IMS Safety Manual

Institute of Materials Science
University of Connecticut

Prepared by the
IMS Safety Committee
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IMS INSTITUTE OF MATERIALS SCIENCE

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Emergency Information

For a true emergency:

Dial 911	To report a chemical spill, fire, injury, or suspicious people in your area. You will be contacted by a Public Safety Dispatcher. Be prepared to provide the type of emergency, the location of the emergency, and any other information that will assist the emergency personnel. Follow instructions regarding evacuation/shelter in place instructions.
Red Pull Station	Pulling down the handle on a Red Pull Station will send a fire alarm to the Fire Department Dispatch center and evacuates the building. Meet first responders at the building entrance and provide details on the location and nature of the emergency.

For a maintenance emergency:

Dial 6-3613 (860-486-3613)	Emergency maintenance to report a water leak, electrical outage, non-working fume hood, etc. after normal working hours. During working hours see **Josh Strecker** in room G16 (860-486-2496; joshua.strecker@uconn.edu).

Environmental Health and Safety Office (EHS):

Dial 6-3514 (860-486-3613)	Environmental Health & Safety Office (EH&S) for information on how to handle and/or dispose of chemical, biological, or radioactive materials. The University's Chemical Safety Manager is **Brent Lewchik** (brent.lewchick@uconn.edu). For up-to-date information visit the EH&S website at: https://ehs.uconn.edu/

IMS Building Safety Contact:

Dial 3-3514 (860-486-3514)	**Jesse David** (jesse.david@uconn.edu) is the IMS Stockroom and Safety Manager.

Introduction

Safety is the first issue that you should consider when entering any laboratory. Safety training with the University Environmental Health and Safety Office for use of chemicals and equipment, safe procedures, proper waste disposal methods, using radiation sources of all types, and use of biological materials is mandatory. When you join a research group you should familiarize yourself with the safety aspects of the lab, the locations of all safety equipment, and think about safe procedures. You are responsible for learning safe procedures for doing experiments. Your faculty advisor and fellow graduate students will help train you in carrying out experiments and in special safety concerns of the types of research being done in your labs.

Safety is a key concern of all Faculty Members, Staff Members and Students in the Institute of Materials Science (IMS). You should fully understand your responsibilities as regards safety in labs. When in doubt about a procedure or specific experiments it is your responsibility to ask questions to get answers to these questions. You should not work alone in a laboratory. You should not use equipment for which you have not been trained.

This Safety Manual was developed for you and every other researcher in IMS. You should read and study this manual and keep it in a place where you can constantly refer to this information. We want you to enjoy your research efforts in a safe environment with safe procedures that will protect you and all members of the Institute of Materials Science.

You must follow all safety rules and practices of IMS and the labs in which you work. Failure to follow safe procedures and rules of the University of Connecticut and IMS will lead to your removal from your lab and the building.

We hope you enjoy your stay at UCONN and at IMS. Please help in making IMS a model environment for safe laboratory practices. Your suggestions about safety and other aspects of labs at IMS are welcome at any time.

Steven L. Suib, Director

Jesse David, Chemical Safety Manager

IMS Safety Committee

Contact Name	Room Number	Phone Number
Jesse David (*chair*)	G11	6-3514
Josh Strecker	G16	6-2496
Rainer Hebert	1019	6-3155
Kelly Burke	MZ-222	6-3133
J. Nate Hohman	1021	6-2880
Denis Shannon		6-3115

IMS Laboratory Safety Reporting Policy

The IMS Safety Committee, in concert with the director of IMS, has established the following IMS policy regarding the proper reporting procedures for safety violations and safety hazards.

Any unsafe practices or problems should be reported immediately – if it is an individual engaging in an unsafe procedure, point out the problem to that individual. If the individual persists in the unsafe practice, bring the problem to the individual's advisor's attention. If there is still no resolution of the problem, please contact any member of the IMS Safety Committee or the Chairman of the IMS Safety Committee.

If you are uncomfortable with reporting to the faculty advisor a continued safety violation by a colleague, please feel free to contact the Chairman of the IMS Safety Committee.

The chain of responsibility for laboratory safety at IMS begins with the individual experimenter (graduate student, post-doc, etc.), then faculty advisor, and ultimately ends with the director of IMS.

Remember: Safety is everyone's concern.

IMS Training and Access

Unauthorized individuals are not allowed in Science I spaces without proper training and permissions. Any individual starting work at Science I should follow the below steps to ensure access is granted in a timely manner and concurrent with their requirements.

Undergraduate students and minors (individuals under the age of 18) may be granted building access but will not be granted laboratory access. These individuals are required to have a supervisory graduate student, faculty, or staff member with them at all times in laboratory environments.

Required Trainings:

All spaces:

- IMS Building Training/Exam (in-person):
  contact Jesse David, Laboratory Safety Manager, to schedule training and concurrent safety exam. The exam contains material from the manual, online, and in-person training.

- Science I Safety Training (online):
  The Science I Safety Training Module is hosted on HuskyCT and reviews the Lab Safety, Chemical Waste Management, and portions of the Chemical Hygiene Plan.

- Chemical Hygiene Plan Confirmation:
  The Chemical Hygiene Plan (CHP) serves as a guide to appropriate work practices and conduct to be used in laboratory environments. Please review the CHP and complete the electronic signature confirmation on HuskySMS here.

- Laboratory Safety and Chemical Waste Management:
  - The Laboratory Safety and Chemical Waste Management should be completed by all faculty, staff, students, visitors, and other individuals working in laboratories where hazardous chemicals are used or stored.
  - There is an initial training for those new to laboratory work at the university. There is then a refresher course annually.
- Laboratory Specific Training:
  Specific training may be required based on the risks present in the laboratory individuals will be working in. Risks and associated training can be checked in HuskySMS or by referencing the Workplace Hazard Assessment (WHA) in the laboratory.

Access Request Form:

Once all applicable training has been completed, complete the IMS Building Access Form (available on ims.uconn.edu), and submit it to Josh Strecker by email. Any subsequent access requests will supplant previous submissions of this form in IMS records (ex. Additional lab access is approved). All laboratory access requests and hours of access are subject to Lab Manager/PI approval.

Special Access Laboratories:

Foundry:

The IMS Casting Facility, room IMS-015, exists for the fabrication of alloys (arc melting, vacuum induction melting, and casting), welding and heat treatment. Certain precautions are necessary when making use of the above facilities and access is gained via the facility supervisor, Dr. Hal Brody (Harold.brody@uconn.edu).

Core Laboratories:

IMS has core laboratories within the building, including chromatography, spectroscopy, thermal analysis, mechanical testing, NMR, and X-Ray Diffraction. Access to these laboratories is determined by the laboratory managers listed below, based on need and training. Please contact the laboratory manager for access to these laboratories.

