

LLE Guest Worker Safety Training – Lab Workers



Scott Householder
Chief Safety Officer



Karen Cera
Safety Manager



Patrick Resch
Safety Coordinator

Contact The LLE Safety Team with your questions and concerns

Emergency phone numbers



| | |
|---|----------------|
| LLE Receptionist | (585) 275-5101 |
| UR Public Safety *campus blue phones connect to public safety directly | (585) 275-3333 |
| Local emergency services (Fire, Police, Ambulance) | 911 |
| Blood exposure hotline | (585) 275-1164 |

Add these emergency contact numbers to your cell phone now

The stickers on lab/desk phones provide dialing instructions for internal phones, specifically

Emergency Numbers
During working hours:
5-5101
After hours:
9-911

Summary

- LLE's Safety Officers and Subject Matter Experts (SME) are available to discuss any questions or concerns you have about safety policies and practices at LLE
- Most Guest Workers can complete this one training module to satisfy all LLE safety training requirements
 - Additional trainings are required to work with beryllium, compressed gases, cryogens, and/or radioactive sources
- Workers who engage in laboratory activities at the Laboratory for Laser Energetics (LLE) need to understand and follow site-specific safety policies
- All workers must read and follow instructions on signs when entering a laboratory space

Outline

- **Overview**
- **LLE General Laboratory Safety Policies**
- **Personal Protection Equipment (PPE)**
- **Laser Safety**
- **Mechanical Safety**
- **Electrical Safety**
- **Chemical Safety**

Access to LLE is restricted to provide physical, personal and facility security

- Building access is controlled by card readers and receptionists
- Some specific lab spaces inside LLE require an escort to access
- Visitors must sign in with a receptionist, wear visitor badges, and wait for an LLE staff member to escort them to their destination
- Everyone must sign in and out at a reception desk when in the facility during non-working hours (Friday 5:15pm - Monday 8:15am)
- Never allow people to enter LLE to use the phone, bathroom, get a drink, etc. unless they are personally known or escorted by you.
- Before you leave the building, make sure the path to your vehicle is safe. Wait inside the building if you observe unusual vehicles or suspicious activities.
- Report instances of suspected unauthorized building entry or any suspicious activity to UR/LLE Facility Security Officer (FSO)

**Call UR Public Safety (585) 275-3333 (or use a Blue Light Phone) to request an escort to your car or report a campus crime.
Call 911 off-campus**

All persons are required to wear UR/LLE issued ID or visitors badge, where it is readily visible, while in the building

Carefully control information you have access to, and items assigned by LLE/UR

This includes, but is not limited to:

- University/Visitor ID badge
 - If you misplace your ID badge, report it immediately to LLE's FSO and The Director's Executive Assistant
- Computer accounts & passwords
- Confidential information
- Radiation badges
- Keys
- Mobile devices

The University enforces strict policies regarding handling of confidential information. University IT Policies are found [here](#), including:

- [Data Security Classifications Policy](#)
- [Mobile Computing Device Security Standards](#)

Individuals are personally responsible for appropriate use of these things.

LLE's Computer and network policies are designed to prevent costly problems

LLE's Information Technology (IT) group has identified key things you should know about accessing or using computer or network resources:

- 1. Never connect or disconnect cables from a computer or network device without explicit permission from IT. Limit your activities to specific cables, devices, and network ports you are authorized to work on.**
- 2. Do not change the network settings on any LLE network device w/o IT approval.**
- 3. Laptops that connect to ANY University network must be up to date with security patches and have University approved anti-virus protection.**
- 4. Treat all email as suspicious until proven otherwise. Don't click links or open attachments unless you recognize the sender and understand why they sent you a link / attachment.**

Computer and Network Safety (cont.)

- 5. Do not leave desktop computers powered off without contacting IT.**
- 6. Save important LLE files on network shares, not on your computer.**
- 7. Mobile devices (phones, tablets, laptops, etc.) that access any LLE resources (mail, files, etc..) must be password protected by a strong screen lock (Password, Biometric, Long PIN).**
- 8. Passwords or passphrases used for LLE accounts should not be used for other accounts (personal or business). University IT recommends the use of the password manager/vault, “Keeper.”**
- 9. Never open a computer chassis without assistance from IT.**
- 10. Log off or lock your computer screen when you are away from your desk.**
- 11. Disconnect VPN when access to the LLE computer network is not needed**

If you have any questions about ANY of these rules, contact IT for answers and/or clarification

Safety is everyone's responsibility

- **Hazards** exist throughout the workplace and change over time
- Restrict your activities to those for which you are trained, qualified, and **Authorized**
- **Stop Work** if an abnormal event occurs or if an activity seems unsafe and **report** it *immediately*.
- **Be Prepared**. Know how to respond in an emergency
- **Prevent Unauthorized Access** to LLE
- Understand **Computer and Network Policies**
- **Prevent unauthorized dissemination** of controlled items

