of mercury containing equipment: barometers, manometers, sphygmomanometers, float valves, electrical switches, light bulbs, etc., most of these guidelines will only regulate thermometers. The intent is to provide recommendations on safe alternatives, proper disposal of mercury thermometers through UGA’s Universal Waste Program, or guidelines on the appropriate spill kit the lab must maintain if mercury containing equipment remain necessary for research. Appendix I of this SOP also includes a quick reference guide for cleaning up small mercury spills.

II. Mercury Initiative Details

A. All laboratory spaces will voluntarily dispose of intact elemental mercury thermometers through the UGA Universal Waste Program or by contacting the Office of Research Safety (ORS) and requesting a pick-up.

i. To dispose of a thermometer through Universal Waste, secure the thermometer to prevent breakage and request a Universal Waste pick up.

ii. To dispose of a thermometer through ORS, secure the thermometer to prevent breakage, then call the main office at 706-542-5288 to request a pick up. Please include the building where you are located and the room where the thermometers can be found.

iii. PLEASE NOTE: All broken mercury thermometers must be properly remediated, bagged, and all mercury contaminated materials must be disposed of through the UGA Hazardous Waste Program. The Office of Research Safety should be contacted if a mercury thermometer has broken in laboratory equipment or if the spill is more than a few drops.

B. Any laboratory in the process of closing will not be permitted to transfer mercury containing equipment to another lab without the permission of ORS. The accepting lab must have the appropriate spill kit in place before transfer can be approved.
C. Any laboratory that requires mercury thermometers must purchase a mercury spill kit and post detailed instructions on how to safely clean spilled mercury. After the spill is contained, ORS should be notified to verify the absence of mercury vapors. For continued use of mercury thermometers, the PI must sign an agreement declaring that they assume remediation responsibilities of any broken thermometer, while being stored or used (see Appendix II). The PI and Lab Manager are also responsible for training all staff on how to safely remediate small mercury spills. Move the affected person to an area with fresh air. If symptoms persist, get medical attention.

D. Any laboratory that continues to use mercury containing equipment (barometers, manometers, sphygmomanometers, float valves, etc.) must sign an agreement declaring that they will contact ORS should one of these instruments break and a mercury spill occur. These items contain more than a trace amount of mercury and lab staff should not attempt to remediate on their own.

III. Mercury Alternative and Spill Kit

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<td>Non-Mercury Thermometer</td>
<td>Fisher</td>
<td>Central Research Stores</td>
<td>~$5.50</td>
<td>CRS Cat # 951825</td>
<td>Total Immersion, Range: -20/110C</td>
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<tr>
<td>Adc Mercury Spill Kit</td>
<td>Cen-Med</td>
<td>UGAmart</td>
<td>$18.00</td>
<td>980SK</td>
<td>Adequate for small mercury spills</td>
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</tbody>
</table>

Please note: These prices and product numbers are subject to change.

IV. Contacts
Environmental Safety Division: 706-542-5801
Office of Research Safety: 706-542-5288
# APPENDIX I: CLEANING UP MINOR MERCURY SPILLS

## Elemental Mercury Spills

Elemental mercury is a shiny liquid that is often found in thermometers, switches, and pressure gauges. Exposure to liquid mercury and its vapor is toxic. Spills of greater than a few drops must be reported to Research Safety at (706) 542-5288.

**Laboratory personnel should be able to clean up small spills of mercury (a few drops or less) with the appropriate supplies.**

### When a Spill Occurs
- Isolate the area and keep lab personnel away. Remember mercury beads tend to scatter.
- Inform others in lab of the spill.
- For spills of a few drops or less, use a mercury spill kit.
- For larger spills or if lab personnel are unable to perform a cleanup, call 911 and request assistance.

### Spill Cleanup Procedure
- Wear gloves.
- Turn off lights and shine flashlight along the spill surface to locate mercury beads.
- Use index cards to push beads together and an eyedropper or pipette to pick them up.
- Place mercury into a plastic bag.
- Sprinkle zinc flakes on the spill area and moisten with water.
- Use index cards etc. to clean up the mercury zinc mixture.
- Place the mercury zinc mixture, gloves, broken thermometer etc. into bag(s) and zip shut.
- Place bag(s) into a secondary container and seal shut.
- Label the container as “Hazardous Waste, Toxic, Mercury Spill Materials”.

## Spill Control Supplies

Use either a mercury spill kit or make one using the following:
- Nitrile gloves
- Zinc flakes
- Eye dropper
- Plastic bags
- Index Cards
- Flashlight

- Never touch mercury
- Never use a household vacuum to clean up spills
- Never use a broom

For mercury spills in sinks, carpet, or equipment, call the UGA Office of Research Safety at (706) 542-5288 for assistance.
APPENDIX II: MERCURY THERMOMETER/EQUIPMENT INITIATIVE OPT-OUT FORM

This lab requests to use elemental mercury containing thermometers and/or equipment for the purpose of research. Though the University of Georgia has made efforts to phase out elemental mercury, the research conducted in this lab space requires its use. This lab assumes all responsibility for safely remediating all broken elemental mercury thermometers. An Emergency Mercury Spill Kit will be purchased by this lab in case of accidental release of mercury from a broken thermometer. Guidelines on proper disposal and usage of the Emergency Mercury Spill Kit must be posted in a prominent place within the lab.