- Mechanical Testing, NMR, Liquid Chromatography
  - Dr. Nicholas Eddy, Nicholas.eddy@uconn.edu
- Gas Chromatography, Spectroscopy
  - Dr. Capri Price, capri.price@uconn.edu
- Thermal Analysis
  - Dr. Dennis Ndaya, dennis.ndaya@uconn.edu
- X-Ray Diffraction
  - Dr. Daniela Morales, Daniela.morales@uconn.edu
- Cleanroom
  - Dr. Mustafa Yavuz, mustafa.yavuz@uconn.edu

Emergency Procedures

Preparation:

1. Sign up for UConnAlert – the University's official emergency notification and alerting system.
2. Know the evacuation route(s) from the laboratories/spaces you're working in.
3. Science I's designated assembly point is the parking lot lawn.
4. Never tamper with the sprinkler systems or fire extinguishers.
5. Do not cover or remove smoke or carbon monoxide detectors.
6. Ensure fire doors and paths of egress (exit) are not obstructed in a way that would prevent closing the door.

Emergency Procedure Course of Action:

1. **Relocate** everyone in the immediate work area to a safe location.
2. **Alert** – **Dial 911.** Follow the directions of the dispatcher. The person that dials 911 must meet emergency personnel to provide additional information about the emergency.
3. **Confine** – if it can be done safely, close doors to confine the area where the emergency occurred. Post "Emergency Hangtag" on the door(s) to prevent reentry.
4. **Evacuate** the building through the nearest exit. Do not run or use elevators.
5. **Report** to the assembly point.
6. **Reenter** once the lab has been cleared by emergency personnel.

Chemical Emergencies:

Chemical Spills:

Chemical spills refer to the release of chemicals, wastes, oils, or other potentially dangerous material into the air, water, or workplace. Spills may include incidents where an individual is injured, impaired, or contaminated. Chemical spills must not be cleaned up without the assistance of emergency personnel (i.e., UCFD, the local Fire Department, or other emergency response vendor). UCFD or the local fire department will assess the risk from a spill and consider:

- Risk of fire/explosion
- Potential overexposure to airborne contaminants
- Onset of dangerous reactions
- Contact hazards with corrosive and/or toxic chemicals
- Threat to the environment

Lab personnel involved in a hazardous chemical spill must follow the emergency procedure course of action above.

Incidental Releases:

Incidental releases are small spills that can be safely dealt with by laboratory personnel. Incidental releases must present little to no risk of exposure to individuals or the environment and can be safely controlled at the time of release.

1. Evacuate everyone in the lab and post an "Emergency Hangtag" on the door(s) to prevent reentry by other lab personnel.

2. Contact the PI or Laboratory/Facility Manager prior to cleaning up any small spill. **Dial 911 if the PI/Facility Manager is not available and follow the emergency procedure for chemical spills.**
3. Ensure the risk of exposure is minimal with the PI/Lab Manager. **If a danger or risk of exposure exists, follow the emergency procedure for chemical spills.**
4. Avoid contact with contaminated areas. If the spill is in a non-ventilated area, relocate, dial 911, and **follow the emergency procedure for chemical spills.**
5. If safe, turn off ignition sources and compressed gases. If not, evacuate the lab, call 911, and **follow the emergency procedure for chemical spills.**
6. Put on appropriate personal protective equipment indicated in the safety data sheet. Work with another person to clean up the spill. Do not clean up a spill alone.
7. Use the appropriate spill kit to control the source and confine the spill to a small area.
8. Place spill debris in an appropriate container, tightly seal or close container, and properly label the waste.
9. Place the waste in the Satellite Accumulation Area and contact EHS for a waste pickup.
10. Report the spill to the IMS Safety Manager and EHS.
11. Restock supplies used to clean up the spill.

Fire, Shelter in Place, and Lockdown Procedures

Fire Emergency:

1. Activate the nearest fire alarm if it isn't already sounding.
2. When the fire alarm is activated, evacuate the building immediately.
3. If time and conditions permit, secure your workplace and take important personal items with you (keys, purse/wallet, medication, and/or eyeglasses). Do not waste time.
4. Calmly and quickly proceed to the nearest exit. Walk, do not run. Your nearest exit may not be the way you entered.
   CLASSROOM INSTRUCTORS — If you are teaching a class, calmly instruct the class to exit to an assembly point outside. Grab your belongings and quickly evacuate to the area you designated outside. Provide further instruction from the exterior of the building.
5. If you are the last one out of a room, close the door behind you and turn off the lights.
6. Do not use the elevator.
7. Call 911, report the situation, and follow their instructions. Note, a fire alarm activation notifies local emergency dispatch.
8. Wait outside for further instruction from (UConn / Local) Emergency Personnel.
9. Immediately report anyone that you believe may be missing or trapped inside to Emergency Personnel.
10. Never reenter a building until it is declared safe by Emergency Personnel, or you receive the "ALL CLEAR."

If you become trapped:

1. Get inside a room and close the door.

2. If there is a smoke or fire condition, or in a hazmat incident, put a towel in the space between the bottom of the door and the floor.
3. Call 911 from your telephone and tell the dispatcher your location and condition.
4. If there is a window in the room, signal for help with a brightly colored object or hang a sheet from it outside.

Experiments during a Fire:

1. If you are conducting an experiment when an emergency evacuation occurs:
   a. Shut down or stabilize the experiment in a safe manner.
   b. Evacuate the building.
2. If the experiment cannot be shut down without creating a hazard, follow this procedure:
   a. Report to the Fire Officer-in-Charge.
   b. Describe the experiment, the location, relative hazard, and estimate the time factor before the situation becomes dangerous.
   c. If possible, you will be permitted to return to the experiment by the Fire Department.

Fire Extinguishers:

No individual working in a laboratory is allowed to use a fire extinguisher without appropriate training. If you would like to register for fire extinguisher training, fill out the form for in-person training.

Shelter in Place:

Shelter-In-Place means you should **stay inside** the building you are already in or closest to.

1. Calmly stop class, work, or close your business.
2. Immediately seek shelter inside the closest sturdy building, interior room, or corridor.
   a. Preferably, find a small interior room with few/no windows.
   b. Avoid large free-standing expanses such as auditoriums and gymnasiums.
3. Close all windows, exterior doors, and any other openings to the outside.
4. Stay away from windows, glass, and unsecured objects that may fall.
5. If you are with other people, ask them to stay in the room with you. When authorities provide directions to shelters-in-place, they want everyone to take those steps right away, where they are, and not to drive or walk outdoors.
6. If you are not at imminent risk, contact your family to let them know your situation.
7. Await further instruction from UConnALERT and Emergency Personnel.
8. Do not leave until an ALL CLEAR is received.