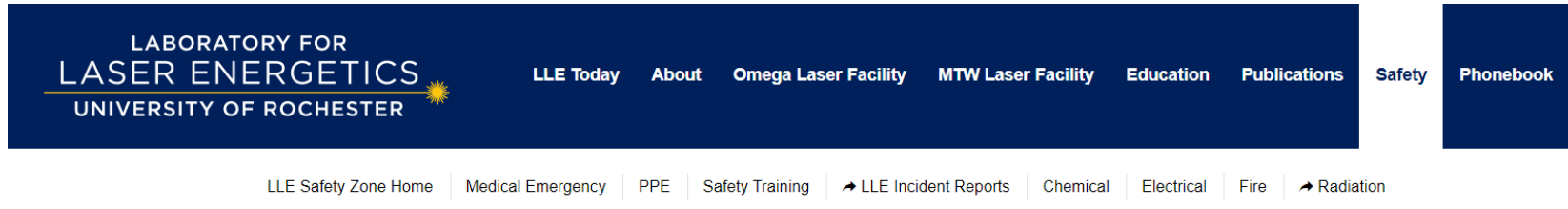
If you see something, say something



We have a duty to report. If you have concerns for your or a coworker's physical safety and/or mental well-being, reach out to:

- **Safety – Scott Householder or Karen Cera**
- **Security – Facility Safety Officer or Cyber Security Officer**
- **Procurement – LLE HR Admin**
- **[Policy Against Discrimination and Harassment \(PADH\)](#) or Human Resources**
- **The Lab Director**

LLE safety information is available at the “Safety Zone”



LLE SAFETY ZONE

Safety Overview

Information on this site is intended for LLE workers only (view full disclaimer)

Laboratory environments contain materials, processes, and equipment that represent potential hazards to health and safety. The multidisciplinary research conducted at the LLE facility makes it imperative that personnel be aware of the risks and hazards associated with his or her work. This is especially true in a research environment, when hazards may lie outside an individual's expertise. In such a situation, lack of attention to safety, whether caused by indifference, lack of information, haste, poor experimental design, or faulty equipment, can have dire consequences.

**Browse the Safety Zone
to learn what information
is available, so you know
where to find it when
needed**

<https://www.lle.rochester.edu/safety/#top>

The LLE Safety Office (Rm 4206) provides...



- Information, assistance and support
- PPE
 - Safety Eyewear
 - Hearing protection
 - Gloves
 - Hard hats



•Reference texts

- Safety Data Sheets (SDS)
- CHP binder
- National Fire Codes

•Safety supplies

- Lens cleaners
- Sharps disposal
- Eyewash flush logs



LLE's Expectations of Guest Workers

- **Immediately report any injury, “near-miss” or unsafe condition to your LLE supervisor, Shot Director or an LLE Safety Officer**
- **Workers who engage in laboratory activities at LLE need to understand and follow site-specific safety policies**
- **LLE maintains extensive procedures describing operation of experimental equipment. Guest Workers are:**
 - **Responsible for obtaining procedures for equipment they wish to operate and understanding them before beginning work.**
 - **Asked to provide feedback to help improve procedures.**
- **Guest Workers are not authorized to allow access or escort other individuals inside of the LLE facility.**

Seek Assistance from LLE Staff if performing the following activities is required:

Guest Workers are not permitted to :

- Perform work requiring a respirator
- Work in the Machine Shop
- Use ladders > 6 feet (1.8 m) tall, rolling stairs, aerial lifts, or perform activities requiring fall protection
- Perform chemical processes (unless provided explicit permission with training from a LLE Chemical Safety Officer)
 - *small quantities of low toxicity reagent use is allowed
- Operate the High Pressure LN2 Fill Station
- Lift items \geq 50 lbs = 22 kg (requiring safety shoes)
- Operate hoists or cranes, or perform rigging operations
- Service energized equipment, unless following written, LLE-approved procedures
- Remove “**Danger - Do Not Operate**” tags
- Modify, or authorize changes to equipment, software, or procedures

Workers need to be aware of work area hazards

- Each work area is dynamic and presents unique hazards
- LLE management informs workers of hazards by training, signs, and other communications
- Some of the hazards that may be present at LLE include:
 - Electromagnetic radiation (laser, x-ray, ...)
 - Radioactive sources (neutron, beta, electron, ...)
 - High-pressure gas and large volume vacuum systems
 - Cryogenic fluids
 - Chemicals, beryllium, lead, silica dust
 - High voltage
 - Working aloft (e.g., ladders, lifts, platforms)
 - Rotating machinery
 - Rigging operations

You must restrict your activities to those for which you are *trained, qualified, and authorized*

“Stop work” policy

Everyone has the right and RESPONSIBILITY to “Stop work” if they perceive an Imminent Danger

