Annual LLE Refresher Training: Chemical Safety (C001-R)





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Summary

Achieving and maintaining a safe working environment is a *shared responsibility*





Administrative

- Safety guidelines and protocols
- Regulatory compliance / employee safety



Supervisory (P.I.'s)

- Task-specific and material-specific training
- Promote safe working conditions and practices
 - lead by example



Implementation (Lab personnel)

- Learn hazards <u>before</u> beginning experiments
- Follow safety protocols in every experiment
- Identify and report potentially hazardous situations

Hazardous materials are those that pose significant physical and health risks under normal laboratory use











Formaldehyde







Hydrogen cyanide





Bleach



Ammonia





Beryllium dust

Hazardous materials storage

Hazardous materials must be stored in separate locations according to their *hazard class*



- Flammables
- Inorganic acids
 - exceptions: nitric and perchloric acids
- Bases
- Organic acids
- Oxidizing agents
- Reducing agents
- High health hazard materials
 - Carcinogens, teratogens, mutagens, acutely toxic







Flammable solvent storage outside of an approved storage cabinet is limited to 8 gallons per "fire area"

Gas safety

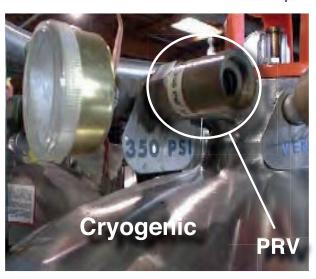
Special precautions must be taken when working with pressurized gases and cryogenic liquids











 NEVER replace, modify or tamper with pressure relief valves (PRV) on gas cylinders, regulators, or cryogenic containers!

If a PRV fails, leave the area immediately

The high-pressure liquid nitrogen fill station is intended for filling closed, PRV-equipped cryogenic containers and requires user training and certification









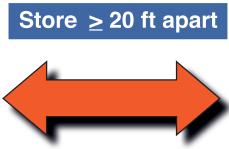
- Certified users can obtain key from the West Lobby receptionist
- Users name MUST be on the certified users list to sign out key- no third party designates
- Key must be returned by no later than 5:00 PMno exceptions!

Fill open cryogenic containers from lowpressure storage dewar

Flammable gases and gas mixtures must be stored at least 20 ft away from any oxidizing gases









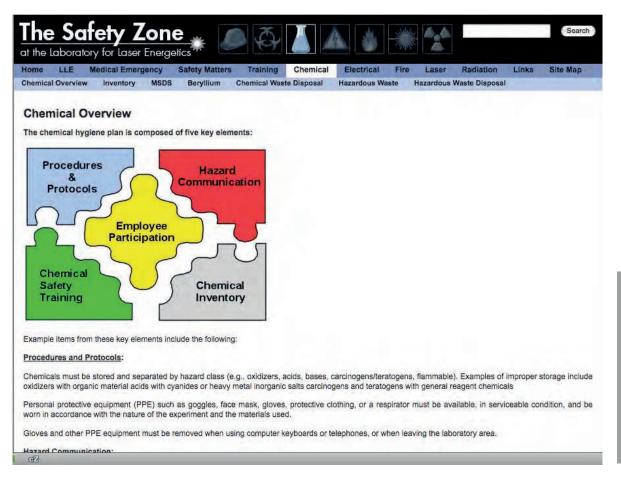
- Use and store only in well-ventilated, readily accessible areas
- Cylinders and connected apparatus must be electrically grounded to prevent sparks and static charge buildup

Spark-proof tools (aluminum / bronze alloy) must be used when changing regulators and fittings

Hazard communication

Facility-wide chemical safety information at LLE is available from several resources







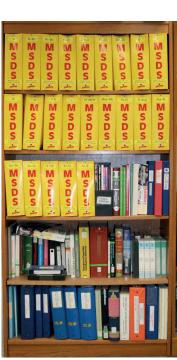
- Both UR and other safety resources (links to EHS web site)
- Off-site access limited (password protected)