Lockdown:

Lockdown is a state of isolation or restricted access instituted as a security measure. You will be safest by quickly placing a locked door or other barricade between you and the potential threat or danger.

1. Calmly, but quickly close and lock all doors into your room and turn off the lights.
2. Block entry into your room, if possible.

3. Close and lock all windows in your room. Draw the blinds where possible.
4. Hide in an area that is out of view and makes your location look as though it is empty.
5. Silence all electronic devices.
6. Remain as quiet as possible and attract as little attention to your area as possible.
7. Wait for further instruction from UConnALERT and Emergency Personnel.
8. Stay locked-down in your hiding place until you receive an "ALL CLEAR."
9. **Call 911** if an emergency arises in your area.
10. **CLASSROOM INSTRUCTORS**: If you are teaching a class, inform them: "Attention everyone, we are being placed under lockdown. Please remain in this room and move to (an area in the room that is out of view). I am going to shut the lights off and lock and barricade the doors. Please silence your electronic devices. Let's make it seem as if there is no one in this room. We will remain as quiet as possible and wait for further instruction."

If someone tries to access your secured area:

1. If there is ANY DOUBT about your safety inside the room or building, the area needs to remain secure. Do not let the person in. Allowing someone to enter a secure location may endanger you and others.
2. You will need to use your own good judgement.

Active Threat/Active Shooter Additional Response Guidance:

If it is determined there is an active shooter/threat in your vicinity, your first choice should be to evacuate the area of the threat.

RUN

- Have an escape route and plan in mind. This will depend on your location in the building, so plan.
- Leave your belongings behind.
- Evacuate regardless of whether others agree to follow.
- Keep your hands visible.
- **Call 911** when safe to do so and provide as much information as possible, such as: your location, number and description of suspects if known, and weapons used.

If you cannot evacuate the area:

HIDE

- Hide in an area out of the suspect's view.
- Block entry to your hiding place and lock the doors, if possible.
- Turn out the lights.
- Silence electronic devices.
- Make your location look as though it is empty.
- **Call 911** when safe to do so.

If you are face to face with the suspect and your life is in imminent danger:

FIGHT

- As a last resort and only when your life is in imminent danger.

- Attempt to incapacitate the suspect.
- Act with physical aggression and throw items to distract or disable the suspect.

For more information about “RUN-HIDE-FIGHT” and training go to:
Public Education | Division of University Safety (uconn.edu)

First Aid Response

All lab personnel are responsible for identifying locations of eyewash stations, safety showers, first aid kits, fire alarms, and other emergency equipment prior to research. Follow the procedures below when emergency situations result in exposure to hazardous chemicals.

Eye Exposure:

Hazardous Chemical Exposure:

1. Forcibly hold both eyes open under an emergency eyewash to ensure an effective wash behind both eyelids.
2. If contact lenses are being worn, remove the contacts while flushing.
3. **Dial 911** or have someone else from the lab dial 911.
4. Continue flushing the eyes underneath the eyewash until emergency personnel arrive.
5. Report the injury to your principal investigator and/or laboratory/facility manager and EHS.

Non-Hazardous Solid Exposure:

1. If eyes are exposed to metal, glass, wood, or other type of particulate, do NOT flush eyes under an emergency eyewash.
2. Close or cover the eye(s), **dial 911**, and have emergency personnel evaluate eye(s) prior to flushing.
3. Report the injury to your principal investigator and/or laboratory/facility manager and EHS.

Skin Exposure:

1. Wash affected area(s) with tepid water from an emergency safety shower. Take care not to break skin.
2. Remove or cut off contaminated clothing while rinsing. Do not pull contaminated clothing over the head.
3. For chemical and thermal burns, flush affected area(s) with water from the safety shower, if indicated in safety data sheet.
4. For blood, biological, or radiological exposures use soap and water.
5. **Dial 911** or have someone else from the lab dial 911.
6. Keep flushing affected area(s) underneath the safety shower until emergency personnel arrive.
7. Report the injury to your principal investigator and/or laboratory/facility manager and EHS.

Inhalation (chemicals, vapors, fumes, smoke):

1. If exposed individual is unconscious, do NOT enter the lab if a possibility of oxygen depletion, toxic vapors, or an explosive atmosphere exists. **Dial 911**.
2. If the exposed individual is conscious, move the person to fresh, uncontaminated air. Dial 911.
3. Report the injury to your principal investigator and/or laboratory/facility manager and EHS.

Ingestion:

1. If safe to do so, move affected individual to an uncontaminated area.
2. **Dial 911** or have someone else from the lab dial 911
3. Do not induce vomiting or drink water or other liquids unless instructed to do so by emergency personnel.
4. Report the injury to your principal investigator and/or laboratory/facility manager and EHS.

Cryogenic Exposure:

1. If skin encounters a cryogen, place the affected area in a warm water bath (not above 40°C/104°F). Never use hot or cold water or dry heat. Thawing of the affected area(s) must be done gradually.
2. If a burn from a cryogen occurs, do not rub the burned area. Rubbing can result in further tissue damage.
3. Dial 911 and seek medical attention as soon as possible for all frostbite injuries.
4. Report the injury to your principal investigator and/or laboratory/facility manager and EHS.

Laser Accidents:

1. If an individual suspects they have received a laser exposure or other non-beam injury, they should first seek immediate medical attention without delay.
2. When possible, close the laser beam shutter and/or turn off the laser system.
3. If there is a fire, pull the fire alarm, evacuate the building, and **contact 911.**
4. Report the injury to your principal investigator and/or laboratory/facility manager and EHS.
5. For eye injuries or suspected eye injuries, an Ophthalmologist must evaluate laser eye injuries within 48 hours of the suspected injury. Contact Solinsky Eyecare immediately to schedule an exam appointment with an Ophthalmologist at one of their nearest locations.

   Solinsky EyeCare
   860-233-2020
   Offices in Willimantic and Vernon CT
   https://www.solinskyeyecare.com/locations/

Class Suspension or Campus Closure

This building is under the authority of the University's Emergency Closing Policy, readily available at policy.uconn.edu. According to the policy:

"Decisions to alter the University's normal operations and schedule for all campuses are made jointly by the President's Office, Provost's Office, and Executive Vice President and Chief Financial Officer (EVPA/CFO). Decisions about such alterations are made with full input from University Safety and Facilities Operations for all campuses…The University will make announcements about closings or delayed openings as soon as feasible, and generally no later than 5 a.m. When conditions change rapidly or unexpectedly, however, the University may need to make or update decisions about classes and business operations on short notice. The UConnALERT website, alert.uconn.edu, is the definitive source of information about the University's operating status."

