

The University of Illinois at Urbana-Champaign

Institute for Genomic Biology Safety Manual

Table of Contents

INTRODUCTION TO SAFETY AT THE IGB.....	4
EMERGENCY AND NON-EMERGENCY SAFETY CONTACT INFORMATION.....	5-6
IGB-SPECIFIC SAFETY POLICIES AND PROCEDURES.....	7-15
Safety Organization at the IGB	
Safety Requirements for New Employees and Students	
Ongoing Training for Continuing Employees and Students	
Laboratory Closeout when Leaving the IGB	
Risk Assessments	
Standard Operating Procedures	
Personal Protective Equipment (PPE) and Personal Hygiene	
Eating Drinking and the Application of Cosmetics, Hand Washing, Attire, Eye Protection, Contact Lenses, Face Shields, Gloves and Respiratory Protection	
Transportation of Chemicals and Potentially Hazardous Materials	
Inside the IGB, To and From the IGB	
Open Lab Issues	
Radioactive, Biological and Highly Toxic Material Security, General Use of	

Shared Space, Chemical Control, Biosafety Level Work and Unattended Operations	
Emergency Equipment and Supplies	
Safety Showers and Eyewashes, First Aid Kits, Emergency Spill Kits, Water Cleanup Shop Vacs and Fire Extinguishers	
First Aid and CPR Classes	
IGB Personnel Assisting in Emergencies	
Children and Unauthorized Persons	
Working Alone	
Refrigerator/Freezer/Constant Temperature Room Storage and Labeling	
Chemical Odor Control from Drains	
Headphone, Earphone and Cell Phone Use in Labs	
Perchloric Acid Use	
 IGB EMERGENCIES.....	 15-20
What to Do and What Will Happen in an Emergency	
General Procedures, Emergency Calls – Who Will Respond, Emergency Medical – Minor Emergency, Emergency Medical – Major Emergency, Chemical Spills to the Body, Chemical Spills to the Eye, Hydrofluoric Acid Spills to the Body, Chemical Spills – General, Defining and Classifying a Chemical Spill for Cleanup, Mercury Spills, Fires and Fire Extinguishers	
Use of Emergency Shutoffs	
Emergency Signage	
Emergency Information Door Signs, Emergency Contact Information, Emergency Evacuation Information and Other Safety Information	
Use of Safety Showers and Eyewashes	
Tornado/Weather/Earthquake Emergencies	
Definitions, Tornado Response, Weather Emergencies other than Tornados, Earthquakes	
Building Issues such as Steam and Water Leaks	

APPENDICES21-40

Campus Administrative Manual (CAM) EH&S, Campus Environmental Health and Safety Policy

Office of the Vice Chancellor of Research (OVCR) document, Responsible Conduct of Research

IGB Theme Lab Manager Responsibility Guidelines

IGB Safety Committee Responsibility Guidelines

Model Closeout Procedure Checklist

IGB Office Safety Inspection Checklist

DRS General Lab Safety Audit Checklist

Emergency Information Door Sign (Sample)

DRS Laboratory Safety Guide

Updated by R. Mann
02-16-2018

INTRODUCTION TO SAFETY AT THE IGB

This manual is designed to acquaint existing and incoming IGB personnel with the safety infrastructure and major safety policies and operating procedures of the IGB. The interdisciplinary work and open lab environment of the IGB can create complex safety issues, and it is important that IGB personnel be aware of and abide by policies and procedures directed towards the needs of that environment as well as general safety policies and procedures. A large body of additional information, guidance and general safety and operating procedures are available on the Safety page of the IGB Web site. Included are an online version of this document as well as the IGB Chemical Hygiene Plan and the IGB Building Emergency Action Plan (BEAP).

The purpose and intent of IGB Safety and Compliance, served by the Associate Director of Operations and Facilities for the IGB, is to provide a safe environment for researchers, support staff, students and visitors, encourage and enable the development of a safety culture within the Institute and enhance the Institute's public image, while minimizing disruption to research activities. IGB Safety and Compliance, which is a part of the IGB Operations and Facilities Office, develops and administers comprehensive safety and compliance programs, which in concert with other campus safety units and in partnership with the IGB research community, assures compliance with regulatory requirements. Additionally, IGB Safety and Compliance interfaces with outside agencies as is required and appropriate, provides teaching and training programs for personnel using IGB facilities, maintains safety equipment and supplies and a collection of safety resource materials, and coordinates other safety and compliance-related functions within the IGB.

EMERGENCY SAFETY CONTACT INFORMATION

EMERGENCY (fire, police or ambulance, major spills)

9-911 from a campus phone

911 from a cell phone

Maintenance / Repair off-hour Service (Facilities and Services)

333-0340

IGB Safety and Compliance (Robert Mann)

bobmann@illinois.edu , Office phone 244-8346,

Cell phone 217-840-7964

Facilities and Services Division of Safety and Compliance

(spills outside of buildings)

265-9828

The Division of Research Safety

Chemical Waste Disposal

333-2436

MTD SafeRides (transportation for individuals)

265-7433

When an emergency arises outside of normal business hours, inform one or more of the following persons after making the appropriate emergency calls indicated above:

Robert Mann, Occupational Safety Coordinator

Home phone 446-7990

Cell phone 840-7964

Jesse Southern, IGB, Operations and Facilities

Office phone 244-1834

Cell phone 898-4456

Any faculty member directly involved in the space where the emergency occurred.

NON-EMERGENCY SAFETY CONTACT INFORMATION

IGB Safety and Compliance (Robert Mann)

bobmann@illinois.edu, Office phone 244-8346, Cell phone 840-7964

Non-emergency Police Department

333-8911

Campus non-emergency fire service

333-9711

Urbana Fire Department, Gregory Drive Substation

333-3985

For other safety contact information, see the Safety page of the IGB Web site at http://www.igb.uiuc.edu/facilities&services/safety_compliance.html.

IGB-SPECIFIC SAFETY POLICIES AND PROCEDURES

Safety Organization at the IGB

Primary safety responsibility at the IGB lies with the Director of the IGB. The Occupational Safety Coordinator for the IGB coordinates the safety and compliance program within the IGB and serves as the liaison to campus safety units, campus safety committees and outside city and regulatory agencies. The IGB Safety Committee, comprised of faculty and IGB theme Lab Managers from individual themes have responsibilities as outlined in each of those documents in the appendices. IGB Faculty share in responsibilities as are outlined in the Office of the Vice Chancellor for Research (VCR) Webpage titled What Compliance Does My Research Require? [OVCR Link](#) a copy of the text is included in the appendices. Each individual researcher has responsibility for safety in areas where the researcher works as is outlined in CAM policies for Environmental Health and Safety “EH&S.

Safety Requirements for New Employees and Students

All new employees and students working in IGB laboratories are required to complete safety training intended to familiarize them with IGB emergency, safety and security policies appropriate to their work. Prior to receiving keys and/or card access to IGB space, researchers and others working in laboratories are required to take both the General Online Laboratory Safety Training provided by DRS and the IGB Online Safety Training appropriate for the work they will be doing, and to pass the corresponding IGB safety exam. The training is intended to familiarize them with the IGB space and safety policies and procedures corresponding to their work and provide a portion of initial training required for their work.

Ongoing Training for Continuing Employees and Students

Regulatory and funding agencies require ongoing (e.g. annual) safety training depending on activities that employees and students are involved in. A list of campus training opportunities is maintained on the Safety page of the IGB Web site. Some annual and specific training is provided by the IGB Safety Coordinator. To request a training session contact the IGB safety coordinator at 244-8346 or bobmann@illinois.edu

Laboratory Closeout when Leaving the IGB

All researchers must go through a close-out process upon leaving IGB space. For researchers within a research group that are staying in the space the theme Lab Manager for that group is responsible for coordinating the close-out of the researcher who is leaving. If an entire research group is leaving the IGB, arrangement for close-out should be made through the IGB safety coordinator. A copy of the IGB Closeout Checklist is in the appendices. Some items on the checklist may not be applicable to everyone.

Risk Assessment

Any time a researcher at the IGB is planning an experiment that involves a hazardous operation, consideration must be given to the type of hazards that will be involved and the dangers those hazards pose. A thorough evaluation of the materials, equipment, surrounding environment, personal protective equipment, and personnel must be conducted. It is important to the safety of the researchers that all potential risks are evaluated and proper safety precautions are taken in order to minimize the potential for an accident. A good set of standard operating procedures (SOP) to outline how the experiment can be conducted in a safe and efficient manner should be developed. Risk assessment checklists are available at the DRS website to assist in the assessment process.

Standard Operating Procedures SOP

Standard operating procedures should be written for all materials and procedures that pose a potential risk to the health and safety of laboratory personnel. SOPs should include exposure control measures and safety precautions that address both routine and accidental chemical, physical, biological or radiological hazards associated with the procedure. SOPs should be implemented as a primary means to inform and educate laboratory personnel about hazards in their work place. The Principal Investigator (PI) or Laboratory Supervisor is ultimately responsible for the development of SOPs and should review the information to determine if it is correct and adequate.

SOPs should be written by someone who has sound knowledge and experience with the material, equipment, and related procedures. Before writing an SOP, the author should think through all steps of a procedure and utilize the information gathered from the risk assessment. This process allows for standardization of materials and methods, as well as identifying safety issues associated with the procedure. It is important to become familiar with all aspects of hazard

identification and how such information should be used as the basis for SOP development.

Personal Protective Equipment (PPE) and Personal Hygiene

PPE, which is required by the IGB and provided by the Themes, along with personal hygiene are basic aspects of laboratory safety. Wearing appropriate personal protective equipment and practicing good personal hygiene as described below will minimize exposures to hazardous materials during routine use and in the event of an accident.