The LLE Safety Library (Rm 1414) is your resource for "hard-copy" safety information, supplies and assistance





- MSDS collection
- CHP document
- Chemical inventory
- Safety references
- Training videotapes and DVDs
- Training records (quizzes)



Labels, hazardous waste forms, safety supplies, information and assistance

Each LLE laboratory or work area has its own set of laboratory-specific materials safety data





- CHP binder
 - CHP document
 - Chemical inventory
 - MSDS sheets (for laboratories with a small chemical inventory)



- MSDS sheet binder
 - one or more volumes for laboratories with a large chemical inventory

Safety documentation must be *prominently displayed* and *rapidly accessible*



NFPA and HMIG graphical warning labels provide rapid communication of critical safety information

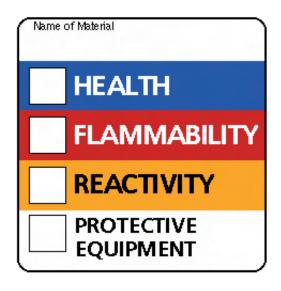












PPE categories: A-K and X

Labeling for hazardous materials containers must be clearly legible and unambiguous







Avoid using recycled food containers for hazardous materials storage - if used, they MUST have all old labels removed!

Experimental activities must be designed and conducted with exposure minimization and containment in mind



- Exposures are best prevented through a combination of:
 - Engineering controls
 - Personal Protective Equipment (PPE)
 - Safe work practices
 - Supervisors and P. I. s must:
 - provide PPE in their work areas
 - enforce wearing of required PPE

Operations involving large volumes and/or highly hazardous materials must undergo design/process safety review





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

Engineering controls

Engineering controls are the preferred method for keeping hazardous materials concentrations below OSHA exposure limits



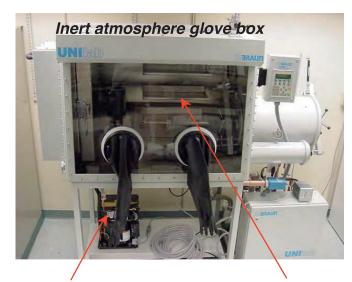






Maximum sash working height

 Keep work at least 6" inside of sash to avoid turbulence



Vent to hood or building exterior

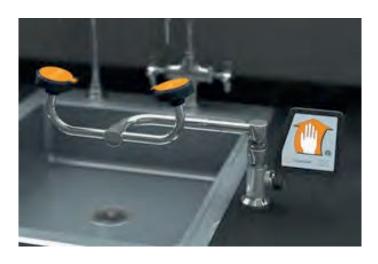
Inert gas purge (positive pressure)

Check regularly - leaks will contaminate lab environment

Working with hazardous materials in an open and uncontrolled environment must be avoided if at all possible

Eyewash stations must be both readily available and completely accessible in all work areas where chemicals are stored, used or handled











- Must be flushed once a week for 3-5 min by laboratory personnel and date recorded
- Flushing log to be kept near each eyewash



PPE requirements are determined by both the hazards of the material and the process it is used in











Check condition of PPE prior to use

Remove gloves before touching keyboards, telephones, door handles or leaving the work area

Do not launder lab coats at home- use a commercial laundry service!

MSDS sheets detail the specific PPE that needs to be worn for a particular material or process





Respirators are deployed in special circumstances only- NOT as a substitute for engineering controls!





 All respirator users must be certified through UR Respirator Wearers Program (UHS)

Initial



- Medical history form
- Physical exam and spirometry test
- Respirator fit test

Annual

- Verify medical history
- Repeat respirator fit test

Report respiratory problems / issues in work areas to your supervisor or the Chemical Hygiene Officer

Site-specific procedures

Special procedures and training are required when working with certain hazardous materials



| Material | Hazard | Mitigation | Training requirements |
|--------------|---------------------------------------|--|---|
| Beryllium | CBD, Cancer suspect agent | Wet crimp cutting (no drilling or machining) Respiratory protection | C_002: Beryllium Safety Training (annual) |
| Lead | Dust | No drilling or machining Cover large items (shielding bricks) with tape and label | "Lead Encapsulation Procedure" (V 1.0, 6/10/09) (one-time) |
| Formaldehyde | Carcinogen, allergic sensitizer | Use in fume hoods only with proper PPE | C_003: Formaldehyde Safety Training (annual) |