General Laboratory Safety

The OSHA Laboratory Standard (29 CFR 1910.1450) requires that the University of Connecticut develop a Chemical Hygiene Plan (CHP) to protect workers from the diverse hazards encountered in laboratories. Employees and students working in IMS laboratories must read the CHP to become familiarized with university expectations.

Chemical Labeling:

All chemicals and samples brought, created, or used in laboratories in IMS must be properly labeled. All new chemicals must have a product identifier, signal word, hazard statement(s), precautionary statement(s), pictogram(s), and the name, address, and telephone number of the chemical manufacturer, importer, or other responsible party.

Original Containers:

New chemicals must have labels that are written in English (other languages may also be included if necessary), legible and prominently displayed on the container. Lab personnel are responsible for ensuring that labels on incoming containers of hazardous chemicals are not removed or defaced. Original labels on older bottles that have faded or been removed must be replaced.

Secondary Containers:

Secondary containers (e.g., beakers, flasks, jars, spray bottles, etc.) must be properly labeled with the full chemical name(s) and hazard class(s). The full name(s) of the hazard class(s) (e.g., Flammable, Corrosive, Reproductive toxin, etc.) can be written out on the secondary container or the corresponding OSHA GHS pictogram can be affixed to the container.

Approved OSHA GHS Labels:

To be used to communicate health and physical hazards in place of a written name of the hazard class.

PHYSICAL HAZARDS		
Flame		▪ Flammable ▪ Pyrophoric ▪ Self-heating ▪ Emits flammable gas ▪ Self-reactive ▪ Organic peroxide
Flame Over Circle		▪ Oxidizers
Gas Cylinder		▪ Gases under pressure

PHYSICAL HAZARDS		
Hazard Symbol	**Pictogram**	**Examples**
Exploding Bomb		▪ Explosive ▪ Self-reactive ▪ Organic peroxide

HEALTH HAZARDS		
Hazard Symbol	**Pictogram**	**Examples**
Exclamation Mark		▪ Irritant ▪ Skin sensitizer ▪ Acute toxicity (Harmful) ▪ Narcotic effects ▪ Respiratory tract irritant ▪ Hazardous to ozone layer (non-mandatory)
Corrosion		▪ Skin corrosion/burns ▪ Eye damage ▪ Corrosive to metals
Skull & Crossbones		▪ Acute toxicity (Fatal or toxic)
Health Hazard (Silhouette of a person with a starburst on the chest)		▪ Carcinogen ▪ Mutagenicity ▪ Reproductive toxicity ▪ Respiratory sensitizer ▪ Target organ toxicity ▪ Aspiration toxicity

Chemical Safety Practices:

The following lab practices, as well as all requirements in the CHP must be followed by all individuals working in IMS laboratories.

General Requirements:

- Unauthorized individuals are not allowed in laboratories. Access is limited to authorized University faculty, staff, students, and visitors with legitimate reasons for being in such a laboratory.
- Authorized individuals must be properly trained, made aware of the hazards present in the lab, and be provided appropriate personal protective equipment.
- Pets are not allowed in laboratories, with some exceptions for police dogs and service animals (e.g., guide dogs).
- The only live vertebrate animals allowed in laboratories are those to be used in teaching and research and must be approved prior to entry by the Institutional Animal Care and Use Committee (IACUC).
- Review the safety data sheet(s) for all chemicals necessary prior to use.
- Substitute or reduce the quantities of hazardous chemicals being used if possible.
- Review the CHP and laboratory-specific standard operating procedures andwork practices.
- Wear appropriate personal protective equipment (PPE) as specified in the Workplace Hazard Assessment Form, safety data sheets, or equipment specifications.
- Inspect equipment and PPE for damage prior to use. Replace or repair damaged equipment or personal protective equipment.
- Use fume hoods when working with hazardous chemicals.
- Label all chemicals in secondary containers with the full chemical name and hazard class.
- Use all chemicals and equipment for their intended purpose.
- Report accidents, spills, or other emergencies to the PI/Laboratory Supervisor as soon as possible

Personal Hygiene:

- Do not drink, eat, smoke, or apply cosmetics in active lab areas.
- Do not store food, beverages, tobacco, or cosmetic products in active lab areas.
- Never touch, smell, inhale or taste a hazardous chemical.
- Do not reuse disposable gloves.
- Do not use mouth suction to pipet. Use a bulb or device.
- Secure loose-fitting jewelry.
- Tie back long hair.
- Wash hands thoroughly with soap and water after handling chemicals and prior to exiting the lab.
- Remove contaminated clothing and gloves before leaving the laboratory.

Housekeeping:

- Access to emergency equipment, showers, eyewashes, and exits must remain unobstructed.
- Aisles, benches, and stairs must be kept clear of all chemicals and equipment.
- Lab benches, shelves, and equipment must be kept clean and orderly.
- Floors must remain clean, dry, and free of obstructions of egress.
- All chemicals must be placed in assigned storage areas at the end of the day.
- Hazardous waste must be labeled and managed properly.

Safety Data Sheets

Lab personnel are responsible for reading safety data sheets (SDSs) and following all procedures within for proper handling, storage, and disposal. SDSs can be found in Vertere, manufacturer websites, or in the lab. Principal Investigators/Lab Supervisors are responsible for ensuring that SDSs are available for every chemical in the laboratory and readily accessible to employees. Printed or electronic copies of safety data sheets are acceptable. If safety data sheets are stored on a computer, they must be on a computer that is accessible to everyone in the lab.

Section	Section Heading	Description
1	Identification	Product identifier; manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use.
2	Hazard(s) identification	All hazards regarding the chemical; required label elements
3	Composition/ information on ingredients	Information on chemical ingredients; trade secret claims
4	First-aid measures	Important symptoms/ effects, acute, delayed; required treatment
5	Fire-fighting measures	Suitable extinguishing techniques, equipment; chemical hazards from fire
6	Accidental release measures	Emergency procedures; protective equipment; proper methods of containment and cleanup
7	Handling and storage	Lists precautions for safe handling and storage, including incompatibilities
8	Exposure controls/personal protection	Includes OSHA's Permissible Exposure Limits (PELs); Threshold Limit Values (TLVs); appropriate engineering controls; personal protective equipment (PPE)
9	Physical and chemical properties	Lists the chemical's characteristics
10	Stability and reactivity	Chemical stability and possibility of hazardous reactions
11	Toxicological information	Routes of exposure; related symptoms, acute and chronic effects; numerical measures of toxicity

12	Ecological information	Since other Agencies regulate this information, OSHA will not be enforcing Sections 12.
13	Disposal considerations	Since other Agencies regulate this information, OSHA will not be enforcing Sections 13.
14	Transport information	Since other Agencies regulate this information, OSHA will not be enforcing Sections 14.
15	Regulatory information	Since other Agencies regulate this information, OSHA will not be enforcing Sections 15.
16	Other information	Includes the date of preparation or last revision

Laboratory Equipment:

Eye Protection/Eye Washes:

Safety glasses should always be worn in active lab areas. Face shields or approved standing shields should be used for any operation having the potential for explosion. All laboratories have an eyewash station located at the front of the lab. These eyewashes are tested regularly by a third-party company to ensure proper operation in case of an emergency.