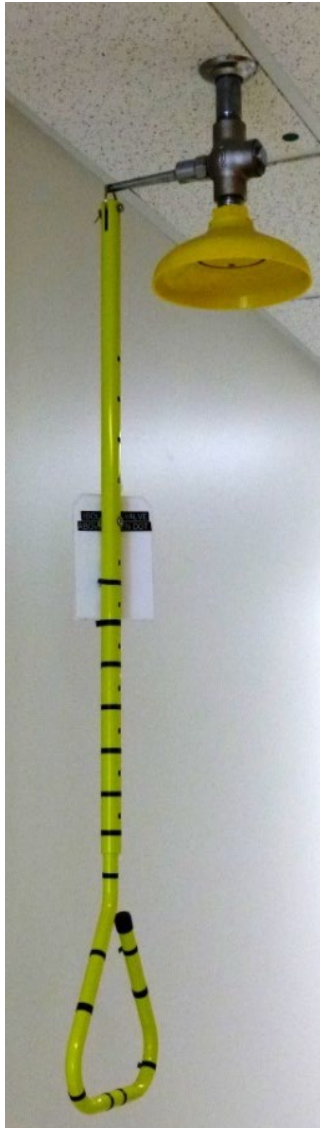
- An **imminent danger** is a hazard that presents an **unacceptable risk** of injury, environmental impairment or property damage.
- **No one should undertake a job that appears unsafe**
- Hazards may result from
 - defective equipment,
 - failure to follow procedures,
 - equipment or techniques that are unsuitable for a task,
 - or unforeseen circumstances.
- Immediately notify LLE management:
 - Shot Director, Laser Facility Manager, and/or Safety Officers

LLE requires use of the Buddy System

- “Buddy System” means working with a partner when
 - Using potentially hazardous equipment or processes or
 - Working in a potentially hazardous environment
- Buddies are responsible for
 - Being available to assist in an emergency
 - Verifying that safe work practices are used
 - Remaining in contact with partner, and knowing they are OK
- **Workers must submit written plans for off-hours laboratory work to their Supervisor and obtain written approval prior to starting.**
 - Review:
 - Planned work hours
 - Activities being performed
 - Worker training and qualification
 - Buddy System implementation
- Sign in/out at the receptionist desk when working off-hours (Friday 5:15pm – Monday 8:15am)

Know what to do and who to call when something goes wrong

Injuries / emergencies / major spills



Emergency Numbers

During working hours:

x55101

After hours:

9-911



Know where eye wash stations and safety showers are located and how to use them



In case of fire



Medical emergencies require a rapid response

- During working hours (M-F, 8:15am – 5:15pm)
 - Call an LLE receptionist to report it. The receptionist will notify the LLE's First-Responders
 - If no response, call 911
- Off-hours (nights, weekends)
 - Call 911
 - UR Public Safety will automatically be dispatched to assist with building entry
- Report all workplace injuries* to LLE Human Resources (HR); (Dave VanWey, Steve Stagnitto)
 - HR will prepare and submit a [UR Employee Incident Report](#)

* see [UR Policy 271](#) – Workers' Compensation Insurance

To dial from a cell phone: 275-5101
Desk phones require pressing “9” first
to get an outside line: “9-911”

Emergency Numbers

During working hours:

(x)55101

After hours:

9-911



Please note the location of the phone
in any lab which you are working

Fire Safety



Do:

- Use only electromagnetic safety latches to hold fire doors open
- Maintain 18" clearance around fire sprinkler heads
- Maintain clear access
 - $\geq 48"$ through hallways, around doors
 - $\geq 36"$ around electrical panels, fire extinguishers, and fire alarm pull stations
- Minimize storage of flammable materials
- Inform a Safety Officer of faulty safety equipment (exit light, fire extinguisher, etc..)



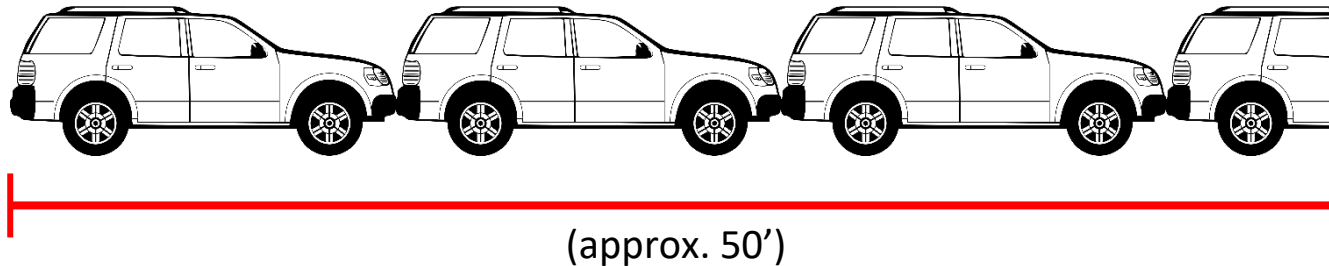
These boxes are too close to the sprinkler, limiting effective coverage



Everyone must respond immediately to fire alarms

Emergency evacuation may be required in response to a fire, bomb threat, active shooter, gas leak, et al.