If the spill is a result from a larger piece of equipment breaking or small releases into other types of equipment (incubators/refrigerators), immediately contact Research Safety for an emergency spill clean-up response.

Principal Investigator: ____________________________________________________________

Department: ___________________________________________________________________

Building / Room: _________________________________________________________________

PI Signature: ___________________________________________________________________

Date: __________________________________________________________________________
I. **Purpose & Scope**

This document is meant to provide an overview of the University’s requirements and recommendations for the use of personal protective equipment (PPE) while handling hazardous substances. Improper or negligent use of PPE could result in serious injury to yourself or others. Please refer to individual chemical safety data sheet (SDS) for appropriate PPE required for each process and always remember that PPE should not be relied on as the only protection against hazards. It should be used in conjunction with engineering controls (e.g., fume hoods) and administrative controls (e.g., using less hazardous alternatives).

II. **Hazard Assessments**

Whether it is formal or informal, a hazard assessment is typically performed before starting any laboratory operation to determine what safety controls should be in place to protect personnel and property. These assessments can be done for either an entire area or lab, a particular job category, or for an individual. If lab users are unsure about the type of PPE necessary for a particular job class or area, it is highly recommended, that they perform a formal hazard assessment before starting any work. Appended to this document is a formal PPE hazard assessment template with instructions on how to use it. Once completed, a formal hazard assessment should be signed by the evaluator and kept on file within the lab. Labs can reach out to any of the departments listed in the Contacts section of this document if they have any questions or concerns about completing a hazard assessment.

III. **Laboratory Attire**

Proper laboratory attire should be worn by all those working in the laboratory whether an individual is actively working with hazardous substances or not. Accidents involving experiments nearby can still inflict injury to those not actively working at lab benches or fume hoods. For this reason, anyone entering the lab space must be wearing at a minimum:

- Flat bottomed shoes that cover the tops of the feet, heels, and toes. No opened toe shoes, Crocs® or any other shoe that exposes part of the foot should be worn in the laboratory.
- Long pants completely covering the user to the ankle. No ripped jeans, shorts, capris, skirts, or pants with sheer panels should be worn in the lab.
- Shirts or tops worn in a lab must cover the user’s torso and shoulders at a minimum. No tank tops, cropped shirts, or ripped shirts should be worn in the lab.

In addition to these requirements, the following recommendations are made regarding proper laboratory attire

- Choose clothing made of natural fibers such as cotton whenever possible as they are more fire resistant than synthetic fibers such as polyester or nylon.
- Wear clothing that accommodates lab coat use.
- Wear clothing that is loose enough to be easily removed in the case of any emergency. Tight clothing that adheres to the body can be difficult to remove in the event of a chemical exposure and can lead to more serious injury.
- Keeping a change of clothes or scrubs in the laboratory is recommended. This allows users to wear other types of clothing for classes or jobs outside of a laboratory setting. Additionally, users will have a backup set of clothing in case the clothing being worn becomes contaminated.

IV. Eye Protection

All employees and students who participate in or observe any of the following functions shall wear proper eye protection: chemical, physical, or combined chemical-physical operations involving caustic, toxic, irritant, or explosive materials, hot liquids or solids, injurious radiation, biohazards, or any dispensing of hazardous chemicals. Eyewear should be cleaned before being issued to a different user. It is recommended that contact lenses not be worn (even with additional eye protection) in environments involving chemical splash hazards or potential vapor exposure.

B. Chemical Goggles - Chemical splash goggles that have splash proof sides to fully protect the eyes shall be worn when participating in or observing procedures using liquid hazardous chemicals that are corrosive or highly toxic.
C. Face Shield - Face shields are required when there is need for protection of the entire face and neck area. Face shields must be worn over top of safety glasses or goggles, they are not an alternative to safety glasses or goggles.
D. Specialty Eyewear – If ultraviolet (UV) light or lasers are used in the lab, specialty eyewear is required to ensure adequate protection during each of these processes.
V. Splash Protection
Lab coats and aprons must be donned before the handling of chemicals, biohazardous material, or radioactive substances. Lab coats and aprons must cover the user to the knees.

A. Aprons - Aprons resistant to the chemical to be used shall be provided to workers when the potential for skin absorption exists.
B. Laboratory Coats - Laboratory coats are intended to prevent contact with the minor chemical splashes and spills encountered in a laboratory. Laboratory coats which do not significantly resist penetration by organic liquids shall be removed immediately when they become contaminated. Laboratory coats shall be worn in the immediate areas where hazardous materials are actively being handled or used. Laboratory coats used during the handling of hazardous chemicals, biohazards, or radioactive substances should not be worn in other areas outside the laboratory such as offices, cafeterias, restrooms, or libraries.

VI. Hand Protection
Protective gloves must be worn while using any hazardous material: chemicals, hot or cold liquids, objects that pose a risk of thermal burns, cryogenics, physical hazards, or equipment that may cause hand injury. The gloves must be appropriate for the material or process being used. Always check your gloves for physical damage such as tears or small pin holes, prior to use.