Safety Showers:

All laboratories have a safety shower located at the front of the lab. These are tested regularly by a third-party company to ensure proper operation in case of an emergency.

Refrigerators:

Food or drink should not be stored in any refrigerator within an active lab area. Domestic (household-type) refrigerators should never be used for the storage of volatile or unstable chemicals. Special explosion-proof refrigerators, where all internal electrical contacts have been eliminated, are the appropriate vehicle for chemical storage. Stored materials should be reviewed periodically, and old chemicals discarded.

Guards:

All mechanical equipment should be adequately furnished with guards that prevent access to electrical connections or moving parts (such as the belts and pulleys of a vacuum pump).

Gas/Chemical Transport & Handling:

Use gas cylinder carts whenever transporting gas cylinders over any distance. All cylinders must always be secured to a bracket by two straps/chains. Only one cylinder per bracket. Use safety bottle carriers whenever carrying reagent chemicals from one laboratory to another. Carts used to transport chemicals should have a lip.

Fume Hoods:

All procedures or operations that may generate irritating and/or hazardous air contaminants should be conducted inside a fume hood. Environmental Health & Safety (EHS) inspects all constant velocity and variable air volume fume hoods annually to ensure proper flow rates. The parameters used to assess proper flow rates are listed in the table below.

Hood Sticker	Flow Rate (feet/minute)	Recommended Action
Green	80-120	Safe to use
Yellow	51-79 or 121-199	Potential for use depends on the operations and chemicals involved
Red	≤50 or ≥200	DO NOT USE

Fume Hoods (continued):

- Keep all apparatus and chemicals at least 6 inches back from the face of the hood.
- Do not store chemicals or apparatus in the hood.
- Keep the hood sash closed as much as possible. Never exceed 18 inches.
- Do not use the hood to volatilize chemicals.
- Keep the slots in the hood baffles free of obstruction.
- Run all equipment cords to outlets outside of the hood.
- If you know the procedure you are planning will generate a very heavy emission of fumes, or vapors, check the capacity of the hood you plan to use. It may be safer to perform your procedure in a larger, higher capacity, hood.
- Contact EHS if you suspect your hood is not working properly.

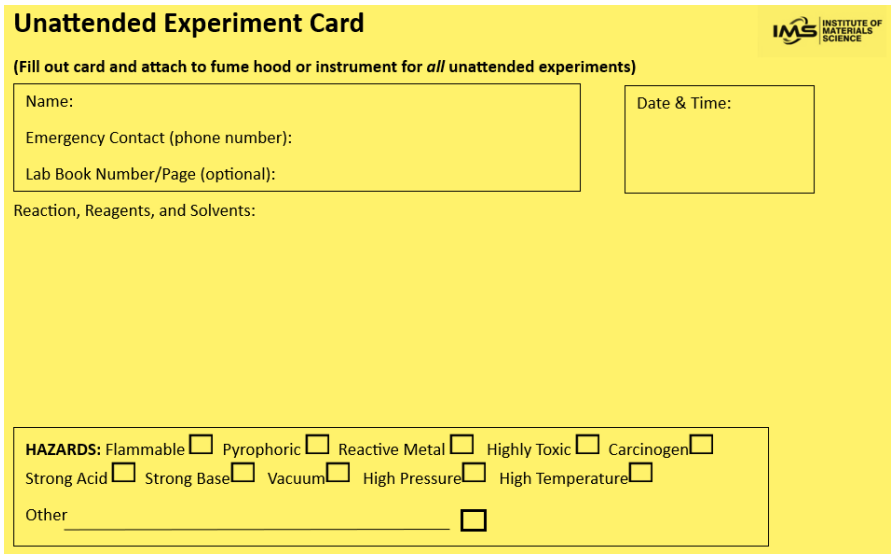
When to consult your advisor:

Working with Hazardous Materials

Students should consult with their advisor when planning any experiment in which hazardous materials are used and/or produced. Engineering controls, substitutions, and reductions in quantities should be considered when materials are highly hazardous.

Potential Interruption Planning:

It is essential to plan for possible interruptions in utility services such as electricity, water, and inert gas. Any reaction that is left unattended for any length of time should be clearly labeled with an *Unattended Experiment Card* (see example below). The card must be filled out completely. No acutely hazardous reactions should be left unattended.



Unattended Experiment Card

(Fill out card and attach to fume hood or instrument for *all* unattended experiments)

Name:

Emergency Contact (phone number):

Lab Book Number/Page (optional):

Date & Time:

Reaction, Reagents, and Solvents:

HAZARDS: Flammable ☐ Pyrophoric ☐ Reactive Metal ☐ Highly Toxic ☐ Carcinogen ☐
Strong Acid ☐ Strong Base ☐ Vacuum ☐ High Pressure ☐ High Temperature ☐

Other _____ ☐

Working Alone:

No student is permitted to work alone in an Immediately Hazardous Environment. Please refer to the University's Working Alone Policy for definitions. Generally, it is wise to avoid working alone in the laboratory. If a task or environment is identified as immediately hazardous, arrangements should be made with the PI/laboratory supervisor to assign a second person for the duration of the task or reschedule the work to a time when others are available.

Chemical Storage

Chemicals must be stored according to compatibility and hazard class. All IMS researchers are responsible for reviewing SDSs and following storage recommendations. Incompatible chemicals must not be stored alphabetically or in proximity.

Hazard Class

If feasible, store each hazard class in a separate cabinet or location. If not feasible, some hazard classes may be stored in bins to segregate upon shelving.

Separate into the following classes at minimum:

Corrosive Acids – Inorganic	Corrosive Acids – Organic
Corrosive Bases- Inorganic	Corrosive Bases – Organic
Explosives	General Stock Chemicals
Flammable Liquids	Flammable Solids
Oxidizers	Water Reactive

Storage Requirements:

- Flammable chemicals must be stored in an approved storage cabinet or refrigerator.
- < 10 gallons of flammable liquids can be stored outside of a flammable storage cabinet.
- Corrosive liquids must be stored below eye level (approx. 5 feet).
- Limit quantities of hazardous chemicals stored on benches or floors.
- Never store chemicals in fume hoods.
- Any chemicals stored on the floor require secondary containment.
- Acutely toxic chemicals must be stored in dedicated cabinets.
- Chemical shelving must be firmly secured to walls.
- Chemicals must not be stored on top of cabinets.
- Heavier chemicals must be stored on lower shelves.
- Chemicals must be stored away from heat, direct sunlight, and ignition sources.
- Any peroxide forming chemicals must be marked with date of receipt, date of opening, and testing date (see CHP page 86 for testing frequencies and disposal instructions).