Eating, Drinking, the Storage of Food for Human Consumption and the Application of Cosmetics are not allowed in IGB laboratories, including the desk areas within the theme labs. Human food storage must be separate from lab chemical, lab biological or radioactive material storage. Food for human consumption should also not be stored in the constant temperature rooms.

Hand Washing: Hands should be washed frequently throughout the day, after glove removal, before leaving the lab, after contact with any hazardous material, and before eating, drinking, smoking, or applying cosmetics.

Attire: Wear a lab coat or apron, cover legs (no shorts or skirts) and feet (no sandals or open-toed shoes), confine loose clothing and long hair. Nylons and/or pantyhose are not recommended because they may melt upon contact with acid, trapping the acid against the skin.

Eye Protection: It is state law and campus policy that personnel including students, staff and visitors in laboratories wear safety glasses, goggles, or face shields at all times where eye hazards are a possibility. Chemical splash goggles are recommended when chemical splashes are possible.

Contact Lenses: Contact lenses may be worn in the IGB laboratories; however, they do not provide any protection for the eyes. Persons who wear contacts must wear the same eye protective equipment as persons who do not wear contacts. It is advisable for a person wearing contacts to inform co-workers and advisors of the contacts, so that if there is an

emergency situation involving chemicals and the eyes, potential emergency responders will know to remove the contacts.

Face Shields: Full-face shields must be worn when conducting a procedure, which may result in a violent reaction.

Gloves: Gloves are essential when working with hazardous substances. The proper gloves will prevent skin absorption, infection or burns without significantly affecting dexterity. Poor dexterity could increase the risk of chemical spills. Glove materials vary in effectiveness in protecting against chemical hazards, and gloves of the same material may differ in the time it takes for a chemical or solvent to pass through the gloves and in the volume of material that easily passes through the gloves. Consult a chemical resistance chart, ideally from the specific glove manufacturer, or contact Robert Mann for assistance in appropriate glove selection.

Respiratory Protection: Administrative controls (different materials or procedures) and engineering controls (chemical fume hoods, biological safety cabinets and other ventilation strategies) are always preferable to protection by PPE. Work in a chemical fume hood when working with materials that produce hazardous vapors or fumes. If the use of a respirator is required for work that can not be performed in a chemical fume hood, compliance with the UIUC Respiratory Protection Program, administered by the F&S Division of Safety and Compliance, is required. The Respiratory Protection Program includes requirements for a medical assessment, fit testing and instructions on proper use of respirators.

Transportation of Chemical, Biological and Radiological Materials

Inside the IGB: Transportation of chemicals, solvents and other potentially hazardous materials must incorporate secondary containment to minimize the chance of accidental release of material. Rubber bottle carriers for 4-liter bottles or lab carts with sealed shelving are examples of appropriate secondary containment. If an elevator is used to transport a Dewar containing a cryogen, the Dewar must be maintained in a manner that assures that the Dewar will not tip over, which could cause possible asphyxiation conditions within the elevator and adjoining spaces.

Passengers should not accompany Dewars of cryogenics, as if the elevator malfunctions, oxygen could be displaced in the elevator compartment.

Transportation to and from the IGB: Chemical, biological and radiological materials should not be brought into the IGB without specific knowledge of a PI and must be contained appropriately for the transportation of the particular material. Personal insurance companies are known to cancel insurance on people found carrying laboratory chemicals in personal vehicles. If transported in vehicles, the vehicles must be appropriate for carrying the materials.

Open Lab Issues

In the open lab environment, many people can be easily impacted by one individual's unsafe practices. Control of potentially hazardous materials needs to be carefully overseen by everyone in the labs.

Radioactive, Biological and Highly Toxic Material Security: While the intent of biosafety is to protect people from dangerous pathogens, the intent of biosecurity is to protect pathogens from dangerous people. Potentially hazardous radioactive and chemical materials also need to be secured from people who should not have access to them. Regulations for many such materials require that the materials be kept under lock and key. The IGB is designed to accommodate the security needed, but every individual in every lab needs to assist in assuring that spaces that need to be secure remain locked, without doors being propped open, and that no one who is not authorized to be in the labs is allowed in the labs.

General Use of Shared Space: Shared lab space inherently has the perception of no one researcher having responsibility for areas within the space. In order to maintain a safe environment, all researchers need to maintain an acute awareness of how they can help to maintain an environment that is safe for everyone. Likewise, while one group may be doing lab work, another group may be in a visiting, and the later group may not be thinking about others doing lab work. It is important to keep in mind, and assume that at any time others in the lab may be working with potentially hazardous materials.

Chemical Control: It is important that researchers take personal responsibility in the storage, disposal and use of chemicals. Chemical inventories should not be allowed to build up beyond needed volumes. Be careful when purchasing chemicals to only purchase what you know will be used, as money saved by purchasing materials in larger quantities is quickly surpassed in disposal costs, and larger quantities can often mean larger hazards.

Biosafety Level Work: In theme laboratories where biosafety level 2 work is being performed, the entire lab where the BL-2 work is taking place is seen as a BL-2 lab, and everyone who may be working in the lab needs biosafety level 2 awareness training provided by the theme.

Unattended Operations: If operations need to be unattended, a system of controls for the operation must be in place to keep potentially hazardous materials in proper containment in the event of malfunction of equipment, accidental disruption by building maintenance personnel, interruptions in electric service, cooling water or inert gases and other unexpected situations; e.g., for unattended water use, an appropriate combination that may include a water pressure regulator, properly rated tubing, hose clips, locking quick disconnects and a thermocoupled heating control, spill detector or flow detector that shuts off power to equipment if cooling water flow stops must be used. If in doubt of what is required to make an unattended situation safe, talk to The IGB Safety Coordinator.

Emergency Equipment and Supplies are generally provided by the IGB with assistance in maintaining the supplies provided by the theme safety coordinators.

Safety Showers and Eyewashes: The IGB provides safety showers in laboratory areas and eyewashes at every hand washing sink in the labs. The IGB will see that the emergency showers are flushed according to campus standards. The theme safety coordinators are responsible to see that eyewashes are flushed weekly.

First Aid Kits, Emergency Spill Kits and Water Cleanup Shop Vacs: The IGB provides first aid kits, spill kits and clean water cleanup shop vacs in theme labs and other specific areas of the IGB. The IGB Facilities services are responsible for keeping the kits in the theme spaces stocked

and the water shop vacs maintained. The shop vacs have motors in them that can produce sparks and should never be used in a situation where flammable materials, flammable solvents or flammable vapors or gases could be drawn into them.

Fire Extinguishers: The IGB provides fire extinguishers and sees that the extinguishers are inspected annually by the campus fire safety group. IGB Facilities will check the fire extinguishers monthly to insure they are accessible and in good working order. The lab Managers are responsible for reporting extinguisher use to IGB Safety Coordinator. Periodically Fire extinguisher training is offered by the Urbana fire department. Notifications will be sent out to all employees encouraging them to participate in these training sessions when they are offered.

First Aid Classes and CPR Classes

First aid and CPR classes are made available to the campus community through the Illini EMS (student organization) at a minimal cost. The IGB will pay for first aid and CPR classes for theme safety coordinators who would like to receive the training.

IGB Personnel Assisting in Emergencies

Anyone with appropriate training in emergency response may assist in what they are trained to do; however any such assistance is voluntary. No one at the IGB is required to provide emergency assistance as a condition of employment.

Children and Unauthorized Persons

Children and other unauthorized persons should not be in laboratories where hazardous materials or hazardous equipment are being used.

Working Alone

When working with hazardous materials, it is advisable to have a second person present, within yelling distance, or at a minimum, maintain contact via telephone. Special protection and consideration is required for work with high energy materials, high pressures, some types of work with electrical systems, transfer of flammable liquids, except in very small quantity, work with quick-acting, highly toxic materials and experimental research or laboratory procedures where previous experience has shown the desirability of having assistance available.

Refrigerator/Freezer/Constant Temperature Room Storage and Labeling:

These units should be labeled and used according to the following:

(Human) Food Refrigerator/Freezer

This unit is for food storage only and should never be located in a lab. Do not store laboratory chemicals in this unit. Do not store flammable liquids/materials in this unit; it has not been explosion protected.

Laboratory Refrigerator/Freezer/Cold Room/Warm Room

Do not store food in this unit. Do not store flammable liquids/materials in this unit; it has not been explosion protected.

Flammables Refrigerator/Freezer

Do not store food in this unit. The interior, but not the exterior of this unit has been explosion protected; do not use this unit in a space where the exterior of the unit would need to be explosion protected; i.e., a potentially explosive atmosphere.

Explosion-proof Refrigerator/Freezer

Do not store food in this unit. This unit may be used to store flammable liquids/materials and may be used in an area where exterior explosion protection is required.

Constant Temperature Rooms

Do not store food or flammable liquids/materials in this unit. Do not store anything in the unit that could cause an unsafe breathing environment.

Chemical Odor Control from Drains

Laboratory drains are a common source of chemical odors in labs, when the water in the drain trap evaporates and the negative pressure within the lab relative to the drainage system draws air and chemical vapors backwards through the drainage system into the lab. To avoid this condition, run a small

amount (a liter is usually sufficient) of water into normally unused drains at month intervals.

Headphone/earphone and Cell Phone Use in Labs

Headphones/earphones and cell phones should be used with careful discretion. Headphones/earphones can make it difficult to hear important warning sounds of machinery or other researchers, and users of cell phones can easily become distracted from their work.

Perchloric Acid Use

If perchloric acid is heated above ambient temperature, it may evaporate and condense on ductwork in the form of explosive perchlorates. Hence, when heating perchloric acid above ambient temperature, a perchloric acid chemical fume hood with a water wash down system or a local scrubbing or trapping system must be used.