A. Chemical Resistant – Nitrile gloves are the recommended choice when working with hazardous chemicals as they provide protection against a wide range of solvents. Chloroprene gloves provide protection against specific chemicals that other disposable gloves do not. Although nitrile gloves provide the broadest range of protection, other specialty gloves may be needed for the handling of certain substances (e.g., methylmercury compounds require the use of silver shield gloves). Double gloving should be exercised when working with highly toxic or corrosive substances.
B. Cryogenic – Cryogenic gloves offer protection against cryogenic liquids and extreme cold, such as liquid nitrogen.
C. Heat Resistant – Heat resistant gloves should be worn to protect the user from hot surfaces such as ovens, autoclaves and microwaves.

VII. Respiratory Protection
Contact either the Office of Research Safety (ORS) or the Environmental Safety Division (ESD) for advice regarding the purchase of respirators. All operations within a laboratory facility that involve the transfer or alteration of a hazardous chemical which may generate air contaminants at or above the appropriate occupational
exposure levels shall be carried out in a chemical fume hood appropriate for the work being performed. If the use of a fume hood is not appropriate or practical, then respirators may be required. If respirators are to be used in the lab, all users must enroll in the UGA Respiratory Protection Program. Contact ESD for further information regarding the use of respiratory protection.

A. **Air Purifying Respirators** – N95, Half Face APR (air purifying respirator), PAPR (powered, air-purifying respirator) and Full Face APR. These respirators are designed to filter out the airborne particles in the air. These are not meant for use in areas of oxygen deficiency and respirator cartridges should be appropriate for the contaminant being filtered.

B. **Atmosphere Supplying Respirators** – Supplied Air (SA) or Air Line respirators and Self- Contained Breathing Apparatus (SCBA) supply the user with fresh breathable air in an immediately dangerous to life or health atmosphere.

**VIII. Other Types of Hazards and Associated PPE**
Types of hazards that are not usually encountered in a laboratory setting include noise hazards and fall hazards. While rarely seen in traditional laboratories, UGA researchers may come across these hazards while conducting research either on campus or in the field. Each of these situations needs to be assessed for the types of risks and hazards presented by the task and then decisions about appropriate PPE should be made based on the risk assessment.

Areas and activities that may present noise hazards include mechanical rooms, machining, grinding, sanding, pneumatic equipment, grounds equipment, generators, motors, saws, jackhammers, and similar equipment. Work in these areas may require earmuffs or earplugs.

Areas and activities that may present fall hazards include working on a surface with an unprotected side that is more than four feet above a lower level, elevated platforms, tree trimming, or performing work on poles, roofs, or fixed ladders. Work in these areas may require a written Fall Protection Plan outlining the use of fall protection PPE.

Other types of hazards not addressed by this SOP may be encountered from time to time and researchers should contact either the Office of Research Safety or the Environmental Safety Division if they have questions about the appropriate PPE for any hazardous research area or activity.

**IX. Contacts**
Office of Research Safety: 706-542-5288
Environmental Safety Division: 706-542-5801
ESD, Industrial Hygiene and Occupational Safety: 706-713-2728
X. References


Personal Protective Equipment
(PPE) Hazard Assessment

Instructions:

PPE use should be considered only as a last resort to minimize exposure to workplace hazards. PPE should always be used in combination with other control strategies, such as engineering controls and administrative controls.

This assessment addresses PPE use for the minimization of exposures to eye, face, head, hand, foot, torso, respiratory, noise, and fall hazards.

General Guidelines:

The PPE Hazard Assessment can be conducted for an area, a job category or for an individual by selecting and filling in the appropriate box. The assigned evaluator should include their name, department/division being assessed, and the date. Completed assessments must be accessible to employees and EH&S inspectors. Assessments should be updated as needed to reflect current work tasks and procedures.

PPE HAZARD ASSESSMENT INSTRUCTIONS

STEP 1: INFORM AFFECTED EMPLOYEES OF THE PROCESS:
Affected employees from each work area that is being assessed should be involved in the process. Discuss the reasons for the survey and the procedures being used for the assessment. Review the job procedures, potential hazards and the PPE currently in use.

Step 2: Review data:
Reports of work-related injuries or illnesses, near-miss events and reported safety concerns are sources of data that can provide helpful information for assessing hazards.

Step 3: Conduct a walk-through survey:
The purpose of the survey is to identify sources of hazards to employees. Observe the following: layout of the workplace, location of the employees, work operations, hazards and places where PPE is currently used including the device and reason for use. Using the form, check the type of hazard(s) present within each section (organized by body part). Further descriptions can be provided in the adjacent box.
Consideration should be given to the following basic hazard categories:
1. Impact (falling/flying objects)
2. Penetration (sharp objects piercing foot/hand)
3. Compression (roll-over or pinching objects)
4. Chemical exposure (inhalation, ingestion, skin contact, eye contact or injection)
5. Temperature extremes (heat/cold)
6. Dust/flying debris (grinding, chipping, sanding, etc.)
7. Fall (slip/trip, scaffolds, elevated work)
8. Radiation (non-ionizing: UV/IR/light, welding, brazing, cutting, furnaces, etc.)
9. Noise (mechanical rooms, machines, cage washing, jackhammers, etc.)
10. Electrical (shock, short circuit, arcing, static)

**Step 4: Select PPE:**
After considering and/or planning for other controls, select the PPE which provides at least the minimum level of protection required to protect employees from the hazards. Using the form, note the appropriate PPE in the required PPE box. For help with proper PPE selection, contact ESD Industrial Hygiene & Occupational Safety (IHOS).