Hazard Class	Recommended Storage	Chems in Sci I		Common Incompatibles
Explosives	Store in a secure location away from other chemicals, away from shock or friction	• Aluminum Powder • Sodium methoxide • Zinc metal	• Titanium powder • Tri-tert-butylphosphine	Consult SDS
General Stock Chemicals	Store on lab benches or shelves with other stock chemicals	• Sodium Chloride	• Potassium Phosphate	Consult SDS
Flammable Liquids	Store in approved flammable storage cabinet. *Peroxide forming chemicals must be dated upon delivery and after opening	• Acetone • Acetonitrile • Benzenes • Butanols • Cyclohexane • Decane • DMSO • Ethanol • Methanol	• *Diethyl Ether • *THF • Isopropanol • Hexanes • Thiols • Toluene • Phenols • Pyridine • Xylenes	• Oxidizers • Hypochlorites • inorganic bases
Flammable Solids	Store in cool dry area ways from oxidizers and corrosives	• Metal Powders (cadmium, carbon, cerium, cobalt, iron, nickel, tantalum, titanium, tungsten) • Sodium Dodecyl sulfate	• Di-tertbutyl Dicarbonate • Ferrocene • Grubbs Catalyst • Hexamethylenamine • Nobium Carbide	• Acids • Bases • Oxidizers
Oxidizers	Store in secondary containment with non-combustibles or inorganic materials	• Nitrates • Persulfates • Perchlorate • Peroxides	• Chromates • Permenganates • Oxides • Periodates	• Flammables • Combustibles • Organic materials
Toxics	Store in ventilated, dry, cool area, as recommended by manufacturer	• Analines • Benzenes • Chloroform • Carbon Tetrachloride	• Dichloromethane • Digoxin • Heavy Metal compounds • Phosgenes • Wollins Reagent	• Flammable liquids • Acids • Bases • Reactives • Oxidizers
Water-Reactive	Store in a cool, dry location, protect from sources or water. Label area for water reactive storage.	• Calcium crystal • Calcium Hydride • Di-n-butylmagnesium • Ethylaluminum dichloride • Lanthanum • Lawesson's reagent	• Magnesium powder • Oxalyl Chloride • Potassium tert-butoxide • sec-Butyllithium • Sodium borohydride • Sodium hydride	• Aqueous solutions • Oxidizers • Water sources
Explosives	Store in a secure location away from other chemicals, away from shock or friction	• Aluminum Powder • Sodium methoxide • Zinc metal	• Titanium powder • Tri-tert-butylphosphine	Consult SDS
General Stock Chemicals	Store on lab benches or shelves with other stock chemicals	• Sodium Chloride	• Potassium Phosphate	Consult SDS
Flammable Liquids	Store in approved flammable storage cabinet. *Peroxide forming chemicals must be dated upon delivery and after opening	• Acetone • Acetonitrile • Benzenes • Butanols • Cyclohexane • Decane • DMSO • Ethanol • Methanol	• *Diethyl Ether • *THF • Isopropanol • Hexanes • Thiols • Toluene • Phenols • Pyridine • Xylenes	• Oxidizers • Hypochlorites • inorganic bases
Flammable Solids	Store in cool dry area ways from oxidizers and corrosives	• Metal Powders (cadmium, carbon, cerium, cobalt, iron, nickel, tantalum, titanium, tungsten) • Sodium Dodecyl sulfate	• Di-tertbutyl Dicarbonate • Ferrocene • Grubbs Catalyst • Hexamethylenamine • Nobium Carbide	• Acids • Bases • Oxidizers
Oxidizers	Store in secondary containment with non-combustibles or inorganic materials	• Nitrates • Persulfates • Perchlorate • Peroxides	• Chromates • Permenganates • Oxides • Periodates	• Flammables • Combustibles • Organic materials
Toxics	Store in ventilated, dry, cool area, as recommended by manufacturer	• Analines • Benzenes • Chloroform • Carbon Tetrachloride	• Dichloromethane • Digoxin • Heavy Metal compounds • Phosgenes • Wollins Reagent	• Flammable liquids • Acids • Bases • Reactives • Oxidizers
Water-Reactive	Store in a cool, dry location, protect from sources or water. Label area for water reactive storage.	• Calcium crystal • Calcium Hydride • Di-n-butylmagnesium • Ethylaluminum dichloride • Lanthanum • Lawesson's reagent • Lithium aluminum hydride	• Magnesium powder • Oxalyl Chloride • Potassium tert-butoxide • sec-Butyllithium • Sodium borohydride • Sodium hydride • Lithium Hydride	• Aqueous solutions • Oxidizers • Water sources

Recommended storage of some commonly used chemicals in Science I.

Compressed Gas & Cryogenics

Compressed Gas Cylinders

Training must be provided by principal investigators, laboratory/facility managers, or a qualified vendor when new gases, or new equipment that uses compressed gases, are brought into laboratories. Safety data sheets (SDSs) must be reviewed prior to the handling, storage, or transport of any pressurized gas.

IMS researchers are responsible for adhering to the following rules. Reference the CHP Compressed Gas Section for more details.

- A cylinder cap or regulator valve must be in place at all times.
- When moving cylinders, they should be strapped to a properly designed wheeled cart to ensure stability. Never drag, roll, or slide cylinders.
- Always secure cylinders to a stand or bracket, at least halfway up the cylinder, except for transport.
- Never store or leave cylinders near a source of heat. Cylinders should be stored in an upright position. Keep flammable and oxidizers separate.
- Never attempt to repair, alter, or change cylinder valves. Wrenches should not be used on valves equipped with a hand wheel. Damaged valves should be immediately reported to Jesse David (room G11, jesse.david@uconn.edu).
- Storage of cylinders in a laboratory at a given time should be restricted to those in actual use or attached to a system ready for use. The actual number of cylinders present should be maintained at an absolute minimum.
- Once a cylinder is empty, remove the regulator and replace the cylinder cap. Mark the order tag with “EMPTY” and contact Jesse David to drop the cylinder off in G15B. **Never leave a cylinder on a cart outside the cylinder storage room.**
- Be sure to use the appropriate regulator on each cylinder. Adaptors or home-made modifications are prohibited.

Cryogenics

Cryogenic materials such as dry ice and liquid nitrogen are commonly used as cooling baths for apparatus and experimental samples thus special safety precautions should be observed.