IGB EMERGENCIES

What to Do and What Will Happen in an Emergency

General Procedures: For any serious emergency where outside emergency assistance is needed, call 9-911 from a campus phone or 911 from a cell phone. Dialing 911 from a campus phone will reach an emergency operator, but it is slower because of a delay put into the system so that a slowly-dialed international call is not mistaken for an emergency call. If a chemical is involved with the injury, hospitals and perhaps emergency responders will want a copy of the Material Safety Data Sheet (MSDS) for the chemical used. Hospitals usually require the MSDS from the specific manufacturer. If possible, always have someone meet the emergency responders outside to provide information to them and take them to the location of the emergency.

Emergency Calls – Who Will Respond: If pulling a fire alarm pull station lever alone or if calling 9-911 / 911 to report a fire or large (HAZMAT) spill, four fire apparatuses and a command vehicle will respond. For a 9-911 / 911 medical call, one fire apparatus and one ambulance will respond. For a chemical incident (that is, once it has been determined that it is not a large, dangerous spill), one fire apparatus and a command officer will respond.

Emergency Medical – Minor Emergency: First aid kits are available in the labs. If injured when work applies towards a degree, go to McKinley Health Center (non-life-threatening) or (Provena Covenant or Carle) hospital emergency room. If injured when work is not degree-related, go to Christie (7am-6pm M-F) or Carle (8am-5pm M-F) Occupational Medicine Department (non-life-threatening) or (Provena Covenant or Carle) hospital emergency room. Inform the supervisor and fill out an incident report form.

Emergency Medical – Major Emergency: Pull a fire alarm pull station lever and call 9-911 / 911 to get emergency medical assistance. If possible, have someone meet the emergency responders outside. Voluntary medical assistance may be provided prior to emergency responders' arrival by trained personnel. Inform the supervisor as soon as possible and fill out an incident report form.

Chemical Spills to the Body: If the spill is major, such that the spill cannot be rinsed off in a sink, use the closest emergency shower in the lab to flush off the chemical. Remove clothing that had chemical contact. **DO NOT HESITATE TO USE EMERGENCY SHOWERS** - there may be a water cleanup afterwards, but the safety of the individual is much more important! Rinse any spills for 15 minutes with a flow of water. The water is warmed so that extended showering can take place without discomfort. If a safety shower is used, call 9-911 / 911 for additional medical assistance, and if possible, have someone meet the emergency responders outside. Inform the supervisor as soon as possible and fill out an incident report form.

Chemical Spills to the Eye: Flush the face and eyes with the nearest plumbed emergency eyewash for 15 minutes. Hold the eyes open with fingers or get assistance to hold the eyes open. **DO NOT HESITATE TO USE EMERGENCY EYEWASHES!** The water is warmed so that extended rinsing can take place without discomfort. Call 9-911 /911 for additional medical assistance. If possible, have someone meet the emergency responders outside. Inform the supervisor as soon as possible and fill out an incident report form.

Hydrofluoric Acid Spills to the Body: Get immediate attention. HF differs from other acids because the fluoride ion readily penetrates the skin, causing destruction of deep tissue layers, including bone. Pain associated with exposure to solutions of 1-50% may be delayed. If HF is not rapidly

neutralized and the fluoride ion bound, tissue destruction may continue for days and result in limb loss or death. HF is similar to other acids in that the initial extent of a burn depends on the concentration, the temperature, and the duration of contact with the acid.

Chemical Spills – General: Simple spills can be cleaned up with the chemical spill kits provided in the labs, following the directions that are in the spill kits. Complicated spills require assistance from the fire department. If building evacuation is necessary, or if you are unsure if it is, pull the fire alarm pull station lever to evacuate the building and then call 9-911 / 911 to describe the nature of the spill.

Defining and Classifying a Chemical Spill for Cleanup: A spill is complicated if a person is injured, the identity of the chemical is unknown, multiple chemicals are involved, the chemical is highly toxic, flammable or reactive, the spill occurs in a “public space” such as corridor, the spill has the potential to spread to other parts of the building, the clean-up procedures are not known or appropriate materials are not readily available, or the spill may endanger the environment such as reaching waterways or outside ground. If none of these criteria are met, the spill is defined as a simple spill.

Mercury Spills: For small mercury spills that are in a controlled space, use the Hg Absorb provided in the lab spill kits, following directions on the containers. For larger spills, contact Robert Mann or contact DRS at 333-2755. If the mercury is in a heated location such as an oven, where mercury vapor would be rapidly generated, evacuate the lab until assistance arrives and determines that conditions are safe.

Fires and Fire Extinguishers: In the event of a fire emergency within the IGB, the top priority is the safety of personnel. If the fire alarm is activated, all personnel must treat it as if there is an actual fire somewhere within the IGB and an evacuation of the building is mandatory. To evacuate the building you should:

- Remain calm.
- Notify others in the area of the alarm if they did not hear it.
- Exit the building via the nearest safe exit route.
- Do not use elevators to exit.

- Report to the designated evacuation area.
- Wait at the evacuation area for directions.
- Do not reenter the building until emergency staff gives the "all clear" signal.

Using a fire extinguisher

It's easy to remember how to use a fire extinguisher if you can remember the acronym **PASS**, which stands for Pull, Aim, Squeeze, and Sweep.

P. Pull the pin. This will allow you to discharge the extinguisher. The pin is usually held in by a plastic tie. This plastic tie will ne to be removed before the pin will come out.

A. Aim at the base of the fire. If you aim at the flames, the extinguishing agent will fly right through and do no good. You want to hit the fuel.

S. Squeeze the top handle or lever. This releases the pressurized extinguishing agent in the extinguisher. ABC dry chemical extinguishers will discharge a white powder extinguishing media

S. Sweep from side to side. Start using the extinguisher from a safe distance away, then move forward. Once the fire is out, keep an eye on the area in case it re-ignites.

Emergency Signage is posted at the entrance to any lab or room that may contain some type of hazard.

Emergency Information Door Signs are provided at each theme lab entrance and in other appropriate locations in the IGB. The emergency information door sign will contain the emergency contact information including names and phone numbers of people who should be immediately contacted to help facilitate the appropriate response to an emergency situation. The door sign will also contain the hazard identification information for any hazardous substances located within that particular laboratory. The hazard information is communicated using the Globally Harmonized system of pictograms. These door signs are located at the entrance to every laboratory so that emergency responders can easily use it to make calls to people listed on the card. It is important that the information on these cards be kept current. An example of the emergency information door sign is included in the appendices.

Emergency Evacuation Maps and Other Safety Information is posted next to the main elevators in the atrium on each floor of the IGB. Emergency response guides are posted at the receptionist's desk in each theme.

Use of Safety Showers and Eyewashes

Safety showers and eyewashes are activated by pulling a handle or pushing a paddle. The devices are designed to stay on until manually turned off, so that hands are free to remove clothing, hold eyes open and assist in flushing. Warm water is provided by the appliances so that extended flushing can take place comfortably. The recommended flushing time for any chemical spill to the body or eyes is 15 minutes. **DO NOT HESITATE TO USE THESE DEVICES!** It is preferable to have an extra lab coat available for people who need to remove clothing. If clothing removal is needed, it is preferable to have someone available to keep people from the area of the lab where the shower is being used.

Tornado/Weather/Earthquake Emergencies

Definitions: *Tornado Watch* - Be alert. Atmospheric conditions in the county are such that a tornado could develop. *Tornado Warning* - Prepare to take cover. A tornado has been sighted in the area. Prepare to take cover immediately if you hear the siren or are advised of this situation via other media. *Tornado Season* - The tornado season for the Champaign-Urbana area is generally from March 1 to August 1.

Tornado Response: If notified of a *Tornado Watch*, tornado information is available on WILL AM 580 or other local stations; be aware of the possible sounding of sirens and have laboratory equipment set up such that equipment can be left in the event of a tornado warning. If notified of a *Tornado Warning* via siren, take cover for a period of 30 minutes in the IGB tornado shelter, which is marked by signs in the east hallway area of the concourse. If the immediate danger continues to exist, the siren will be sounded again at the end of that 30-minute period, or any time after that 30 minute period that a new, immediate danger develops. *No all clear signal will be sounded.*

Weather Emergencies Other than Tornadoes: Links to information on severe weather, such as severe thunderstorms and blizzards, can be found on the Safety page of the IGB Web site.

Earthquakes: The IGB is built to accommodate earthquake activity for this area of the state. Although no major activity is expected, it is always wise to plan for activity by storing potentially hazardous materials where they can not easily fall off shelves.

Building Issues such as Steam and Water Leaks: For steam, water and other utility issues in normal working hours (8 a.m. – 5 p.m.), contact the IGB Facilities office at facilities@igb.uiuc.edu or 333-0860. For repairs off hours, call the campus Facilities and Services office at 333-0340.

Campus Environmental Health and Safety

Purpose

To establish the environmental health and safety commitments and responsibilities necessary for the University of Illinois at Urbana-Champaign to fulfill its commitment to protecting the health and safety of its faculty, staff, students, visitors, and its goals of conducting university operations in compliance with all applicable laws and regulations and providing a safe and healthful workplace.

Scope

This policy applies to all faculty, staff, students, post-doctoral fellows, visiting scholars, visiting scientists, contractors, subcontractors, and visitors engaged in university operations either in campus facilities or at off campus locations.

Authority

Pursuant to the [University of Illinois Statutes](#) and [The General Rules Concerning University Organization and Procedure](#), the Chancellor is the chief executive officer for the campus and is responsible for safety and health of individuals and all facilities and properties on the campus. The Chancellor delegates responsibility for implementation and enforcement of environmental health and safety policies and standards to the Vice Chancellor for Research and the Executive Director of Facilities.