Repeated exposure to beryllium particles is a risk factor for both *Chronic Beryllium Disease (CBD) and cancer*



 Beryllium is used in both OMEGA and OMEGA EP as vacuum windows, x-ray filters, blast shields, and target supports







- LLE Instruction 6706 establishes procedures to insure safe handling and exposure minimization
 - prohibits any beryllium shaping processes that can generate dust (sawing, drilling, abrading)
 - beryllium articles can only be shaped by wet crimp cutting

Hazardous waste

Hazardous chemical waste disposal is governed by EPA and NYSDEC regulations



 Hazardous chemical waste is defined as any chemical-containing product, item or material that is unwanted or has no further use and is



- Ignitable: solvents, oils
- Corrosive: acids, bases, developers, metal etchants
- Toxic: heavy metals, cyanides, carcinogens
- Reactive: oxidizers, reducing agents, air-sensitive compounds
- Unstable: catalysts, peroxides, perchlorates

Nearly everyone working at LLE handles or generates some form of hazardous chemical waste



- Many items commonly used in laboratories qualify as hazardous chemical waste under the EPA guidelines:
 - Batteries: (toxic, corrosive, reactive): lead-acid, mercury, NiCd,
 NiMH, Li+, AgO but NOT alkaline or carbon batteries
 - "Sharps" (toxic)
 - "Universal wastes" (toxic): mercury-containing lamps, bulbs, switches, electronics
 - "E-waste" (toxic): computers, power supplies, electronics
 - Beryllium, lead and other powdered metals (toxic, ignitable)
 - Aerosol cans (ignitable, corrosive, toxic)

Other hazardous wastes (radioactive, biological) are covered by different regulatory agencies

Proper management and disposal of hazardous chemical wastes is the responsibility of those who generate them

- Disposal requirements:
 - identify by name, quantity and composition NO UNKNOWNS
 - collect according to hazard class
- Drain disposal of chemicals requires special permits





UR Dept: Hazardous Waste Management Unit (5-2056)

Sharps management

Contact with chemically contaminated "sharps" can result in some of the most serious exposure injuries



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







NEVER put sharps or glass items in the regular trash!

EPA mandates specific requirements for hazardous waste storage in laboratories and work areas



• Storage areas must be labeled as: Variations are unacceptable!

Hazardous Waste Satellite
Accumulation Area



 Secondary containment required to control spills or container leaks

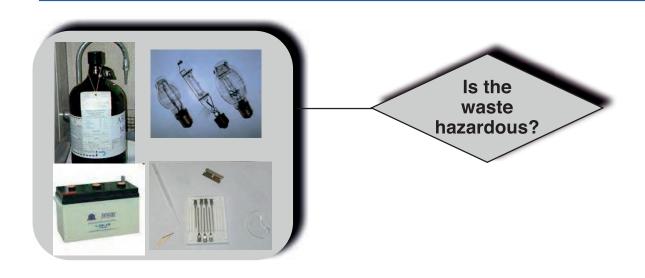


 Incompatible wastes (i.e., oxidizers and organic liquids) must be segregated

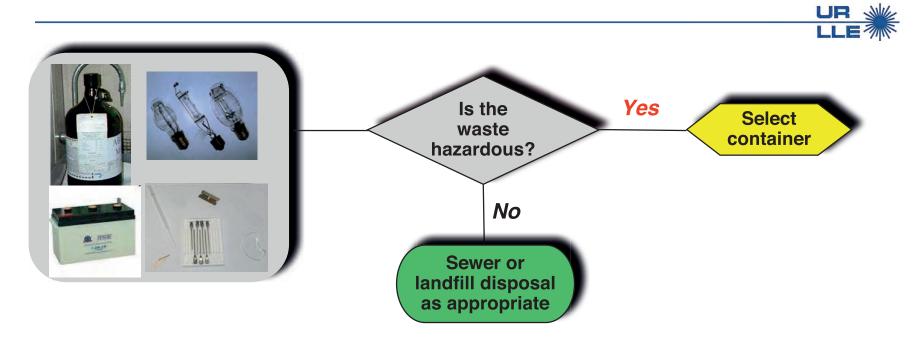
Waste containers must be kept closed and stored in the labeled accumulation area except when being filled