**Step 5: Make Document Accessible:**
Once completed, signed and dated, store the form either electronically or as a hard copy in a location easily accessible to employees and EH&S inspectors.

**Step 6: Revise Procedures:**
Update workplace procedures/SOPs with the new or modified PPE requirements if applicable. Attach or append this hazard assessment to any affected procedures.

**Step 7: Reassess the workplace as necessary by identifying and evaluating:**
1. New equipment and processes
2. Accident records
3. Suitability of previously selected PPE

Please contact ESD Industrial Hygiene and Occupational Safety (IHOS) by phone at 706-713-2728 or email at ihos@uga.edu for PPE selection guidance, resources and assistance.
PPE Hazard Assessment

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<thead>
<tr>
<th>I am reviewing (check the appropriate box):</th>
<th>Location:</th>
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</thead>
<tbody>
<tr>
<td>A worksite</td>
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<tr>
<td>A single employee’s job description</td>
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<tr>
<td>A job description for a class of employees</td>
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</table>

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<tr>
<th>Your Name:</th>
<th>Department/Division:</th>
<th>Date:</th>
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</table>

**EYE HAZARDS:** Tasks that can cause eye injury include: working with chemicals or acids; UV lights; chipping, sanding, or grinding; welding; furnace operations; and metal and wood working.

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<thead>
<tr>
<th>Check the appropriate box for each hazard:</th>
<th>Description of hazard(s):</th>
<th>Required PPE</th>
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<tbody>
<tr>
<td>Chemical Exposure</td>
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<td>High Heat/Cold</td>
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<td>Dust/Flying Debris</td>
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<td>Impact</td>
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<td>UV/IR Radiation</td>
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<td>Other:</td>
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**HEAD/NECK/FACE HAZARDS:** Tasks that can cause head/neck/face injury include: working below other workers who are using tools or materials that could fall, working on energized electrical equipment or utilities, and working in trenches or confined spaces.

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<tr>
<th>Check the appropriate box for each hazard:</th>
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<td>Chemical Exposure</td>
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<td>Dust/Flying Debris</td>
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<td>Electrical Shock</td>
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<td>Other:</td>
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**FOOT HAZARDS:** Tasks that can cause foot injury include: exposure to chemicals or acids, welding or cutting, materials handling, renovation or construction, and electrical work.

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<tr>
<th>Check the appropriate box for each hazard:</th>
<th>Description of hazard(s):</th>
<th>Required PPE</th>
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<tr>
<td>Chemical Exposure</td>
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<tr>
<td>High Heat/Cold</td>
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<td>Impact/Compression</td>
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<td>Electrical</td>
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<td>Puncture</td>
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<tr>
<td>Slippery/Wet Surfaces</td>
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<td>Other:</td>
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</table>
# PPE Hazard Assessment

## Hand Hazards:
Hand injury can be caused by: working with chemicals or acids, exposure to cut or abrasion hazards (for example, during demolition, renovation, woodworking, or food service preparation), work with very hot or cold objects or materials, and exposure to sharps.

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<tr>
<th>Hazard</th>
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<th>Required PPE</th>
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<td>Chemical Exposure</td>
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<td>Puncture</td>
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<td>Cuts/Abrasion</td>
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<td>Other:</td>
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## Body Hazards:
Injury of the body (torso, arms, or legs) can occur during: exposure to chemicals, acids, or other hazardous materials; abrasive blasting; welding, cutting, or brazing; chipping, sanding, or grinding; use of chainsaws or similar equipment; and work around electrical arcs.

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<tr>
<th>Hazard</th>
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<tr>
<td>Chemical Exposure</td>
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<td>Electrical Arc</td>
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<td>Cuts/Abrasion</td>
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<td>Other:</td>
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## Fall Hazards:
Personnel may be exposed to fall hazards when performing work on a surface with an unprotected side or edge that is 4 feet or more above a lower level, or 10 feet or more on scaffolds. Fall protection may also be required when using vehicle man lifts, elevated platforms, tree trimming, performing work on poles, roofs, or fixed ladders.

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<tr>
<th>Hazard</th>
<th>Description of Hazard(s)</th>
<th>Required PPE</th>
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<tr>
<td>Fall hazard</td>
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## Noise Hazards:
Personnel may be exposed to noise hazards when working in mechanical rooms; machining; grinding; sanding; cage washing; dish washing; working around pneumatic equipment, grounds equipment, generators, chillers, motors, saws, jackhammers, or similar equipment.

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<tr>
<th>Hazard</th>
<th>Description of Hazard(s)</th>
<th>Required PPE</th>
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<tbody>
<tr>
<td>Noise hazard</td>
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## Respiratory Hazards:
Personnel may be exposed to respiratory hazards that require the use of respirators: during emergency response, when using certain chemicals outside of a chemical fume hood; when working with hazardous powders; when entering fume hood plenums, when working with animals; when applying paints or chemicals in confined spaces; when welding, cutting, or brazing on certain metals; and when disturbing asbestos, lead, silica, or other particulate hazards.

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<tr>
<th>Hazard</th>
<th>Description of Hazard(s)</th>
<th>Required PPE</th>
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<td>Chemical exposure</td>
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<td>Particulate exposure</td>
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<td>Other:</td>
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I certify that the above hazard assessment was performed to the best of my knowledge and ability, based on the hazards present on this date.