Policy

1. All faculty, staff, students, post-doctoral fellows, visiting scholars, visiting scientists, contractors, subcontractors, and visitors who conduct university operations either in campus facilities or at off campus locations shall comply with environmental health and safety regulations issued by the Illinois Department of Labor (“IDOL”), the Occupational Safety and Health Administration (“OSHA”), and other applicable federal or state agencies.
2. Administrators, faculty, staff, students, post-doctoral fellows, visiting scholars, visiting scientists, contractors, subcontractors, and visitors of the Urbana campus have a duty to protect the safety and health of other members of the campus community, and each is responsible for his/her health and safety obligations and behaviors.
3. Each campus unit is responsible for maintaining the buildings and structures, or portion thereof, such unit uses for university operations in compliance with health and safety related regulations, codes and standards as described within the [University of Illinois at Urbana-Champaign Facilities Standards](#).

Processes/Procedures/Guidelines

Consistent with the university’s long-standing traditions of independent decentralized management, interdisciplinary collaboration, and shared faculty governance, these procedures set forth the responsibilities of the campus, units, and individuals to fulfill the university’s commitment to protecting the health and safety of the campus community, and to achieve the university’s goals of conducting university operations in compliance with all applicable laws and regulations to provide a safe and healthful workplace.

Campus Responsibilities

The Division of Research Safety (“DRS”) and the Division of Safety and Compliance (“S&C”) collaborate with appropriate campus committees to provide regulatory oversight, monitor compliance, and to maintain effective standards necessary for compliance with applicable laws and regulations. DRS and S&C provide technical, regulatory, and related management expertise to the campus units and serve as the primary liaison to state and federal environmental health and safety regulatory agencies. DRS and S&C provide health and safety training and awareness information to faculty, staff, students, post-doctoral fellows, visiting scholars, visiting scientists, and visitors and collaborate with campus units and personnel to identify and mitigate potential environmental health and safety hazards. Campus units provide health and safety awareness information to contractors and subcontractors.

Deans, Directors, and Heads of Academic and Administrative Units (DDH)

Unit executive officers have the responsibility for environmental health and safety of activities conducted or sponsored by employees within the unit. The partition of responsibility for health and safety of buildings and facilities follows the policy set forth in [CAM VI-A, Organization and Responsibilities, and Cost Apportionment](#) between units and Facilities and Services for general building operation and maintenance.

Faculty, Investigators, and Supervisors

The immediate managers of employees or supervisors of other members of the campus community are responsible for maintaining a healthy and safe environment within their areas under their supervision and are responsible for the safety of activities, procedures and operations under their control or direction. This includes responsibility for delivering appropriate training and providing personal protective equipment necessary for safe working conditions and safe operation of equipment.

Students, Employees, and Visitors

Each member of the campus community is responsible for complying with all applicable environmental health and safety regulations, standards and guidelines. Each individual accepts personal responsibility for protecting his/her own health and safety and accepts that he/she has a duty to protect the health and safety of other members of the campus community.

Exceptions

There are no exceptions.

Contact

The Vice Chancellor for Research and the Executive Director of Facilities

What compliance does my research require?

The Office of the Vice Chancellor for Research provides programs and services to help you meet the ethical and regulatory requirements for the responsible conduct of research. Use the questions below to determine your requirements and find contact information for units that offer support.

If you:

Have a laboratory or oversee research work

- Ensure that you and your personnel have received the appropriate training
- Be prepared to deal with emergencies – have a written plan and appropriate spill response materials; ensure that personnel are familiar with the plan; and maintain current information on door signs for emergency personnel
- Manage conflicts of commitment and interest that may arise
- Conduct research and publication activities according to accepted ethical standards

Conduct research using animals

- Obtain approval for your animal use from the Institutional Animal Care and Use Committee (IACUC)
- Report any concerns about animal mistreatment to the OVCR, Division of Animal Resources (DAR), Agricultural Animal Care and Use Program (AACUP), or IACUC
- Arrange for animal housing. Consult with a veterinarian about animal procedures, anesthesia, analgesia, euthanasia, or other issues by contacting DAR or AACUP
- Enroll yourself and your staff in the Occupational Health and Safety Program

Conduct research using people, personal information, or human specimens

- Review information on the Office for the Protection of Research Subjects website
- Submit a "New Protocol Form" or an "Exemption Form" along with funding proposals if applicable
- Obtain approval before initiating your research
- Submit a renewal form at least once annually

Conduct research with human materials; any plant, animal, or human pathogens; transgenic plants or animals; nonhuman primate materials; biotoxins; wild mammal materials; or recombinant DNA

- Register your project with the Institutional Biosafety Committee through the Division of Research Safety (DRS) and obtain approval before initiating your research

Work with chemicals

- Have a written Laboratory Safety Plan that addresses the safe use, proper storage, engineering controls, personal protective equipment, and emergency response procedures for chemicals in your laboratory

- Make sure laboratory personnel are familiar with and follow the safety plan requirements and use Safety Data Sheets appropriately

Work with radioactive materials

- Obtain a radiation permit from DRS. The facilities, equipment, and procedures required to work safely with these materials will be addressed in the registration or permitting

Generate hazardous waste in the laboratory

- Know the options and requirements for disposal of biological, chemical, and radiological waste - DRS provides free collection and disposal of most laboratory wastes

Receive, ship, or transport hazardous material to or from off-campus locations

- Determine, before shipping, whether the biological material, radioactive material or chemical substance (e.g. dry ice) is considered a hazardous material by the Department of Transportation
- Understand that shipping or transporting hazardous materials internationally may have additional requirements
- Obtain appropriate training required for the function you perform in shipping and/or receiving of hazardous materials. Contact DRS for more information

Use biological safety cabinets

- Get your cabinet certified at the time of installation, annually thereafter, and at any time the unit is re-located, then send certification report to DRS

Work with analytical X-ray machines or operate lasers

- Register the machine with DRS and develop a written safety plan and safe operating procedures

Are going on sabbatical leave or will be absent more than 30 days

- Appoint a person familiar with laboratory procedures to oversee the laboratory in your absence
- Ensure that there is a named co-investigator who has the authority to make any necessary decisions regarding animal use on any animal use protocol
- Notify the Grants and Contracts Office, Post-Award Administration (GCO) and the Sponsor, if you have a sponsored project

Are resigning or leaving the University

- Arrange for final disposal of all biological, chemical, and radiological materials
- Decontaminate all work surfaces and perform a radiation survey, if applicable
- Leave the laboratory clean for the next occupant
- Contact the IACUC to terminate any animal use protocol or amend protocol to name new investigator
- Contact the GCO, if you have a sponsored project

Have Intellectual Property (IP) concerns or need assistance with IP disclosure, licensing, transfer, or agreements

- Contact the Office of Technology Management (OTM)

IGB Theme Lab Manager Responsibility Guidelines

- 1. Serve as a liaison between theme members, the IGB Safety and Compliance Coordinator and other safety contacts** for providing information and materials to theme members and bringing safety-related questions, concerns and suggestions from theme members to the attention of appropriate responsible people. As appropriate, meet with or attend meetings with other Theme Safety Coordinators and the IGB Safety and Compliance Coordinator to discuss safety information and concerns.
- 2. Maintain the theme safety information** The Theme Lab Manager should designate a place in the lab that will contain the Theme Safety Binder, which should serve as the theme safety manual and theme biosafety manual. The binder should contain a copy of the IGB Safety Manual, the IGB Chemical Hygiene Plan, protocols within the theme, SOPs, and other materials such that it can be used as a safety training reference. Also located in this area there should be a copy of Prudent Practices in the Laboratory, Biosafety in Microbiological and Biomedical Laboratories, , accident report forms and other safety-related references as appropriate.
- 3. Assist in the safety training program of theme members and development of the IGB safety culture** This could include providing information to theme members about what to do in the event of emergencies, showing theme members how to access Material Safety Data Sheets, how to use safety equipment. etc.
- 4. Assist the theme in preparation for and contingency planning for the safety and security aspects of emergency and non-emergency situations** such as safe and secure storage of hazardous materials, power outages (planned and unplanned) or for emergency departures from the labs in emergencies such as for tornado warnings or fire evacuations.
- 5. Assist in the maintenance of lab emergency equipment and supplies** by performing or coordinating weekly flushing of eyewash stations, monitoring supplies in first aid kits and spill kits, and reporting fire extinguisher use.
- 6. Where appropriate, inspect or assist in various safety inspections and audits and assist in the abatement or resolution of deficiencies or issues found in the inspections or audits.**
- 7. Serve as a liaison between theme members and the Division of Research Safety (DRS)** to provide information to theme members for the proper disposal of excess chemicals and chemical waste, disposal of sharps, etc. Assist in the assurance of the segregation of chemical waste as required by DRS.
- 8. Coordinate as needed the recycling program for the theme**

- 9. Provide accident report forms to theme members**

- 10. Coordinate the updating of emergency door notices**

- 11. Maintain theme location(s) for theme safety supplies, which may include visitors' safety glasses and other safety supplies that are for the benefit of the theme rather than for individual theme members.**

- 12. Perform the safety checkout of research personnel within the theme that are leaving IGB space**

IGB Safety Committee Responsibility Guidelines

- 1. Consider, review and develop, as needed, policies and procedures related to IGB safety and compliance.**
- 2. Review, as appropriate, fire and other emergency responses to the IGB and incidents and accidents occurring in IGB space.**
- 3. Review, as required, IGB safety documents that have mandated review requirements**
- 4. Assist in the oversight of safety and compliance as needed within themes.**
- 5. Make recommendations to the IGB Director and campus**

Reviewed 2/16/18 Mann

Model Closeout Procedures Check-List

<u>Hazardous Material/Procedure</u>	<u>Date Completed or N/A</u>
Chemicals	
If moving chemicals off campus, prepare chemicals for shipment according to DOT requirements.	
Transfer ownership of chemicals to lab(s) that can use them and have agreed to take them.	
Dispose of all remaining chemicals through DRS.	
Clean all surfaces with strong detergent.	
Controlled Substances	
If transferring substances to another DEA registrant, submit appropriate forms to U.S. DEA prior to transfer.	
If disposing substances, submit appropriate forms to U.S. DEA prior to and after disposal.	
Conduct appropriate transfer or disposal of controlled substances.	
Gas Cylinders	
Return to supplier.	
Contact DRS to arrange for disposal of non-returnable cylinders.	
Sharps	
Place in sharps disposal container.	
Arrange for disposal of full containers by contacting BSS (3-2755).	
Cultures, Stocks and Disposable labware	
Collect and autoclave waste in an autoclavable bag; overbag with opaque trash bag; dispose in regular waste stream.	
Clean incubators, ovens, refrigerators.	
Pathological Waste	
Dispose of tissue via incineration. Contact BSS for information	
Dispose of preservative. Contact CSS (3-2755) for information.	
Clean refrigerators/freezers.	
Radioactive Materials	
Package all radioactive materials for disposal and arrange pickup.	