Proper management and disposal of hazardous waste follows a multi-step process





Proper management and disposal of hazardous waste follows a multi-step process



Container selection depends on both the physical properties and quantity of waste disposed



Must be chemically compatible with leak-free closure

Glass bottles



All materials except HF

Heavy-walled plastic containers



HF-containing materials, other corrosives, solids

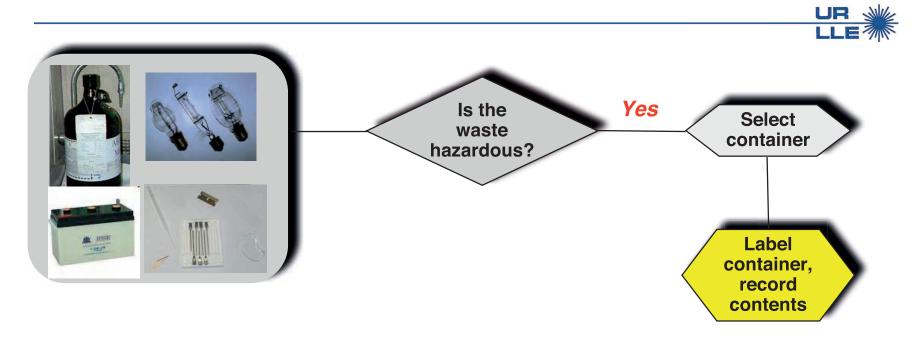
Metal cans and drums



Non-corrosive liquids and solids

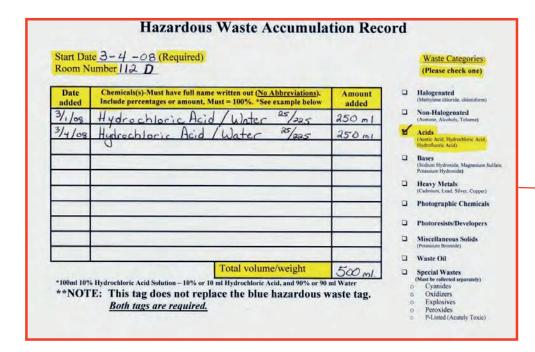
"Recycled" containers must be *triple-rinsed* before disposal or when re-used for hazardous waste storage

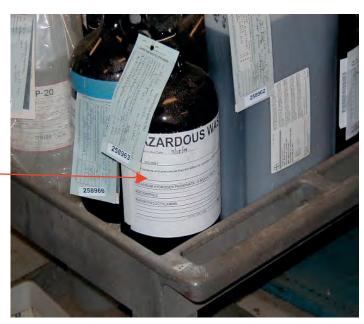
Proper management and disposal of hazardous waste follows a multi-step process



Waste container contents must be identified using only *approved* hazardous waste accumulation record labels