__________________________ (signature)
I. Purpose & Scope

The following standard operating procedure (SOP) provides direction and guidance for the selection of a Unit Safety Officer (USO) and an outline of the required training and responsibilities for the role. For this SOP, the term “Unit” can be defined as either a department, college, or center; the scope of the term, and thus the scope of the USOs oversight will be determined by each individual entity.

USOs will serve as liaisons between their designated department, college, or center and the Office of Research Safety (ORS) to help ORS ensure that safety and regulatory requirements are being met by laboratory personnel. Opting into the program will be voluntary for units.

II. Requirements & Eligibility

a. Units are given the option to nominate someone to serve as the USO. They have the flexibility to nominate for an entire department, college, or center, depending upon the complexity and breadth of a particular program.

b. It is preferable that the USO be a full-time staff member or faculty member within the unit they represent. Students are not eligible for this role. USOs that are staff must be authorized to attend faculty meetings to keep abreast of upcoming faculty hires, departures, and laboratory relocations.

c. There is no term limit for someone assigned to the role of USO and no backup USO will be necessary.

d. Each USO will receive endorsement from ORS to perform the responsibilities listed in Section III after completing the following training requirements.

i. An initial training will be provided by ORS to all individuals nominated for the role. The training will cover the following:
   • Overview of ORS programs including inspection procedures, fee-for-service, and emergency response procedures
   • Overview of ORS interactions with other groups such as the Environmental Safety Division and the Facilities Management Division
   • Overview of Chematix functionality and the Learning Management System
   • An introduction to the web-forms used by ORS
   • Lab-specific Chemical Safety Plans
   • Respiratory Protection Program
   • Laboratory opening, relocation, and decommissioning procedures including equipment decontamination

ii. Each new USO will be required to shadow an ORS inspector on one safety inspection within their unit.

e. ORS will provide periodic training and announcements to discuss challenges, provide updates on
policy changes, and highlight potential areas for improvement with the program. These trainings and announcements will primarily be given through the Learning Management System.

f. It is highly encouraged that individuals agreeing to serve in this role be credited or compensated in some way, but specifics for how to do so will be left to the individual units.

III. Responsibilities

a. USOs will have the following responsibilities:
   i. Work with ORS to coordinate training for faculty, staff, and students working in laboratories within the unit.
   ii. Collect informal feedback from researchers and lab personnel.
   iii. Serve as a conduit for ORS announcements related to lab safety policy changes or updates.
   iv. Relay information to ORS regarding any near-misses or laboratory accidents.
   v. Serve as a liaison for fee-for-service requests.
   vi. Notify ORS of any upcoming laboratory openings, closings, relocations, or renovations.
   vii. Attend faculty meetings and serve on the unit’s safety committee if one exists.
   viii. Receive lab safety summaries for all laboratories in the unit. These summaries will be provided by ORS and will cover common findings, highlighting problematic laboratories.
   ix. Stay up to date on training for hazardous waste management and right-to-know training.
   x. Maintain contact information for ORS, the Environmental Safety Division, and the Facilities Management Division.

b. USO responsibilities will NOT include the following:
   i. Scheduling or performing any sort of laboratory safety assessment
   ii. Documenting safety related concerns or problems; this will be done by ORS after being notified by the USO
   iii. Cleaning any laboratory space
   iv. Taking corrective actions on behalf of laboratories within the unit. This responsibility will still rest with the PI and lab personnel of each individual lab
   v. Serving in any sort of on-call capacity; this role will only function during normal business hours

IV. Making Changes

If a unit would like to change the USO they have nominated or if a USO decides to step down from the role, they must notify ORS by contacting the Senior Safety & Compliance Office for Chemical Safety. Contact information is provided below:

K. Brandon Foskey
brfoskey@uga.edu
706-542-9088
Laboratory Decommissioning Guidelines

Version: May 2019

I. Purpose & Scope

This standard operating procedure provides direction and guidance for proper decommissioning of a laboratory whether it be due to retirement, relocation, or the Principal Investigator (PI) ceasing to work at UGA. Outlined below are the minimum safety and regulatory requirements that must be met by laboratory personnel before a PI can be relieved of the responsibility for a space.

II. General Decommissioning Guidelines

a. When preparing for a laboratory decommissioning, the PI or their designee should first fill out the online Laboratory Closing/Relocation Form. This not only informs the Office of Research Safety of your intentions, but also allows ORS the opportunity to consult with other offices that need to be involved in the lab decommissioning. Ideally, this form should be submitted 45-60 days prior to the planned date of decommissioning and/or relocation.

b. Any packaging or moving of lab items should occur during normal business hours so that in the event of a spill or accident, safety staff will be readily available to respond and assist the lab.

c. Equipment designated for relocation to a new laboratory and laboratory equipment to be left in place for the next occupant should be cleaned and decontaminated in accordance with the Laboratory Equipment Decontamination SOP. The transportation of heavy equipment should be arranged with FMD Support Services.

d. During cleanup and decommissioning, laboratory staff are expected to wear the appropriate personal protective equipment (PPE) necessary for whatever task they are performing.