IGB Office Safety Inspection Checklist

Housekeeping:

1. *Aisles are uncluttered.* Aisles are free of debris or materials which create a projection hazard, and in rooms with multiple desks should be maintained at or near 36" clear.
2. *Floor is free of debris which could create a slipping/tripping hazards.* The floor of the office must be maintained free of water and other materials which could create a slipping hazard. In addition, the office floor must be maintained free of cords and other materials which could create a tripping hazard.
3. *Trash cans and recycle cans are not overflowing.* All trash cans and recycle cans must be emptied on a regular basis to prevent them from overflowing and creating an unhealthy condition and/or fire hazard.
4. *Room is free of excess combustible materials.* The room must not be used for the storage of excess boxes, plastic and other combustible materials which could create an unreasonable fire hazard.

Storage:

1. *All boxes and other materials are stored in an orderly manner.* All office materials are stored in an orderly non-hazardous manner inside storage cabinets or on shelves.
2. *Shelves do not appear to be overloaded.* The shelves within the office do not appear to be overloaded, buckling and/or pulling away from the mounting surface.
3. *Stored materials do not create a hazard.* Other stored materials in the office do not create any additional hazards. Considerations include the storage of flammable and combustible liquids, materials with sharp or jagged edges, and hazardous chemicals.

Other considerations:

1. *Equipment within the office appears to be in good repair.* All of the equipment in the office appears to be in good condition. Considerations include exposed electrical conductors, broken sharp edges and exposed hazardous mechanical parts.
2. *There are no frayed electrical cords.* There are not frayed electrical cords on the office equipment or power strips being used.
3. *Power strips and extension cords are being used properly.* Power strips are in locations where they can be inspected and are not daisy-chained. Extension cords are being used only as a temporary means of providing power to equipment and they are not run through doors, walls, floors or any other location where they could be damaged.
4. *Coffee pots and their cords are in a location where they do not create a physical, fire or spilling (burn) hazard.* Coffee pots are located such that they do not create a projection hazard, they are no to close to combustible materials and they are not likely to be knocked over and spilled.
5. *Electrical panels are accessible.* If existing, electrical panels in the office are immediately accessible with no less than 36 inches clear distance in front of them.
6. *There are no obvious fire hazards.* There are no other obvious fire hazards within the room, e.g. gasoline cans and flammable chemicals.

General Laboratory Safety Audit

Principal Investigator:

Building:

Room #

Auditor:

Date:

	Satisfactory	Needs Improvement	N/A
Lab Safety Plan			
1. Lab door lockable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Door sign present and up-to-date	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Lab safety plan available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Plan reviewed/evaluated annually	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Standard Operating Procedures available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Safety Data Sheets available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Training provided/documented	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Satisfactory	Needs Improvement	N/A
Personal Protective Equipment (PPE)			
1. Gloves appropriate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Eye/face protection available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Appropriate lab coats available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. PPE is being utilized appropriately	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Respirator users fit-tested annually	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Satisfactory	Needs Improvement	N/A
Laboratory Housekeeping			
1. No eating or drinking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. No clutter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. No un-cleaned spills or residues	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Aisles and exits 28" wide and unobstructed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. 18" clearance around sprinklers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Soap and paper towels readily available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Floors and work surfaces easily decontaminated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Satisfactory	Needs Improvement	N/A
Electrical			
1. Extension cord use temporary	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Proper grounding is used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Cord and equipment in good condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. No outlet overloading	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Outlets near water GFCI protected	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Electrical panels accessible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Shock hazards have proper signage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Satisfactory	Needs Improvement	N/A
Fume Hoods			
1. Inspected within last year	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Undamaged	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Used correctly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Satisfactory	Needs Improvement	N/A
Other Equipment			
1. Biosafety cabinet is present and in an adequate location	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Biosafety cabinet certification up-to-date	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Shut-off valve for gas line external to biosafety cabinet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Vacuum protected with traps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Exhaust vented properly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Vacuum glassware coated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Machine guards in place	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. No mercury thermometers in ovens	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Sink for hand-washing present in lab	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Chemically resistant work surfaces present	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Chairs easily decontaminated (Bio)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Tubing in good condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Equipment properly secured	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Proper engineering controls/ventilation used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Needles are not bent, sheared, broken, recapped, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Satisfactory	Needs Improvement	N/A
Emergency Equipment			
1. Fire Extinguishers:			
a. Correct type present	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Readily accessible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Checked monthly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Tagged within the last year by F&S	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Safety Showers:			
a. Unobstructed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Tested annually	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Functional and installed properly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Unaltered	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Eyewashes:			
a. Unobstructed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Tested weekly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Functional and installed properly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Unaltered	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Spill Kits and First Aid:			
a. Stocked appropriately	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Readily accessible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Disinfectant available (Bio)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Broom, dustpan, forceps available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Calcium gluconate available for HF	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Satisfactory	Needs Improvement	N/A
Waste			
1. Container condition good	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Containers labeled	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Containers closed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Vented caps used when necessary	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Waste streams segregated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Secondary containment used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Sharps and glass disposed of properly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. No waste accumulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Biohazard waste bag & containers labeled with BH symbol	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Biohazard container lidded and leak proof	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

		Satisfactory	Needs Improvement	N/A
Compressed Gases				
	<i>Present?</i>	Y	N	
1. Cylinders secured		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Tubing poses no hazard		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Away from heat		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Flammable and Oxidizing gases separated.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Total number within limit		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Toxic Gases in enclosures		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Tubing compatible with gas		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Away from exits		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

				Satisfactory	Needs Improvement	N/A
Cryogenics	<i>Present?</i>	Y	N			
1. Adequate room ventilation				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Appropriate containers				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Away from combustibles				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

				Satisfactory	Needs Improvement	N/A
Flammable Liquids	<i>Present?</i>	Y	N			
1. Amount within limit				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Away from ignition sources				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Certified refrigerators used				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Bonding & Grounding used for bulk vessels				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

				Satisfactory	Needs Improvement	N/A
Peroxide Forming Chemicals	<i>Present?</i>	Y	N			
1. Peroxide formers dated				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Tested regularly & documented				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

				Satisfactory	Needs Improvement	N/A
Pyrophoric Materials	<i>Present?</i>	Y	N			
1. Gas cylinders in enclosure				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Tubing compatible				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Away from exits				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Sprinkler system present				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Flame resistant lab coats available				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

				Satisfactory	Needs Improvement	N/A
Explosive Materials	<i>Present?</i>	Y	N			
1. Material that becomes explosive when dry, is checked quarterly				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Proper documentation is provided for handling explosives.				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Materials are stored according to standards.				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Sample of the DRS emergency information door sign.

AUTHORIZED PERSONNEL ONLY - HAZARDS PRESENT			
Roger Adams Laboratory, 256			SAFETY NOTES
Name	Title	Office	Alternate
Paul Hergenrother	Principal Investigator	217-333-0363	217-363-1791
Robert Mann	Safety Contact	217-244-8346	
Elizabeth Parkinson	Safety Contact		662-820-1560
Benjamin Leslie	Safety Contact	217-244-4832	217-369-9280
Michelle Richter	Safety Contact		
Evjola Llabani	Safety Contact		

	• Compressed Gases - INERT		• Corrosives		Low/No Cryogen
	Low/No Explosive Materials		• Flammable Liquids • Flammable Solids • Pyrophorics		• Health Hazards
	• Oxidizers - Liquids and Solids		• Acutely Toxic Liquids and Solids		• Water Reactives

No biological or radioactive hazards present.

University of Illinois - Division of Research Safety 217-333-2755 Last Updated: 1/7/2015

IN CASE OF EMERGENCY CALL 911

Laboratory Safety Guide

University of Illinois at Urbana - Champaign

The **Laboratory Safety Guide** is a required element of the Laboratory Safety Plan that introduces basic safety information and best practices for laboratory procedures. It is a reference document for the Division of Research Safety's laboratory programs, campus policies, and common laboratory hazards, including hyperlinks to more detailed information. DRS maintains this guide and updates it annually or as necessary. All researchers must understand the contents of this guide before working in Illinois research laboratories.

Responsibilities and Expectations

The responsibilities for providing a safe work environment at the University of Illinois at Urbana-Champaign are outlined in the [Campus Administrative Manual](#). All groups must understand their responsibilities for providing a healthy and safe environment for all faculty, staff, students, and visitors.

Each laboratory group is required to develop a [Laboratory Safety Plan \(LSP\)](#) to address the laboratory's specific hazards and exposure control measures. Development and implementation of a LSP will fulfill each laboratory's requirement for a Chemical Hygiene Plan as specified in the Occupational Safety and Health Administration (OSHA) regulation 29 CFR 1910.1560 ([OSHA Lab Standard](#)). The requirements for hazard identification and safety training for other laboratory hazards such as biological hazards ([BMBL](#)), recombinant or synthetic nucleic acids ([NIH Guidelines](#)), radioactive materials ([IEMA Title 32-Part 340](#)), and lasers ([IEMA-Title 32-Part 315](#)) are also satisfied upon implementing a comprehensive Laboratory Safety Plan. An annual evaluation of the LSP must be completed by the laboratory group to determine necessary revisions or updates.