- Evacuate and move at least 50 feet from the building and emergency equipment



- Failure to respond and evacuate as quickly as possible causes delays in response and re-entry into the building
- ***DO NOT*** re-enter the building until alarms are silenced and beacons are off
- LLE hosts are responsible for their guests during an emergency

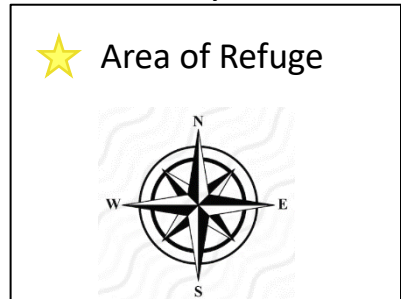
Guest Workers must report to their LLE host after exiting the building during an alarm-event

The UR Medicine Imaging is LLE's assigned meeting location during an emergency evacuation

If an emergency prevents employees from re-entering LLE, employees may shelter at UR Medicine Imaging at 200 E. River Rd (first building east of LLE)



Areas of refuge are fire-resistance and smoke protected areas where those unable to use stairs can safely await assistance.



LLE seeks to minimize safety risks

- **Operational risks are mitigated to the maximum extent practical by:**
 - Engineering controls (interlocks, guards, pressure relief valve, ...)
 - Procedures and training
 - Administrative controls (restricting access, buddy system, ...)
 - Personal protective equipment (PPE)
- **Never alter, remove or defeat safety features;** examples include software and hardware interlocks, guards on moving machinery, electrical and laser enclosures
- **Do not deviate from procedure**
 - Read and understand procedures before starting work
 - Stop and obtain clarification for procedures that are unclear or inaccurate
 - Any deviation from procedure must be formalized by the applicable section leader(s) or Subject Matter Expert (SME) as an Advance Change Notice (ACN) and authorized by The Laser Facility Manager (LFM)

Good housekeeping is essential to maintaining a safe work environment

- **Promptly correct, or report, slippery conditions on walkways and work surfaces**
- **Keep aisles and passageways unobstructed.**
- **Set up barriers when passage is encumbered by work-in-progress or activities prevent safe passage**
- **Promptly remove all clutter, tools, hardware, packaging and similar material**
- **Maintain a 3 foot (1 m) clear area around circuit breaker panels**
- **Eliminate trip hazards. Secure hoses, cables and other potential trip hazards overhead, under walkways, or cover them with a cable ramp**

Everyone must help maintain a clean and organized work environment

Personal Protective Equipment (PPE) is your LAST form of protection

- When safety barriers fail, PPE is critical
- PPE is effective only when properly maintained and used
- Wear PPE correctly
- Many types of PPE are designed to withstand a single catastrophic event (e.g., hard hats, impact-resistant eyewear, fall arresters)
 - If such an event occurs, or if the PPE appears to be damaged, remove it from service immediately!
- Some PPE is designed for single-use to prevent spread of contamination (e.g., disposable gloves, mask, lab coat, ear plugs)
 - Discard single-use PPE after use



Know the capabilities and limitations of the PPE you use, and use it accordingly



PPE is provided by LLE*

- Areas within LLE have signs indicating the specific type of PPE required.
- Each worker must know/understand what PPE is required prior to starting a task. Contact the work-area supervisor or a Safety Officer if there is any question about what PPE is needed
- Types of PPE (permitted for use by Guest Workers) include:
 - Safety eyewear. Laser, chemical, and mechanical eyewear must meet ANSI Z87.1 impact resistance standard
 - Face shield (must be used with safety eyewear)
 - Hard hat
 - Gloves, lab coat
 - Hearing protection

*** LLE can provide only non-prescription safety eyewear for guest workers, and may not be able to provide safety shoes. LLE personnel will move and rig items > 50 lbs.**

The user is responsible for inspecting PPE before every use

- Inspect PPE for wear and damage before each use
- Keep PPE clean and in good working order
- Verify the PPE selected affords the required protection
- Immediately remove damaged PPE from service; return it to the work area supervisor who will dispose of it and replace it
- Return PPE to the point of origin. Do NOT transfer PPE from one laboratory to another
 - For example: do not “upgrade” your laser safety eyewear from another lab, the wavelengths may not be compatible



Not all safety equipment is interchangeable!
Laser safety glasses ≠ Mechanical safety glasses ≠ Chemical safety goggles

Alarms inside individual labs indicate the potential for an oxygen deficient atmosphere



If alarm sounds:

- Exit the area *immediately*
- Call 9-1-1 if anyone is unable to exit the space
- Call a responsible person listed on the door sign to report the issue

No LLE employee or guest worker is permitted to enter an oxygen deficient atmosphere

Lasers are classified according to the hazard they present to your eye or skin

| Laser Class | Hazard Level |
|-------------|--|
| 1 | Incapable of causing injury <u>during normal operation</u> |
| 1M | Incapable of causing injury <u>unless optical system is used to collect light</u> |
| 2 | Visible light laser incapable of causing injury <u>in 0.25 seconds</u> |
| 2M | Visible light laser incapable of causing injury <u>in 0.25 seconds unless optical system is used to collect light</u> |
| 3R | Safe when handled <u>carefully</u> . Can cause flash blindness and disorientation. Extended viewing could cause damage. Less than 5 mW of visible light (400-700nm) |
| 3B | Can cause eye injury |
| 4 | Class 4 lasers have the greatest potential to cause injury. Can cause skin injury or ignite a fire |

Knowing the laser class allows you to know the relative hazards of a laser.