e. PIs or their designees have the responsibility to remove all waste and hazardous substances from their assigned laboratory spaces before ORS can remove them from responsibility for their lab spaces.

i. Arrange for pickup of sharps containers through an approved vendor. Some departments already have contracts in place so contact your department for additional information.

ii. Any biohazardous waste must be properly disposed of (e.g., autoclaved).

iii. Any EPA regulated hazardous waste must be picked up by the UGA Hazardous Waste Group. These include any hazardous waste streams generated by the lab during normal operations as well as any hazardous chemicals that the PI is planning to leave behind. See below for information on transferring unwanted chemicals to other researchers. The appendix to this SOP details how to create waste cards and request pickups of your hazardous chemicals and EPA regulated waste.

iv. Any radioactive waste must be disposed of through the Office of Radiation Safety. If you have a piece of equipment destined for property surplus with a sealed radioactive component, that component must be removed by the Office of Radiation Safety prior to the equipment being sent to surplus.

v. Glass disposal boxes should be sealed shut and taken to the nearest dumpster by laboratory staff.
Refrigerators, freezers, and cold rooms should be emptied, cleaned, and decontaminated (see the Laboratory Equipment Decontamination SOP). If samples are being left behind for use by another research group, these samples must be clearly labeled to indicate their contents. Labeling these sample containers with just initials or sample ID numbers is not acceptable.

III. Special Considerations for Chemical Hazards

a. If there are chemicals intending to be transferred to another laboratory, please keep a list of the following information for each chemical container being transferred. Once transfers have been completed, this list will need to be sent to the Office of Research Safety to ensure that inventory records are accurate:
   i. UGA Chematix barcode number
   ii. Building number and room number that the chemical is being transferred to
   iii. Last name of researcher taking responsibility of the chemicals
b. If chemicals need to be transported within a building or to an adjacent building, these transfers may be done by lab staff using a hand-truck or cart. Chemicals should be packaged in sturdy, compatible containers with absorbent pads or absorbent materials when transporting liquids. Special care should be taken to not package incompatible materials together (e.g. oxidizers with flammables, acids with bases). If hazardous chemicals are needing to be transported to an offsite location or to a non-adjacent campus building, please contact the Office of Research Safety to coordinate the transfer. See the ORS Guide to Relocating Hazardous Materials for additional information.

c. If the lab has compressed gas cylinders, these cylinders must have all regulators removed and safety caps replaced. Pickup will need to be coordinated with the vendor.

d. For labs with IBC protocols, IACUC protocols, or radioactive material permits, you should contact the appropriate office to discuss how to amend or close your existing protocols or permits.

IV. Guidelines for Transport of Freezers Containing Infectious Agents

a. Everything within the freezer must be secured. Any item that cannot be secured must be packaged and transported in accordance with DOT/IATA regulations.
b. Perform a surface decontamination of the outside of the freezer with an appropriate disinfectant. Affix a decontamination tag and the PI’s name on the front of the freezer.
c. Place tape around the seal of the freezer door.
d. Lock the freezer door with a keyed or combination padlock.
e. At least two wide moving straps must be tightly secured around the freezer (one at the top and one at the bottom).
f. Tape a large Ziploc bag containing an itemized inventory of the freezer contents to the freezer. Any applicable transport permits will need to be included with the inventory.
g. FMD Support Services should only use a truck with a generator and outlets to move these freezers whenever possible. They must be certain that freezers are secure prior to transport.
h. PIs must amend transport permits as needed. Movement of freezers to new locations will require escort by a certified shipper who must have a biological spill kit readily available. If the lab does not have a certified shipper, please contact the Office of Biosafety.

V. Contact Information

<table>
<thead>
<tr>
<th>Department</th>
<th>Phone Number</th>
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<tbody>
<tr>
<td>Biosafety</td>
<td>706-542-7265</td>
</tr>
<tr>
<td>Radiation Safety</td>
<td>706-542-0107</td>
</tr>
<tr>
<td>Research Safety</td>
<td>706-542-9088</td>
</tr>
<tr>
<td>FMD Support Services</td>
<td>706-542-7584</td>
</tr>
</tbody>
</table>
Appendix: Creating Waste Cards and Submitting Pickup Requests for EPA Regulated Hazardous Waste

Creating Waste Cards
- Go to https://chematix.uga.edu and login with your UGA ID and password
- Click the Waste Module at the top of the screen
- Click ‘Create A Waste Card’
- Then you can click whichever link is applicable (either ‘Chemical Mixture By Percentage’ or ‘Pure Chemicals in Individual Containers’).
- Fill out the applicable information and click ‘Generate Waste Card’. Also, note that if this is a waste stream that you generate frequently, you can add it to your Hotlist by clicking Save to Hotlist at the bottom of the page. This enables you to simply click that Hotlist link next time and automatically generate a waste card rather than having to fill out all of the information every time.
- You will complete this step any time you start to fill a container with waste; once the containers are full, you will need to then create a Waste Pickup Request.