The Principal Investigator (PI) or Laboratory Supervisor is responsible for implementing the Laboratory Safety Plan and ensuring safety procedures are followed within their laboratories. A [Safety Contact](#) may be chosen to assist with the implementation of this plan by developing Standard Operating Procedures, training personnel, and overseeing day-to-day operations while promoting safety in the laboratory. The Safety Contact should be aware of all laboratory activities, be a point of contact with DRS, and play an active role in the annual General Laboratory Safety Audits.

Training

The PI or lab supervisor must ensure that all laboratory personnel receives adequate training for the hazards they will be working with to perform the procedures safely. In addition everyone working in a lab must at least have hazard awareness of all materials present even if they are not working with them. Online trainings offered by DRS provide basic information and must be supplemented by lab specific training through the PI or experienced lab members. See the [Safety Training Checklist](#) on the DRS website for specific training and documentation requirements.

Lab Facilities

Work with hazardous material should only be performed in adequately equipped laboratory spaces. The main requirements are:

- Lockable doors to control access.
- Work benches impervious to water and resistant to heat and chemicals.
- Emergency equipment (safety shower, eyewash, fire extinguisher) necessary for the hazards present. See [Campus Emergency Eyewash and Shower program for details.](#)
- [Sink for handwashing present.](#)
- No carpet, rugs, cloth chairs, or other porous material that is difficult to decontaminate.
- Ventilation is adequate for the hazards present.

General Laboratory Safety Audits

General Laboratory Safety Audits should be performed and documented annually as a part of [safety management](#) for the laboratory. A General Laboratory Safety Audit is an important quality assurance tool to help the PI/laboratory supervisor assess the safety of their laboratory and provide information relevant to a required annual evaluation of the Laboratory Safety Plan. DRS provides this type of audit, and typically arranges audits on a per department basis. However, individual consultations including auditing of laboratory groups new to campus or new facilities for existing groups will be arranged upon request.

Laboratory Safety Policies and Work Practices

The following policies and work practices apply to all laboratories on campus. In addition, lab specific policies and work practices to further mitigate the risk of exposure should be implemented by the PI adequate for the hazards in the laboratory.

Door Signs

All doors leading from a public space to a laboratory must bear a sign that indicates the hazards present and lists the contact information of the occupant(s). Contact information and hazards should be updated as necessary, at least annually, by the laboratory group on the DRS website so that DRS can issue an updated sign. A new door sign should be requested by contacting DRS.

Food Storage and Consumption

Eating, drinking, and applying cosmetics is prohibited in areas where hazardous materials are in use. Storage and consumption of food is only allowed in well-defined, designated, non-work areas. Food should be stored in designated refrigerators outside of laboratory space and should bear a sticker indicating that no research material storage is allowed. Refrigerators and freezers used to store chemicals, biohazards, or radioactive materials or other potentially hazardous samples should bear a sticker indicating that no food storage is allowed. Contact DRS to request stickers.

Labels

All hazardous material including waste must be properly labeled.

In accordance with the Hazard Communication Standard (29CFR 1910.1200) labels on **chemical** containers should not be removed or defaced. All secondary and temporary containers

(including water) must be clearly labeled with at least the name of the chemical (no abbreviations).

For more information, refer to the DRS guidance document [Labeling of Chemicals in Laboratories](#).

The **Biohazard symbol** should be posted on anything where biohazards including recombinant materials are used, stored, or discarded; examples include autoclave bags, biohazard containers, incubators, and other equipment.

The **Radiation Hazard symbol** must be posted everywhere where radioactive material is being used, or stored including sinks, fume hoods and benches, and on equipment contaminated with radioactive material. The radiation symbol is also used for x-ray machines.

Electrical Safety

Access to electrical panels should be unobstructed to allow electricians access. Ground Fault Circuit Interrupters (GFCI's) should be used in those locations involving wet processes or outdoor work, including electrical outlets within six feet of a water source. Cords with a three-wire design should have the ground plug intact and be plugged into a three-wire receptacle.

Extension cords should not be used as substitution for fixed receptacle outlets. For more information refer to the guidance document on [Electrical Safety in Laboratories](#).

Housekeeping

Exits, aisles, and safety equipment must not be obstructed. Aisles within the laboratory must be at least 28 inches in clear width. Work areas and floors should be kept orderly and cleaned up after completion of work and immediately after any spill. For laboratories with sprinkler systems, an unobstructed vertical clearance of 18" from sprinkler heads or deflector is mandatory. Doors which are not in use but which are accessible from a corridor or adjacent room should be appropriately labeled if they are blocked on the interior of the room. For more information refer to the guidance document on [Laboratory Housekeeping](#).

Hand Washing

Hands should be washed with soap and water frequently throughout the day. Hands should be washed after handling any hazardous materials, after the removal of gloves, and before leaving the laboratory.

Mouth Pipetting

Mouth pipetting is prohibited. Mechanical pipetting devices should be used.

Sharps Precautions

Needles, syringes and other sharp items should be restricted in the laboratory for use only when there is no alternative. Hypodermic needles should not be bent, sheared, broken, recapped or removed from disposable syringes. If recapping or any other handling is required, a one-handed technique or a tool should be used.

Where possible plasticware should be substituted for glassware, especially when working with infectious agents.

Transportation

If materials are transported by laboratory personnel, they must be contained in such a way as to prevent release to the environment or prevent exposure to people. Shipping hazardous materials requires additional training. For more information, see the DRS guidance document on [Introduction to Shipping](#).

Spills

Every laboratory should be equipped with appropriate material to clean-up spills of the hazardous material present. Small spills that can be cleaned up by laboratory personnel safely without threatening the health of any person or the environment should be cleaned up immediately. Broken glassware should not be handled directly, instead it should be removed using a broom and dustpan, tongs, or forceps. DRS can consult in the event of a spill and give advice on proper clean up procedures. More information on [Preventing Spills](#), [Preparing for Spills](#) and Spill Response can be found on the DRS web page:

- [Biological Material Spill Response](#)
- [Chemical Spill Response](#)
- [Radiological Material Spill Response](#)

Waste

DRS offers disposal services related to hazardous waste (chemical, biological and radioactive) for all campus units. Hazardous waste and solid chemicals (including non-hazardous chemicals) must not be disposed of in the regular trash. Liquids containing biological or chemical hazards must not be poured down the sink. Chemical waste must be collected and stored near the point of generation and cannot be shipped off campus. All hazardous waste containers must be properly labeled with the word “waste” and their content, closed at all times, and segregated by compatibility. Details and procedures for waste collection and disposal can be found on the DRS website at the Waste Management tab on the main menu and under the links below:

- [Chemical waste](#)
- [Biological waste treated by the user](#)
- [Biological waste requiring incineration](#)
- [Radioactive waste](#)
- [Glass disposal](#)
- [Sharps disposal](#)

Lab specific policies to be determined by the PI/Lab supervisor

Working Alone: The PI or lab supervisor has to determine under what circumstances working alone is allowed. A system of periodic checks or a buddy system should be implemented. Working alone should be prohibited for highly hazardous materials and procedures (e.g. HF, pyrophorics, or hazardous machinery).

Prior Approval: The PI/lab supervisor has to decide if the use of a particularly hazardous material or a highly hazardous procedure needs prior approval.

Unattended Experiments: If hazardous operations are carried out with no one present, procedures must be developed that prevent the release of hazardous substances in the event of interruptions in utility services such as electricity, cooling water, and inert gas. Lights should be left on, and signs should be posted identifying the nature of the operation and the hazardous substances in use. If appropriate, arrangements should be made for other workers to periodically inspect the operation.

All lab specific policies should be written down (hardcopy or electronic) and clearly addressed in initial training of laboratory personnel.

Exposure Control Measures

Engineering Controls

Engineering controls are designed to remove the hazard out of a person's breathing area, reducing the exposure. A chemical fume hood, biological safety cabinet, glove box, ventilated gas cabinet, or local exhaust ventilation should be utilized to keep exposures below permissible exposure levels.

Chemical Fume Hoods

All procedures where a chemical exposure to vapor, dust or aerosols is expected under normal conditions or in a foreseeable emergency should be conducted in a chemical fume hood or other adequately vented work area. All users of chemical fume hoods at the University of Illinois at Urbana-Champaign campus should be trained on and comply with the DRS guidance document [Chemical Fume Hoods](#).

A campus-wide Chemical Fume Hood Surveillance Program is conducted by Safety and Compliance at no charge to the users: <http://www.fs.illinois.edu/services/safety-and-compliance/employee-safety-health/chemical-fume-hood>. Hoods are inspected annually and receive a green inspection sticker indicating if the unit is functioning properly.

Biological Safety Cabinets

Any work with biological material at biosafety level 2 that produces aerosols such as centrifuging, pipetting, vortexing, or sonicating, should be performed inside a Biological safety cabinet (BSCs) or other physical containment equipment unless precautions are taken to prevent escape of aerosols (e.g. sealed containers).

All users of BSCs at the University of Illinois at Urbana-Champaign campus should be trained on and comply with the DRS guidance document [Biological Safety Cabinets](#).

BSCs have to be certified annually by an accredited certifier. DRS maintains a list of qualified vendors which is available upon request.

Ventilated Gas Cabinets

Full sized cylinders of toxic compressed gases (NFPA health hazard ranking of 3 and 4, and a ranking of 2 without physiological warning properties) shall be kept in a continuously ventilated gas cabinet. Small cylinders and lecture bottles of toxic gases may instead be kept inside a chemical fume hood. See the DRS guidance document [Compressed Gas Cylinder Safety](#) for more information.

Personal Protective Equipment (PPE)

The PI/laboratory supervisor has to determine which personal protective equipment (PPE) is required to protect laboratory personnel from the hazards they are exposed to and provide such equipment without cost to the personnel. DRS can assist with the selection.