- **Class 3 and 4 can cause eye or skin injury**
- **Other classes will not cause eye or skin injury when used according to manufacturer's instructions**

Laser radiation exposure can cause *irreversible* damage to the eyes and skin

- The eye can intensify (focus) light 100,000 times making eye exposure the principal hazard associated with laser radiation.
- Ultraviolet radiation (180-400 nm) causes damage to the cornea.
 - Excessive ultraviolet exposure produces photophobia, an intolerance to light.
 - Adverse effects are usually delayed for several hours after the exposure but will occur within 24 hours.
 - Cumulative exposure can contribute to cataracts (clouding of the lens).
- Visible and infrared radiation (400-1400 nm) can damage the retina.
- The principal cause of tissue damage is thermal in nature
 - Thermal effects are caused by absorption of laser energy
- Maximum Permission Exposure (MPE) is the maximum level of laser radiation that does not cause adverse biological changes in the eye or skin. Laser Protective Eyewear is specified to reduce laser energy to below the MPE (See next slide for more information)

Contact the Safety office immediately if you suspect eye exposure to laser has occurred or you have received a skin burn

Laser Safety Signs and LPE refer to the OD. Let's review OD

- Optical Density* (OD) characterizes the fraction of light blocked (absorbed) by laser protective eyewear
 - When OD=1 at a wavelength, 90% of the incoming light *at that wavelength* is blocked. $1/10^{\text{th}}$ of the light transmits
 - When OD=5 at some wavelength, 99.999% of the incoming light *at that wavelength* is blocked. $1/100000^{\text{th}}$ of the light transmits
- Make sure that the OD listed on the eyewear is equal to or greater than the OD required *for every wavelength listed on the sign*
 - The OD can be specified for a single wavelength or a range of wavelengths



A higher OD value means the eyewear will provide greater protection at the specified wavelength(s)

Warning signs are made for each laboratory to alert you to the presence of laser hazards



- Many labs are equipped with illuminated style signs
 - Warning does not apply unless illuminated sign is flashing
 - Rooms are being fitted with interlock circuits so that warning signs are activated to enable the laser. This will take time to implement everywhere
- Signs that are printed are applicable whenever they are visible
- Before activating a laser, verify the sign is active and other personnel in room are notified

Persons completing this training have limited authority to work in a laser environment at LLE

Allowed:

- **Work in an environment where lasers are being used (under escort)**
- **Setup and operate a laser that is class 1, 2, 3R, or 3B**
 - **Do not point any laser beam at a person**
 - **Class 3B laser operation requires completion of a training card**
 - **LLE approved, written procedures must be followed for all operations using Class 3B lasers**

Restricted:

- **Modification of any LLE approved laser system requires safety office approval before work begins**
- **Guest Workers may only perform repairs after arranging work with the safety office**

Prohibited:

- **Operation of any laser that is not fully assembled with all engineering controls operational**
- **Setup and/or operation of Class 4 lasers**

Guidelines for working in a laser environment

Before entering

- **Communicate with escort or buddy**
- **Verify laser safety eyewear is rated for the optical density and wavelength(s) indicated on the warning sign**
- **Put on laser safety eyewear and other required PPE**
- **Look in a mirror (if available) to verify you are wearing all required PPE and, when required, cleanroom apparel**

While working

- **Request supplemental lighting if needed to compensate for visible light attenuation of the laser glasses**
- **Do not remove your laser protective eyewear for any reason while inside the laser environment**
- **Wear your safety eyewear close to your eyes (Straps are available to assist)**
- **Turn toward the object you want to see (do not look around your glasses)**

The most common causes of laser-related ACCIDENTS are easily mitigated

| Cause | Mitigation |
|---|---|
| Misaligned optics and upwardly directed beams | Align with low power, terminate all beam paths |
| Unanticipated eye exposure during alignment | See above |
| Equipment malfunction | Perform regular maintenance. Provide additional controls before bypassing safety features |
| Improper methods of handling high voltage | Operator training, written procedures, de-energize when servicing |
| Unintentional exposure of unprotected personnel | Controlled access |
| Operators unfamiliar with laser equipment | Qualify all operators |
| Lack of protection for ancillary hazards | Failure mode analysis. Understand potential hazards and mitigate by design |
| Improper restoration of equipment following service | Repairs performed by trained, qualified personnel |
| Failure to follow operating procedures | Read, understand & follow procedures |

THE PRIMARY CAUSE OF LASER EYE INJURIES IS UNSAFE WORK PRACTICES COMBINED WITH THE FAILURE TO USE PROTECTIVE EYEWEAR PROPERLY!

Numerous mechanical hazards exist at LLE



- Tripping
- Falling objects
- Cutting/abrasion
- Pinch points
- Elevated work surfaces
- Bump hazards
- Noise
- Slipping ...