Creating a Pickup Request
- Go back to the main Waste Module page within Chematix.
- Click ‘Create Waste Pickup Worksheet’
- Select your location from the drop down list and then your created waste cards should be populated.
- Select the ones you want to be picked up and then click ‘Add Selections to Worksheet’
- Once that is done you should see a button that says ‘Submit for Pickup’
- There is sometimes a 1-2 week turnaround for waste pickups because our waste vendor is based out of Atlanta.
Laboratory Equipment Decontamination Guidelines

Version: May 2019

I. Purpose & Scope

This standard operating procedure provides direction and guidance for proper cleanup and decontamination of common laboratory equipment in preparation for equipment removal, moving to another lab, or being relocated to property surplus. Outlined below are the minimum safety and regulatory requirements that must be met by laboratory personnel before any laboratory equipment can be moved for relocation, disposal, repair, and/or storage.

The scope of this SOP only covers laboratory equipment, both mobile and stationary, that over the course of routine lab use, can reasonably be expected to possibly come into contact with hazardous chemicals, biohazardous material, or radioactive material. This policy does not cover office equipment or similar items that under the course of normal laboratory operations would not be expected to come into contact with hazardous materials.

II. Cleanup & Decontamination Guidelines

a. All laboratory equipment must be cleaned regardless of whether or not it has come into contact with any biological, chemical, and/or radioactive material.

b. All laboratory equipment that has been in contact with any biological, chemical, and/or radioactive material must be cleaned and decontaminated.

c. Each piece of equipment set aside for removal or relocation must have a decontamination tag (see appendix) attached to the piece of equipment.

i. By signing and dating the top line on the tag you are certifying that this piece of equipment has never been exposed to any radioactive materials, biohazards, or chemical hazards.

ii. If the first statement on the tag cannot be certified beyond doubt by someone in the laboratory or department, then the second portion of the tag should be filled out detailing how the equipment was decontaminated.

d. Appropriate personal protective equipment (PPE) should be worn when performing decontamination of laboratory equipment (at a minimum, nitrile gloves, safety glasses, and a lab coat).

III. Guidelines for Common Laboratory Equipment

a. Biological Safety Cabinets – BSCs should be emptied and cleaned. Perform a surface decontamination using an appropriate disinfectant, allowing for proper contact time. Close the sash and affix a decontamination tag.

i. If the BSC is going to be removed from the lab, in addition to the surface disinfection, it needs to have the HEPA filter decontaminated by an appropriate method (e.g., VHP, formaldehyde gas). This will need to be coordinated with an outside vendor. You may contact the Office of Biosafety for recommendations.

b. Centrifuges – surface disinfect interior and exterior of centrifuges with an appropriate disinfectant,
allowing for proper contact time. Affix a decontamination tag.

c. **Fume Hoods** — these should be emptied and cleaned with an appropriate disinfectant. Reasonable measures should be taken to remove stains from the work area and from the sashes. Close the sash and affix a decontamination tag

i. If the hood has been used to perform hot acid digestions of any kind, additional precautions may need to be taken prior to hood service or removal. Please contact the Office of Research Safety for an evaluation.

d. **Incubators** — turn off incubators, remove water pans, wash them and dry them with paper towels and place the water pans back in the incubator. Surface disinfect interior and exterior of incubators with an appropriate disinfectant and allow for proper contact time. Affix a decontamination tag.

e. **Refrigerators and freezers** — these should be emptied and cleaned. Perform an interior and exterior surface disinfection using an appropriate disinfectant, allowing for proper contact time. Affix a decontamination tag.

i. If a freezer containing infectious agents needs to be moved, please refer to “Guidelines for Inter-Entity Transport of Freezers Containing Infectious Agents.”

ii. A refrigerator or freezer will not be moved if it contains any chemically hazardous agents. These agents should be removed by the lab and packaged separately for transport.

f. **Shakers and scales** — wipe clean with an appropriate disinfectant and affix a decontamination tag. Make every reasonable effort to remove visible stains and debris.

**IV. Special Considerations**

a. FMD Support Services will not move any piece of laboratory equipment that does not have a decontamination tag affixed to it. They have the right to refuse service if they do not feel that equipment has been properly cleaned and decontaminated.

b. All equipment with a radioactive element or used with radioisotopes must be cleared by the Office of Radiation Safety prior to being moved. This will need to be arranged by the laboratory by contacting the Office of Radiation Safety. A decontamination tag will need to be affixed after the equipment has been cleared.

c. A proper disinfectant will vary depending on the types of hazards used with a piece of equipment. If your hazards are primarily biohazardous in nature and you have questions about an appropriate method of decontamination not addressed by this SOP, please contact the Office of Biosafety. If your hazards are primarily chemical in nature and you have questions about an appropriate method of decontamination not addressed by this SOP, please contact the Office of Research Safety.

**V. Contact Information**

<table>
<thead>
<tr>
<th>Service</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biosafety</td>
<td>706-542-8043</td>
</tr>
<tr>
<td>Radiation Safety</td>
<td>706-542-0107</td>
</tr>
<tr>
<td>Research Safety</td>
<td>706-542-9088</td>
</tr>
<tr>
<td>FMD Support Services</td>
<td>706-542-7584</td>
</tr>
</tbody>
</table>
Decontamination Tag

This equipment has NOT been exposed to hazardous chemicals or infectious organisms and may be safely serviced, repaired, disassembled, or transferred to another location.