All protective clothing should be removed and left in the laboratory before entering non-lab areas (e.g., hallway, cafeteria, library, offices). All protective clothing is either disposed of by the lab or laundered – it should never be taken home by personnel.

The following basic PPE should be worn at all times when entering a laboratory:

Close toed shoes, clothing that covers the legs, a lab coat, and safety glasses.

Lab Coats: Lab coats should be chosen based on the hazard present. Protective lab coats should be worn by personnel while in the laboratory. Certain lab coat materials are better suited for fires, aqueous splashes, biological agents, or solvent splashes. Consult the manufacturer or DRS with questions about lab coat materials.

Gloves: Gloves should be worn for performing any procedure that requires the handling of hazardous materials, contaminated surfaces, or equipment. Disposable gloves should not be washed, reused, or sprayed with chemical solvents such as ethanol. Gloves should not be worn when touching clean surfaces like keyboards, cell phones, and door knobs. Glove materials vary widely in effectiveness in protecting against specific hazards. Consult a chemical resistance chart, a glove manufacturer, or contact DRS for assistance in appropriate selection.

Safety Glasses: Safety glasses must be ANSI Z87.1 certified to offer the desired protection. Prescription glasses are not to be substituted for safety glasses unless approved prescription safety glasses are purchased. Goggles should be worn when an elevated splash hazard is present.

Respiratory protection: The use of respirators should be avoided as much as possible by using engineering controls. If engineering controls are technically impossible or insufficient, a respirator may be required. Contact Safety and Compliance (S&C) for an assessment of the work and potential exposure. If a respirator is required, compliance with the UIUC Respiratory Program administered by S&C is mandatory. The program includes a medical assessment, fit testing, and instructions on proper use.

Additional PPE: Additional PPE that may be required for certain procedures include a face shield, apron, acid smock, or shoe covers.

For more information, refer to the DRS guidance document [Personal Protective Equipment](#).

Exposure Evaluation and Monitoring

For procedures that cannot be performed inside a fume hood or other well ventilated enclosure, and where an exposure to hazardous chemicals is likely, an exposure evaluation should be performed. Safety and Compliance (S&C) conducts evaluations upon request. Depending on the result of the evaluation, exposure monitoring may be required to assure that OSHA permissible exposure limits (PEL) are not exceeded. Monitoring can also be conducted by S&C.

Medical Consultation and Accident Response

Emergency Assistance

In case of an emergency, assistance can be reached by dialing 911. The following situations constitute an emergency:

- Life-threatening exposure, injury, or health condition
- Fires
- Explosions
- Hazardous material spills that pose a threat to health or safety

METCAD will dispatch the Fire Department and/or ambulances as appropriate. The fire department has the capability to mitigate chemical spills that cannot be managed without assistance.

Exposures

Depending on the severity of the exposure and hazard of the material, students and staff can seek medical attention at the emergency room either at Presence Covenant Medical Center or Carle Foundation Hospital. If the exposure involves a chemical, the Safety Data Sheet (SDS) of the chemical should be brought along, if it is readily available (do NOT delay seeking medical attention to find a SDS). If exposed to a potentially infectious agent or recombinant material, medical follow-up is recommended if: (1) the exposure involves eyes, nose or mouth, (2) skin is damaged at or near the exposure area, (3) the exposure is through parenteral contact (e.g., needle stick, or cut by sharp object). The emergency rooms are located at:

Presence Covenant Hospital Emergency Department

1400 W. Park Street, Urbana, IL 61801, (217) 337-2131

Carle Hospital Emergency Department

602 W. University Avenue, Urbana, IL 61801, (217) 383-3313

Students may also seek basic medical care at the McKinley Health Center or with their personal physician.

Reporting

Supervisors should ensure that an [Employee's Injury Report](#) is completed for all work-related injuries or illnesses, however slight, involving activities for which campus persons are paid.

If a person suffers an injury during activities for which they are not paid, a [Public Injury Report](#) should be completed. These reports should be completed regardless of where the injury occurred or whether the person received medical follow-up. For more information on Worker's Compensation, contact the Claims Management Office.

In addition, exposures to hazardous materials including recombinant or synthetic nucleic acids, ionizing or laser radiation, significant spills, or improper disposal of hazardous material should be reported to DRS immediately.

University policy and state legislation have certain reporting requirements for specific hazards:

- For [biological related issues](#), University policy requires that significant research-related incidents be reported immediately to the Institutional Biosafety Committee (IBC) via the Division of Research Safety. Such incidents include research-related accidents, exposures and illnesses as well as inadvertent release or improper disposal of biohazardous including recombinant or synthetic nucleic acids materials.
- For exposures to [lasers](#), the Illinois Emergency Management Agency (IEMA) requires immediate notification for exposures that involve the partial or total loss of sight in either eye or perforation of the skin or other serious injury. IEMA requires notification within 24 hours for exposures that cause second or third degree burns to the skin.

Medical Surveillance

Safety and Compliance (S&C) coordinates the development and implementation of the campus Medical Surveillance Program. The program includes the routine medical examination of employees over a period of time to evaluate occupational exposure to a potential work-related hazard.

Employees are eligible for inclusion in this program if they perform work-related tasks that might be reasonably anticipated to cause occupational exposure to a potential hazard. The program does not include pre-employment medical examinations. The medical examinations and tests are provided without cost to the employee and at a reasonable time and place. It is the responsibility of the individual campus unit to bear the full cost associated with the medical examination of its employees.

For more information, contact S&C at (217) 265-9828.

Biological Safety

Work with any biological material requires specific safety policies listed in this section. All work with the following materials requires registration with the Institutional Biosafety Committee (IBC) prior to initiation:

- Recombinant or synthetic nucleic acid molecules.
- Transgenic animals (vertebrate & invertebrate).
- Transgenic plants.
- Pathogens (human, animal, and plant).
- Human and Non-human primate materials (cell lines, blood, blood products, tissues, any bodily fluid).
- Biotoxins.

More information about IBC registrations and training requirements can be found at the IBC webpage: <http://www.dr.illinois.edu/Programs/RegistrationInformation>.

Biosafety Levels

Biosafety levels outline containment criteria based on a combination of practices and techniques, safety equipment, and laboratory facilities necessary to work safely with biological agents. The levels are designated in ascending order, by degree of protection provided to personnel, the environment, and the community.

The University of Illinois at the Champaign-Urbana campus has the capability of housing BL-1 and BL-2 laboratory spaces.

Biosafety Level 1 (BL-1) is the lowest level of containment, and is only suitable for work involving well-characterized agents that do not cause disease in healthy adult humans, such as lab strain E coli. These agents present minimal hazard to personnel and the environment.

Biosafety Level 2 (BL-2) builds on BL-1 and is for work with agents that pose moderate hazards to personnel and the environment, BL-2 contains all guidelines of BL-1 with the addition that: 1) personnel have specific training in handling pathogenic agents; 2) access to the laboratory is restricted when work is being conducted; and 3) all procedures that generate aerosols or splashes require physical containment such as a BSC or other physical containment equipment.

For additional information on biosafety levels and standard microbiological practices, please read "Biosafety in Microbiological and Biomedical Laboratories" published by the Department of Health and Human Services, <http://www.cdc.gov/biosafety/publications/bmb15/index.htm>.

Decontamination

Lab equipment and work surfaces should be decontaminated with an effective disinfectant on a routine basis, after work with infectious materials is finished, and especially after overt spills, splashes, or other contamination by infectious materials. Effective disinfectant and appropriate contact times can be found in "[Biosafety in Microbiological and Biomedical Laboratories](#)".

Chemical Safety

The following is a list of basic policies for certain groups of hazardous chemicals. The provided information is NOT sufficient to safely handle those chemicals. Refer to the Safety Library at the DRS website and Standard Operating Procedures developed by your laboratory group for safe handling procedures for hazardous chemicals.

Acutely Toxic Liquids and Solids¹

Chemicals with a high degree of acute toxicity can cause serious injury or even death upon exposure to small amounts. In particular the handling of highly toxic chemicals (GHS classification of acutely toxic category 1 and 2) requires extra care:

- Quantities of these chemicals used and stored in the laboratory should be minimized, as should their concentrations in solution or mixtures.
- Work should only be performed within a functioning fume hood, ventilated glove box, sealed system, or other system designed to minimize exposure to these substances. (The exhaust air from the ventilation systems may require scrubbing before being released into the atmosphere.)
- Where appropriate, an area within the laboratory should be designated for work with highly toxic chemicals. This area should be marked with an appropriate hazard warning such as "DANGER, *specific agent*, AUTHORIZED PERSONNEL ONLY" or comparable warning sign.
- The designated working area should be cleaned after each work procedure and thoroughly decontaminated at regular intervals determined by the laboratory supervisor depending upon the frequency of usage and level of hazard.
- All laboratory workers with access to a designated area for use with extremely toxic chemicals must be trained about the deleterious effects of these substances, signs and symptoms regarding exposure, and how to respond in an emergency situation like a spill or exposure. This training is required even for those who do not actually work with the substances.
- Highly toxic chemicals should be transported in secondary containment.

¹ Acutely toxic category 1 and 2 chemicals have previously been referred to as particularly hazardous substances (PHS)

Compressed Gases

Gas cylinders should be stored in well ventilated areas with their protective caps on. They should be secured in an upright position at or slightly above midpoint to a secured surface at all times. Gas cylinders must not be stored near heat or high voltage sources.

Compressed gas cylinders containing flammable, corrosive, oxidizing, or toxic gases should not be used near egress routes.

Compressed gas cylinders that contain acutely toxic gases, such as arsine and nitrogen dioxide, must be stored in a ventilated gas cabinet. Leak detectors should be utilized as a warning system.