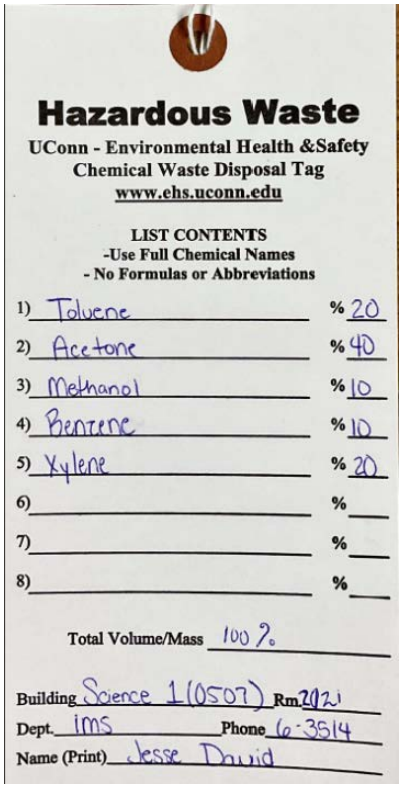
- Avoid contact with the skin, cryogenics will cause severe burns and possible frost bite.
- Use appropriate cryogenic gloves and face shield when handling cryogenics.
- When cooling a warm object, pour the liquid or immerse the warm object into the liquid slowly to avoid splashing caused by vigorous boiling.
- Use only approved metal/glass dewars to transport cryogenics. Note: glass dewars should have a secondary containment jacket to safeguard them in the event of implosion.
- Dewars should be equipped with a loosely fitted cap to prevent spillage during transport and prevent pressure build up. Corks, rubber stoppers, and solid screw caps (unless specifically designed with a pressure release spout) should NOT be used.

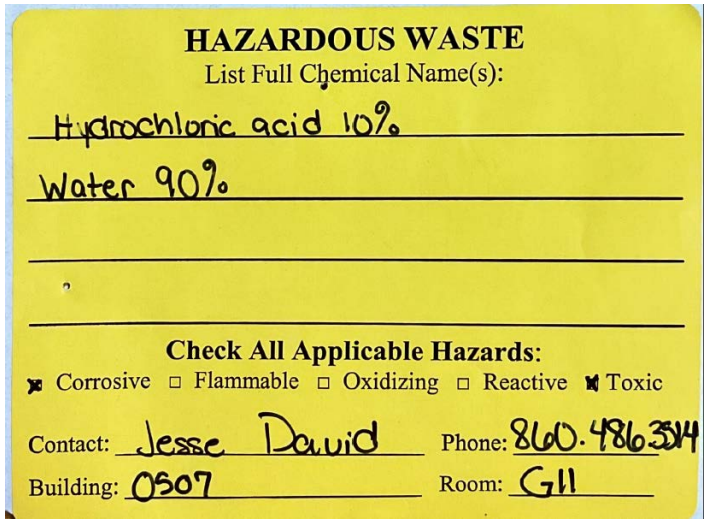
Hazardous Waste

The principal investigator or lab supervisor is responsible for assuring that the policies and guidelines outlined in the Chemical Waste Disposal Manual are followed by all personnel working in IMS labs.

Chemical Waste Management:

- EHS provides stickers, tags, and waste containers (solid & liquid waste, 5gal). Fill out a pickup request form to order.
- Package all chemical waste in a sturdy container. Original bottles are acceptable.
- All waste containers must be marked with a hazardous waste sticker or tag as soon as accumulation begins (see examples below).
- Contact name and phone number should reflect the person that generated the waste or someone knowledgeable about the contents of the waste.
- Use full chemical names to describe the waste. Do not use formulas or abbreviations.
- Containers must remain closed unless waste is being added to the container and must have a tight-fitting cap (i.e., no corks, rubber stoppers or open funnels).
- Incompatible materials must not be mixed in the same container. Consult SDS.
- Incompatible materials must not be stored in the same secondary containment bin.
- When containers are ¾ full (do not fill completely) fill out the Chemical Waste Pickup Form. In "description", enter the number of containers and their location in the lab.
- Chemical waste pickups are on Monday, Wednesday, and Fridays.
- Incorrect or incomplete labels on waste containers may be refused for pickup.





Two types of correct, fully filled out waste tags.

Glass Waste

- Uncontaminated glass waste should be disposed of in a 5-gallon bucket available from the stockroom manager.
- Glass waste should be labeled “GLASS WASTE” – labels available from the stockroom.
- Do not dispose of sharps waste in the glass waste container. Use a biowaste appropriate sharps container.
- Any glass waste significantly contaminated with hazardous materials should be treated as hazardous waste. Any questions on contamination should be directed to the safety manager or EHS.
- When full, dispose of glass waste in the dumpster outside of the loading dock. Do not throw away the primary container, as it can be reused.

Biological Waste

- Disposable sharps (e.g., syringes with or without needles, needles, scalpels, razor blades, etc.) are to be collected in approved sharps containers.
- **Sharps containers are not to be utilized for regular lab glass waste.**
- Sharps containers are available through the Biological Health & Safety website.
- When sharps containers are almost full, complete a Biological Waste Pickup Form.
- Biological Waste Pickup is Monday-Friday.
- Boxes must be prepared, sealed, and labeled for pickup. Incomplete or incorrect preparation will not be picked up.

Radioactive Waste

- Every authorized user is responsible for the safe handling and proper disposal of his/her radioactive waste products prior to a waste pick-up by EHS Radiation Safety.
- Individuals should contact the Radiation Safety Office to determine the proper disposal method for each.
- For radioactive waste pick-up fill out the Radioactive Waste Pickup Form.

Radiation Safety

State, Federal, and University regulations require a usage permit for any proposed use of radioactive materials. Radiation-producing devices require registration with the State of Connecticut DEEP. Contact the Radiation Safety Office prior to ordering any ionizing radiation producing materials or devices. . The Radiation Safety office is also responsible for tracking uranium and thorium compounds. IMS researchers must inform Radiation Safety of intended purchases of these compounds.

User Responsibilities:

All IMS researchers who are authorized users of radioactive materials and analytical x-ray producing equipment are responsible for the following, in accordance with the Radiation Safety Manual and Analytical X-Ray Safety Program.