Signature     Date

----OR----

This equipment was decontaminated with:

________________________________________

________________________________________

________________________________________

Signature     Date

Title

Contact Information

ORIS Signature (if requested)     Date
(Biosafety signature required for items from BSL-3 labs)

Research Integrity & Safety | https://research.uga.edu/compliance/
I. Purpose & Scope
The following procedure contains safety guidelines and reference information for the physical relocation of hazardous materials and is primarily written for laboratory relocations. These guidelines are based on established policies and procedures drawn from several oversight groups including Chemical Safety, Radiation Safety, Biosafety, and the Environmental Safety Division. Planning and preparing for your move is the perfect time to update your chemical and equipment inventories, clean out unusable and outdated materials, and repair or discard broken equipment.

II. Planning for the Move

A. In the planning stages, the following groups must be informed a month prior to the move:

- Office of Research Safety (ORS): The Opening, Closing, or Relocation Form must be completed. This form is the first step of a lab move and is located on the ORS webpage. After submitting the form, an ORS representative will reach out to the laboratory and contact all involved compliance groups which may include the Office of Biosafety, the Office of Radiation Safety, and/or the Environmental Safety Division (ESD).
- Facilities Management Division (FMD) Support Services: Support services is tasked with coordinating equipment moves, but note that FMD will not move chemicals.

B. ESD-Hazardous Materials Group will be consulted before the packing process and prior to the move. If the move is within the same building or to an adjacent building on campus, laboratory staff may be given authorization to move properly packed chemicals using a hand-truck, dolly, or cart.

C. If hazardous materials are being transported to an off-site location or a non-adjacent building, ESD will need to be consulted for an appointment to pack and ship all hazardous materials.

D. Trained staff using university vehicles must be used to transport hazardous materials on campus. The use of private vehicles to transport hazardous materials is prohibited.
E. **Radioactive materials** – The Radiation Safety Officer must clear any lab with radioactive materials before a move. To move radioactive materials on- or off-campus, arrangements must be made through the Radiation Safety Office. Prior to moving radiation sources to other on-campus locations, the lab permit needs to be amended. The Radiation Safety Office can be contacted for additional information.

F. **Biohazardous materials** – The University Biosafety Office must be contacted prior to the relocation of any biologically hazardous materials and equipment including all biological safety cabinets. Biohazardous materials must be properly packaged prior to the move. The Biosafety Office can be contacted for additional information.

III. **Deciding What Items to Move**

At least four weeks (preferably two months) before the move:

A. Inspect existing chemicals and equipment in your laboratory.
B. Evaluate your relocation site and move only those items that will be of use at the new laboratory.
C. Unwanted chemicals that have not been opened can be relocated through the University’s chemical surplus program operated by Central Research Stores.
D. Prepare to dispose of opened containers of chemicals that you no longer want. This will include unusable, expired and/or inherently waste-like chemicals. Process these chemicals for disposal through the University’s Hazardous Waste Program as soon as possible because it may take three to four weeks from the time of the initial request for the hazardous waste vendor to perform a pickup. If a complete lab clean-out is required, contact the Hazardous Materials Group as soon as possible so that proper arrangements can be made.
E. Arrange to give unserviceable equipment and items that are broken or that will not be used to the unassigned property unit (surplus properties).
F. Schedule equipment repair before you move so that only properly functioning equipment is moved.
G. Check all equipment for chemical or radioactive contamination. If you need assistance with this, contact the appropriate department.
H. Contact Radiation Safety to have radioactive waste removed.
I. Check all cabinets, drawers, closets, and fume hoods for chemicals that might have been left.
J. Verify that shared storage areas have been cleared of all chemicals belonging to this laboratory. If they are to remain they will need to be transferred to another Principal Investigator (PI) before the lab space can be closed.

IV. **Moving Supplies**

Check to ensure that you have all the supplies and equipment you need to pack. Some of the items listed below are available through various offices so please contact ORS to check availability prior to purchasing items. At a minimum, you will need:

A. Boxes
B. Absorbent materials (newspaper, vermiculite, etc.)
C. Markers
D. Gas cylinder cart
E. Hand trucks
F. Packing tape
G. Proper personal protective equipment for the chemicals that will be packed
H. Proper spill cleanup materials in the event of a spill

V. Unwanted Equipment & Gas Cylinders

A. Recycle, salvage, or dispose of unwanted equipment when possible. Old refrigerators must be emptied, decontaminated, and labeled “FOR LAB USE ONLY.”
B. Decontaminated equipment may be given to the unassigned property unit. Call Surplus Property for information. Liquid scintillation counters and certain gas chromatographs being surplused must have the radioactive source removed and a contamination survey completed by the Radiation Safety Office prior to transportation.
C. Empty cylinders should be labeled empty. Call the supplier for pick-up. Because of the very high cost of disposal of most toxic gases, these gases should be returned to the vendor whenever possible. Contact the vendor for guidelines on preparing the cylinder for return.
D. If you have a cylinder with unknown contents or if the manufacturer will not take the cylinder back, contact ESD-Hazardous Materials Group.

VI. Closing the Previous Laboratory
The laboratory that is being vacated must be closed in accordance with the Laboratory Decommissioning SOP and all equipment should be decontaminated in accordance with the Laboratory Equipment Decontamination SOP.

VII. Contacts
Office of Research Safety: 706-542-5288
Environmental Safety Division: 706-542-5801
Radiation Safety: 706-542-0107
Biosafety: 706-542-7265
FMD Support Services: 706-542-7584
Property Surplus: 706-542-6983