Situational Awareness – The best way to prevent an accident is to be aware of your surroundings

Stored energy is a common metric for evaluating the potential risk associated with equipment and systems

Common mechanical energy storage mechanisms include:

- **Gravity acting on any elevated mass**
- **Springs**
- **Compressed gases**
 - **Only persons who have completed compressed gas training (M_002) may assemble or operate a compressed gas system**
- **Vacuum vessels**
- **Pressure vessels**
- **Motors/actuators (any rotating machinery)**
- **Thermal sources**
 - **Heat**
 - **Cryogenics**

The uncontrolled release of stored energy can cause personal injury and collateral damage to nearby equipment

Safely-designed equipment can be made unsafe by altering its construction or operating conditions

- **Guest Workers must use LLE approved assembly drawings and procedures when building equipment for use at LLE**
- **ME must provide explicit authorization for:**
 - **Deviations from assembly procedure**
 - **Material substitutions**
 - **Changes to joint design, including fastener changes (material, grade, size, etc.)**
 - **Changes to fastener torque specifications**
 - **Ensure the safety of mechanical equipment and its use**
 - **Inspect compressed gas and vacuum systems prior to operation**

Electrical Safety Policies

- If it is 50 Volts or Greater, it is High Voltage
 - HV power supplies brought to LLE must be reviewed by LLE Electrical Safety before use
- Guest Workers may not
 - Open/close/reset circuit breakers in electrical panels
 - Modify electrical distribution services
 - Service energized equipment, unless following LLE approved written procedures



Physiological Effects of Electricity

Effects of Electrical Current* on the Body³

| Current | Reaction |
|---|---|
| 1 milliamp | Just a faint tingle. |
| 5 milliamps | Slight shock felt. Disturbing, but not painful. Most people can "let go." However, strong involuntary movements can cause injuries. |
| 6–25 milliamps (women)† 9–30 milliamps (men) | Painful shock. Muscular control is lost. This is the range where "freezing currents" start. It may not be possible to "let go." |
| 50–150 milliamps | Extremely painful shock, respiratory arrest (breathing stops), severe muscle contractions. Flexor muscles may cause holding on; extensor muscles may cause intense pushing away. Death is possible. |
| 1,000–4,300 milliamps (1–4.3 amps) | Ventricular fibrillation (heart pumping action not rhythmic) occurs. Muscles contract; nerve damage occurs. Death is likely. |
| 10,000 milliamps (10 amps) | Cardiac arrest and severe burns occur. Death is probable. |
| 15,000 milliamps (15 amps) | Lowest overcurrent at which a typical fuse or circuit breaker opens a circuit! |

*Effects are for voltages less than about 600 volts. Higher voltages also cause severe burns.

†Differences in muscle and fat content affect the severity of shock.

Electric shock victims suffering from ventricular fibrillation will die if they do not receive prompt, emergency medical attention

LLE Lockout / Tagout Policy

- **LOCKOUT** - installation of a **physical barrier** or removal of a connecting link to prevent operation of component
- **TAGOUT** - placement of **tag** on breaker, switch, control device or valve stating “DANGER DO NOT OPERATE”
- **POLICY:**
 - Immediately notify Supervisor if equipment is suspected of presenting a hazard to personnel or other equipment.
 - LLE staff are responsible for ensuring that equipment is properly locked/tagged out and recorded
 - **Guest Workers may not remove “Danger – Do Not Operate” tags**



LLE electrical safety policies

- **Extension cords**
 - 500W maximum (UR policy)
 - May not be connected in series
- **Equipment used at LLE must be UL certified, or have approval of LLE Electrical Safety Officer**
- **Guest Workers may not repair any high voltage ($\geq 50V$) equipment. Have your LLE supervisor contact the LLE Electronics shop if repairs are needed**

Warn, damaged, frayed or deteriorated cord?

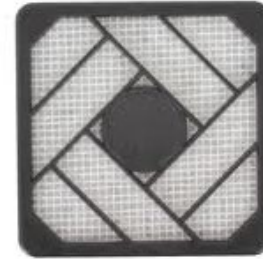
Ground pin missing?

STOP! Seek assistance



Common Sense Practices

- Allow proper ventilation for power dissipating equipment. Keep air filters clean.
- Investigate “hot” or unusual smells around equipment.
- Turn off unused equipment (excluding LLE-managed PC's)
- Prior to activation of remote (OUT OF SIGHT) equipment verify clear and secure
- Never leave a potentially hazardous situation unattended for **ANY REASON**
- Recognize and mitigate hazards to others. Use **simple** warning signs to communicate dangers or possible risks
- Employ good housekeeping



Ask for help before it is too late!

Guest Workers have limited authorization to use chemicals at LLE

Persons who complete this training may use only low toxicity, low reactivity, reagents and chemicals in small quantities (< 100 ml) , e.g. Methanol, Isopropyl, Acetone.