Compressed gas cylinders that contain pyrophoric gases must be stored in a ventilated and gas cabinet with a sprinkler system. Special plumbing and fittings are also required.

Please note that there is a limit on the number of compressed gas cylinders that can be stored in a laboratory space.

For moving compressed gas cylinders, appropriate carts should be used. The cylinder must be capped and securely strapped to the cart.

For more information, refer to the DRS guidance document [Compressed Gas Cylinder Safety](#).

Corrosives

Corrosive chemicals can cause severe irritation and permanent destruction of the skin, and respiratory tract. They are particularly hazardous to the eye. Besides mineral acids and bases, other chemicals such as some inorganic salts, phenols, amines, halogens, and some halogenated organic compounds are also highly corrosive. The use of any liquid corrosives requires wearing splash goggles and gloves at a minimum. Depending on the amount handled, a face shield, chemically resistant gloves and an apron / acid smock may be required.

Consult the Safety Library at the DRS website for information on specific materials covered by this category.

Cryogenics

Cryogenic material should not be stored in poorly ventilated rooms such as cold rooms. Cryogenics should be stored in well ventilated places to avoid asphyxiation hazards caused by oxygen depletion. Containers holding cryogenics should not be transported in elevators at the same time as people. The handling of liquid cryogenics requires wearing cryogenic gloves and splash goggles at a minimum.

For more information, refer to the DRS guidance document [Cryogenics and Dry Ice](#).

Explosive Materials

Compounds that may explode upon heat, friction or shock pose a serious safety hazard even for laboratory-scale quantities. Heavy metal azides, organic azides and organic peroxides are often shock sensitive explosives. Chemicals that become explosive when dry (e.g. picric acid), should be monitored quarterly for their water content and always be kept wet. Potentially explosive chemicals and procedures should only be performed in a chemical fume hood and behind a blast shield.

Consult the Safety Library at the DRS website for information on specific materials covered by this category.

Flammables

Flammable chemicals should be stored in a flammable cabinet whenever possible. They should never be stored or used near ignition sources. Bunsen burners are not permitted to heat flammable solvents. There is a limitation of the amount of flammable solvent that be stored in a laboratory space.

For more information, refer to the DRS guidance document [Flammable Liquids](#).

Health Hazard Chemicals²

Chemicals that are classified as carcinogens, mutagens or reproductive toxins are referred to as health hazard chemicals. Use of these chemicals should be minimized; if possible they should be substituted with less hazardous chemicals.

- Quantities of these chemicals used and stored in the laboratory should be minimized, as should their concentrations in solution or mixtures.
- Work should only be performed within a functioning fume hood, ventilated glove box, sealed system, or other system designed to minimize exposure to these substances. (The exhaust air from the ventilation systems may require scrubbing before being released into the atmosphere.)
- Where appropriate, an area within the laboratory should be designated for work with chemicals dangerous to health. This area should be marked with an appropriate hazard warning such as "DANGER, *specific agent*, AUTHORIZED PERSONNEL ONLY" or comparable warning sign.
- The designated working area should be cleaned after each work procedure and thoroughly decontaminated at regular intervals determined by the laboratory supervisor depending upon the frequency of usage and level of hazard.
- All laboratory workers with access to a designated area for use with health hazard chemicals must be trained about the deleterious effects of these substances, signs and symptoms regarding exposure, and how to respond in an emergency situation like a spill or exposure. This training is required even for those who do not actually work with the substances.
- Health hazard chemicals should be transported in secondary containment.

Mercaptans

To avoid false reporting of natural gas leaks, mercaptans should not be used in such a manner (e.g. scrubbers for effluent) that persons outside of the laboratory could smell the mercaptan and suspect a natural gas leak in the building. All persons using mercaptans should report these uses to people in the area (including facility managers) that may notice a malodor.

Mercury

Mercury and mercury compounds are extremely toxic and difficult to dispose of. The use of mercury and its compounds should be minimized. Mercury containing thermometers and other devices should be replaced unless no appropriate substitute is available. Mercury thermometers should not be used in ovens. If metallic mercury is present in a laboratory, a mercury spill kit must be available.

For more information, refer to the DRS guidance document [Mercury](#).

² Reproductive toxins, and "select carcinogens" have previously been referred to as particularly hazardous substances (PHS).

Nanomaterials

The health hazards of nanomaterials are not yet fully understood. There is evidence that they can penetrate intact skin, deposit in the lungs, enter the blood stream and travel through the whole body including the central nervous system. Any handling where an exposure to nanomaterials is likely (handling dry powders, agitating suspension or mechanically working on materials with embedded nanoparticles) should be performed in a well-ventilated enclosure adequate for nanoparticle use.

For more information, refer to the DRS guidance document [Nanomaterials](#).

Oxidizers

Strong oxidizers promote combustion of flammable materials and often react vigorously with organic compounds. They should be stored away from reducers, heat sources, organic chemicals, and any other combustible material. Refer to the DRS document [Oxidizers](#) for guidance in identifying such chemicals.

Perchloric Acid

If procedures require the heating of perchloric acid, a perchloric acid fume hood with a water wash down system or a local scrubbing or trapping system must be used. Evaporation of perchloric acid and condensation of potentially explosive peroxides on ductwork can lead to a severe explosion hazard.

For more information, refer to the DRS guidance document [Perchloric Acid](#).

Peroxide Forming Chemicals

Some chemical form peroxides over time. The two most serious hazards associated with peroxides are fires and explosions when exposed to heat, shock, or friction. Peroxide decomposition can initiate explosive polymerization reactions. Peroxides can also oxidize human tissue, cotton, and other materials.

Peroxide forming chemicals must be dated upon opening and checked periodically according to the DRS guidance document [Peroxide-Forming Chemicals](#).

Pyrophorics

Pyrophoric materials ignite spontaneously in air and are therefore extremely hazardous. Training for handling pyrophorics must include practical instructions from someone experienced in using such chemicals. Laboratory personnel should only handle pyrophorics once they feel comfortable that they can perform the procedure safely. All handling of pyrophorics requires wearing a flame retardant lab coat.

For more information, refer to the DRS guidance document [Handling Pyrophoric and Highly Reactive Materials](#).

Water Reactives

Water reactive chemicals react violently with water often liberating highly flammable or toxic gas. They should be stored safely away from any source of water and should only be used after receiving adequate training.

For more information, refer to the DRS guidance document [Handling Pyrophoric and Highly Reactive Materials](#).

Storage of Chemicals

Chemicals should be stored safely in cabinets and on shelves in an upright position. Toxic or corrosive liquids and any fragile containers (glass) should not be stored above 5 feet.

Chemicals should be segregated based on chemical categories and compatibilities. The specific storage guidelines include:

Acids

Store acids separate from bases and other acid sensitive chemicals that may liberate toxic or flammable gas upon contact with acid such as: azides, bleach, carbides, cyanides, nitrides, sulfides and metals. Separate nitric acid from organics such as acetic acid.

Strong Oxidizers

Store away from reducers, heat sources, organics (including organic acids) and other combustible material.

Flammables

Preferably store in a flammable cabinet. Always keep flammables away from any ignition sources.

A special refrigerator or freezer must be used for flammables that must be stored in a cool atmosphere. Refer to the DRS guidance document [Flammable Liquids](#).

Pungent smelling (stench) chemicals and lacrymators should be stored in ventilated storage cabinets.

For more information, refer to the DRS guidance document [Chemical Storage](#).

Laser Safety

All lasers class 3b and 4 must be registered with the Illinois Emergency Management Agency (IEMA) through DRS. More information and the laser registration form can be found under [Laser Registration and Program Information](#).

Commercially purchased lasers are certified and labeled by the manufacturer as to belonging to one of the four hazard classes:

- Class 1 and 1M
Class 1 laser systems do not emit hazardous radiation under normal operating conditions. Most class 1 laser systems incorporate “embedded” higher-power lasers, which can be accessed only if safety interlocks are defeated or bypassed during servicing. In this case, the system temporarily reverts to the original laser classification.
A class 1M laser system is considered to be incapable of producing hazardous exposure conditions during normal operation unless the beam is viewed with an optical instrument such as an eye-loupe or a telescope.
- Class 2 and 2M
A class 2 laser system emits in the visible portion of the spectrum (400-700 nm), and the

natural aversion reaction to bright visible light (0.25s) is expected to protect the eyes from damage. However, a class 2M laser is potentially hazardous if viewed with magnifying optics.

- Class 3R (formerly 3a) and 3b
A class 3R laser system is potentially hazardous under some direct and specular (mirror-like) reflection viewing conditions if the eye is relaxed (focused at infinity), but the probability of an injury is small.
A class 3b laser system is more powerful than a 3R and is NOT safe for direct viewing or viewing of specular reflections.
- Class 4
A class 4 laser system is damaging to the eye and skin from the direct beam and diffuse reflections (scattering), and a potential fire hazard. I can also generate airborne contaminants and hazardous plasma radiation.

It is important to understand that also the low powered lasers can pose a hazard. Eye injuries can occur when staring directly into the beam or if beams from class 1M or 2M lasers are viewed through optical devices that focus and magnify the beam. In such cases, eye protection may be necessary.

For more information on hazards and control measures of class 3b and 4 lasers, refer to the DRS guidance document [Laser Hazards and Control Measures](#).

Radiation Safety

DRS administers a radiation safety program that all University personnel on the Urbana campus and all visiting academic, faculty, staff or students must adhere to when using radioactive material or ionizing radiation sources on or off campus. All radiation-producing machines must be registered with the Illinois Emergency Management Agency (IEMA) through DRS. The procurement, possession, or use of radioactive material is permitted only pursuant to a Radiation permit issued by DRS.

The following links provide more information:

- [Authorization to use Radioactive Materials](#)
- [Registering Radiation Producing-Machines](#)

Every person entering a space where radioactive material is present, must take the DRS online training [Radiation Safety Awareness Training](#).