- Following the authorization and safety protocols and procedures for the particular use.
- Successful completion of required EHS training.
- Keeping his/her exposure to radiation as low as possible, and below the maximum permissible exposure levels.
- Wearing the prescribed monitoring equipment such as dosimeter badges or utilizing area monitoring badges if issued.
- Performing appropriate radiation surveys during and after work with a radiation source.
- Keeping radiation exposures as low as reasonably achievable (ALARA) by:
- Utilizing time, distance, and shielding protection factors for all sources.
- Following established protocols and safety procedures.
- Using appropriate protective clothing.
- Labeling radiation sources and areas where sources are used.
- Reporting radiation incidents such as uncontrolled contamination or injury involving radioactive materials to the Principal Investigator and the Radiation Safety Officer.
- Properly securing radiation sources when not in use.
- Maintaining laboratory security and controlling laboratory access by unauthorized individuals.

For more information on University Policies, Procedures, and Forms for Radiation Safety:
https://ehs.uconn.edu/radiation-safety/

Laser Safety

Laser Safety Program

The University of Connecticut has a Laser Safety Program in place necessitating approved Standard Operating Procedures (SOPs), training, safety controls, appropriate PPE, and operational requirements intended to ensure the safe use and operation of Class 3B and 4 lasers. The EHS Laser Safety Officer (LSO) is Brianna Sullivan, brianna.sullivan@uconn.edu.

Laser Acquisition

Individuals intending to purchase a laser or laser system must first email the LSO or the Radiation Safety Manager a request to purchase and provide all information requested by EHS that pertains to the laser. The LSO or the Radiation Safety Manager may consult with Facilities and may deny a purchase based on insufficient facilities, insufficient information or if other program requirements cannot be met or may provide conditional approval based on inspection after the item is received.

Laser Safety Training

Laser Users

Prior to the use of Class 3B or Class 4 lasers or laser systems, all laser users, including the Primary Laser Researcher (PLR) must complete all appropriate UConn laser safety training. Training consists of an online training program and a PLR provided laboratory-based training specific to the user's responsibility. Completion of both the on-line course and documentation of the laboratory-based training on the Laser Safety Laboratory-Based Training Form satisfies the training requirements necessary to gain access to the lab spaces with laser considerations and commence using either Class 3B or Class 4 lasers or laser systems. The completed form must be submitted to EHS at radiationsafety@uconn.edu, cc jesse.david@uconn.edu.

Laser Non-Users

The PLR must also conduct laboratory-based training for their non-laser using research and clerical, and maintenance personnel. PLR conducted laboratory-based training must be documented on the EHS Laser Safety Laboratory Based Training Form and submitted to EHS at radiationsafety@uconn.edu.

Visitors/Guests

Visitors to UConn who request to use either Class 3B or Class 4 lasers or laser systems must contact the LSO regarding the training requirements for non-UConn personnel.

Operational Safety

Class 3B and Class 4 lasers or laser systems must be operated only in designated laser control areas approved by the LSO.

Class 3B and 4 lasers or laser systems which are not in use or do not have approved Standard Operating Procedures (SOPs), proper safety controls, or appropriate protective eyewear will be blocked out and tagged out by the LSO until all safety requirements are in place and verified.

All workers in a laser laboratory where class 3B or 4 laser systems are operated in must follow the below requirements:

- Wearing appropriate personal protective equipment
- Complete (and maintain) required training.
- Following approved SOPs.
- Conducting laser activities in a safe manner.

For more information on University Policies, Procedures, and Forms for Laser Safety:
https://ehs.uconn.edu/radiation-safety/

Electrical Safety

The hazards associated with the use of electricity include electrical shock, electrical arc flash/blast as well as fires caused by shorts and overloaded circuits or wiring. Sparks from electrical equipment can serve as an ignition source for flammable or explosive vapors or combustible materials.

Adherence to the following rules and procedures can significantly reduce the electrical hazards in the laboratory and ensure compliance:

- Know the location of emergency disconnect panels and post the location of the panel on the equipment it services.
- Never obstruct electrical panels or disconnect switches. Clearly label what supply/power source they control.
- Do not overload circuits or wiring.
- Inspect all electrical equipment before use – no worn, frayed, abraded, corroded or exposed wiring should be used.
- Live parts need to be effectively insulated or physically guarded. Take out damaged equipment from service immediately.
- All equipment should have a three pronged, grounded, or double insulated plug.
- Electrical outlets, wiring, and other equipment inherent to the building can only be serviced by Facilities Operations or other qualified personnel. See Josh Strecker (josh.strecker@uconn.edu) with questions.
- Only work on electrical equipment once all power has been disconnected and any potential energy diffused. Service or repair work can only be carried out by authorized individuals who have received Lockout Tagout training.
- Limit extension cord usage – these are for temporary, short-term use only. Do not use more than one multiplex outlet plugged into a single wall outlet.
- Cords must not run through doors, walls or partitions, under rugs, or above dropped ceilings. They must not be tied in knots, draped overhead, or attached to walls.
- Extension cords must never be linked together – use the proper length extension cord needed for the application.
- Keep corrosives, flammables, and organic materials away from electrical cords and equipment, except in manufacturer intended use.
- Keep electrical equipment away from wet or damp locations or potential water spillage, unless specifically rated for use under such conditions.
- Never handle electrical equipment when hands, feet or body are wet or perspiring or when standing on a wet floor.
- In the event of an electrical fire, leave the area, call 911, and pull the nearest fire alarm. Do not use water on an electrical fire. If safe, and possible, shut down the main power source.
- In an electrical emergency, if a person received an electrical shock, do not touch the equipment, cord, or person. Call 911 so that the Fire Department can treat the injured person and evaluate the situation. If safe, and possible, shut down the main power source.

For more information on the UConn EH&S Electrical Safety Policy:
http://media.ehs.uconn.edu/Occupational/Electrical/ElectricalSafetyProgram.pdf

Additional Resources

IMS Main Site

https://www.ims.uconn.edu/

EHS Main Site

https://ehs.uconn.edu/

Vertere

https://uconn.vimenterprise.com/Vim/Account/SignIn

UConn Alert

https://alert.uconn.edu/

UConn Policies

https://policy.uconn.edu/

Science I Safety Training

https://huskyct.uconn.edu/ultra/courses/_137912_1/cl/outline

Laboratory Safety and Chemical Waste Management

https://uconn.bioraft.com/node/1903731

Division of University Safety (uconn.edu)

https://universitysafety.uconn.edu/police/education-and-programs/public-education/

Chemical Hygiene Plan

https://media.ehs.uconn.edu/Chemical/ChemicalHygienePlan.pdf

Chemical Waste Disposal Manual

https://media.ehs.uconn.edu/RegulatedWaste/chem/ChemicalWasteDisposalManual.pdf

Radiation Safety Office

http://ehs.uconn.edu/ehs-contacts/radiation-safety-contacts/

Laser Safety Program

https://media.ehs.uconn.edu/Radiation/Laser/LaserSafetyManual.pdf

Electrical Safety Program

http://media.ehs.uconn.edu/Occupational/Electrical/ElectricalSafetyProgram.pdf