- Persons needing to perform chemical mixing or processes, exceeding the above conditions must complete the LLE Chemical safety training**
- Persons needing to work with beryllium must complete the LLE Beryllium safety training**

Chemical labeling follows the Globally Harmonized System (GHS) for hazard communication guidelines

Container label:

Signal Word

Hazard statements

Precautionary statements

CHEMICAL NAME

Signal Word

"Danger" implies a higher hazard level than does "Warning"

Hazard statement

Statements assigned to a hazard class and category that describes the nature and degree of the hazards

Precautionary statements

Phrases which describe recommended measures that should be taken to minimize or prevent adverse effects resulting from exposures to a hazardous product

Company Name, Street Address, City, State, Zip, Country Phone number

UN####
CAS# XXXX-XX-X

Pictograms



Product identifier

Pictograms

Supplier information

Cabinet label:



Pictograms communicate chemical hazards

Flame



- * Flammables
- * Self-Heating
- * Self Reactives
- * Organic Peroxides
- * Pyrophorics
- * Emits Flammable Gas

Exploding Bomb



- * Explosives
- * Self Reactives
- * Organic Peroxides

Flame over Circle



- * Oxidizers

Skull & Crossbones



- * Acute Toxicity (fatal or toxic)

Health Hazard



- * Carcinogen
- * Respiratory Sensitizer
- * Reproductive Toxicity
- * Target Organ Toxicity
- * Mutagenicity
- * Aspiration Toxicity

Gas Cylinder



- * Gases Under Pressure

Corrosion



- * Corrosives

Exclamation Mark



- * Irritant
- * Dermal Sensitizer
- * Acute Toxicity (harmful)
- * Narcotic Effects
- * Respiratory Tract Irritant

Environment



- * Acute Aquatic Toxicity

Flammables are separated into four categories according to their flash points and boiling points

Category 1 (extremely flammable):

- Flash point $< 73.4^{\circ}\text{F}$ (23°C)
- Boiling point $\leq 95^{\circ}\text{F}$ (35°C)

Ex: Diethyl ether

DANGER



Category 2 (highly flammable):

- Flash point $< 73.4^{\circ}\text{F}$ (23°C)
- Boiling point $> 95^{\circ}\text{F}$ (35°C)

Ex: Acetone, isopropanol

WARNING



Category 3 (Flammable liquid and vapor):

- Flash point $\geq 73.4^{\circ}\text{F}$ (23°C) and $\leq 140^{\circ}\text{F}$ (60°C)

Ex: Acetic acid, acetylacetone

Category 4 (Combustible liquid):

- Flash point $\geq 140^{\circ}\text{F}$ (60°C) and $\leq 199.4^{\circ}\text{F}$ (93°C)

Ex. Kerosene, chloroform

WARNING

(no symbol)

Explosion and fire are the two primary hazards associated with flammable and combustible liquids

- Many organic solvents are *highly flammable*
- Common organic solvents used at LLE include (but are not limited to):

Flammable (flash pt < 100 °F)

- Acetone
- Isopropanol
- Methanol



Combustible (flash pt > 100 °F)

- Dichloromethane
- Kerosene
- Cutting oils, lubricants



Always review safety information and work in a fume hood when using organic solvents

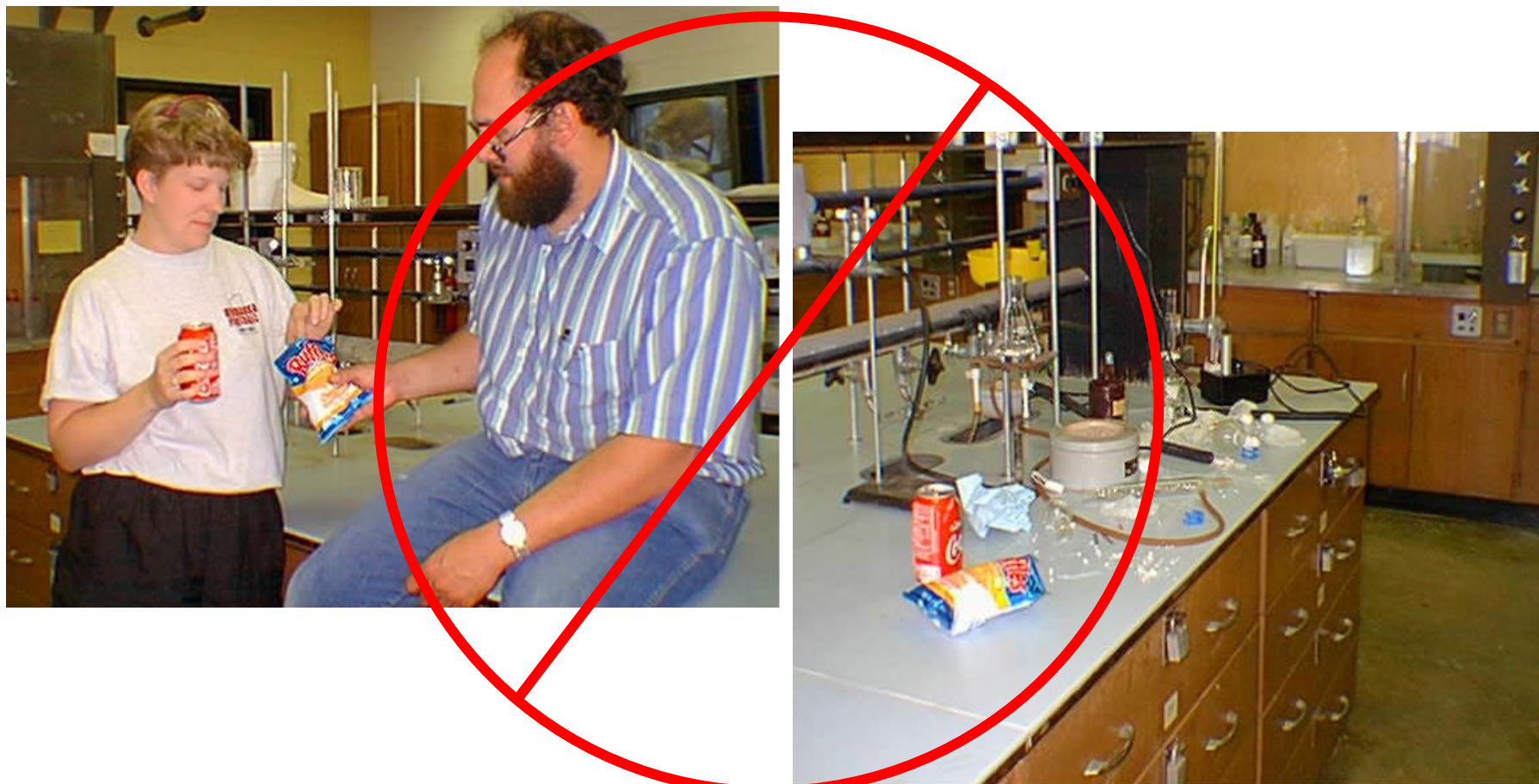
Eye protection and gloves are mandatory for all chemical operations at LLE



**Don't spread contaminants.
Remove gloves before touching
keyboards, telephones or door
handles**



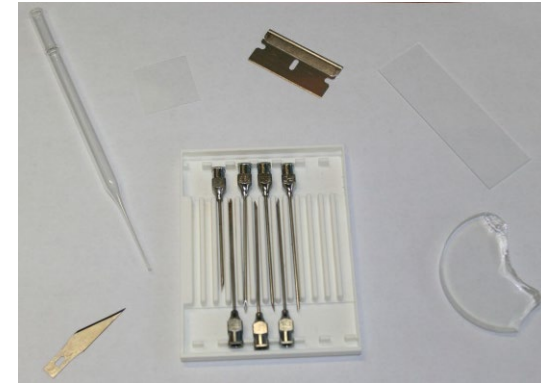
Food and beverages are prohibited in laboratories



Strictly prohibited by governmental, UR, and LLE regulations and guidelines!

Contact with “sharps” can result in serious injuries

- Razor blades/scalpels
 - Broken glass items (including optics)
 - Syringe needles (new or used)
 - Microscope slides
 - Pipettes
-
- Use **non-biohazard** sharps containers (small items) or glass disposal boxes



NEVER put sharps or glass items in the regular trash!

Syringe needles should ***NEVER*** be bent, sheared, or re-capped using two hands - either during use or before disposal



- ***Serious or possibly fatal exposure could occur, depending on the material contained in the syringe or needle***
- **Alternative: one-handed “scoop” technique**
 - place needle cap on table
 - hold syringe only, guide needle into cap
 - lift syringe so that cap is sitting on needle hub
 - secure needle cap in place
- **Better: use a safety needle**
 - mechanism to blunt or cover the needle after use
 - one-handed operation

Many waste materials are designated as “hazardous”

- Batteries (*toxic, corrosive, reactive*)
 - lead-acid, mercury, NiCd, NiMH, Li+, AgO
 - **alkaline and carbon batteries are excluded**
- “Sharps” (*toxic*)
- “Universal wastes” (*toxic*)
 - mercury-containing items (lamps, bulbs, switches, electronics, pressure/vacuum monitors, thermostats)
- “E-waste” (*toxic*)
 - computers, power supplies, electronics, circuit boards, lasers
- Beryllium and other powdered metals (*toxic, ignitable*)
- Aerosol cans (*ignitable, corrosive, toxic*)

Contact your LLE Host or the Safety Office to assist with disposal of hazardous wastes

Know what to do if a chemical exposure occurs

Touching, breathing or ingesting harmful chemicals can result in varying symptoms with different degrees of danger.

- Mild reactions can include tearing of the eyes, burning sensation of the throat, nose, chest, or skin
- Severe reactions can include coughing, wheezing, dizziness, and even death

For ingestion or other serious exposures, immediately:

- Alert the LLE Medical Response Team (by calling LLE reception)
- And call Poison Control 1-800-222-1222

For eye or skin exposure:

- Flush exposed area for 15 minutes

For inhalation exposure:

- Move victim to fresh air



Report all chemical exposure incidents to your LLE Host, Chemical Safety Officer, and the Chief Safety Officer

Summary

- LLE's Safety Officers and Subject Matter Experts (SME) are available to discuss any questions or concerns you have about safety policies and practices at LLE
- Most Guest Workers can complete this one training module to satisfy all LLE safety training requirements
 - Additional trainings are required to work with beryllium, compressed gases, cryogenics, and/or radioactive sources
- Workers who engage in laboratory activities at the Laboratory for Laser Energetics (LLE) need to understand and follow site-specific safety policies
- All workers must read and follow instructions on signs when entering a laboratory space

You must complete the [G 001C](#) quiz to satisfy your training requirement