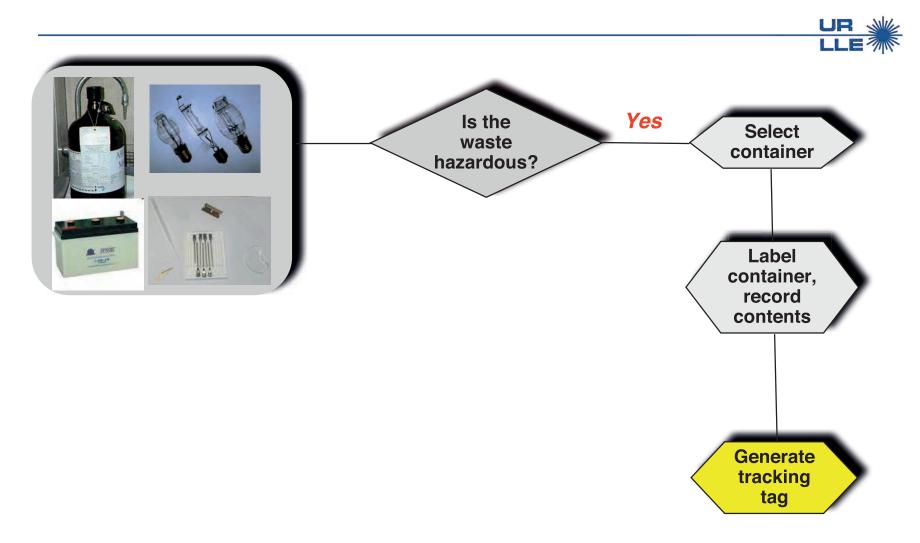




Accumulation record labels available at:

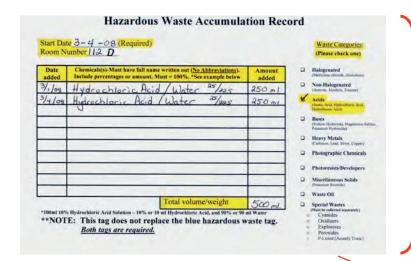
- LLE main hazardous waste storage area
- Safety Library (Rm 1414)
- Safety Zone (download)

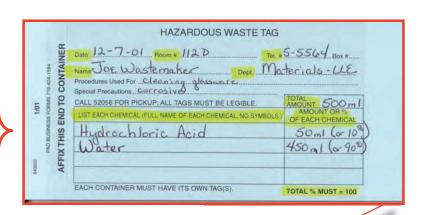
Proper management and disposal of hazardous waste follows a multi-step process



Hazardous waste tracking tags are generated using the information on the accumulation record



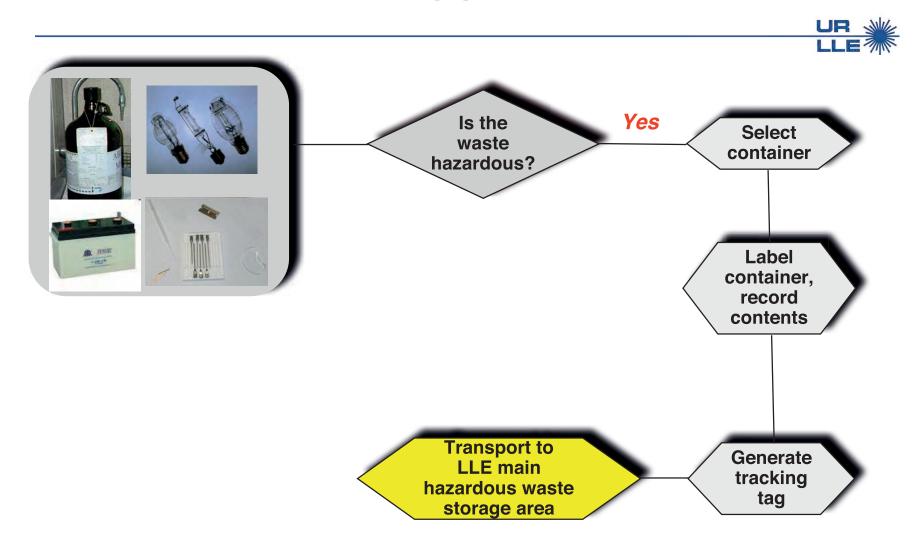




- Tracking tags are available at:
 - LLE main hazardous waste storage area
 - Safety Library (Rm 1414)



Proper management and disposal of hazardous waste follows a multi-step process



Transport properly filled and labeled containers to the main LLE hazardous waste storage area for pickup by the UR HWMU



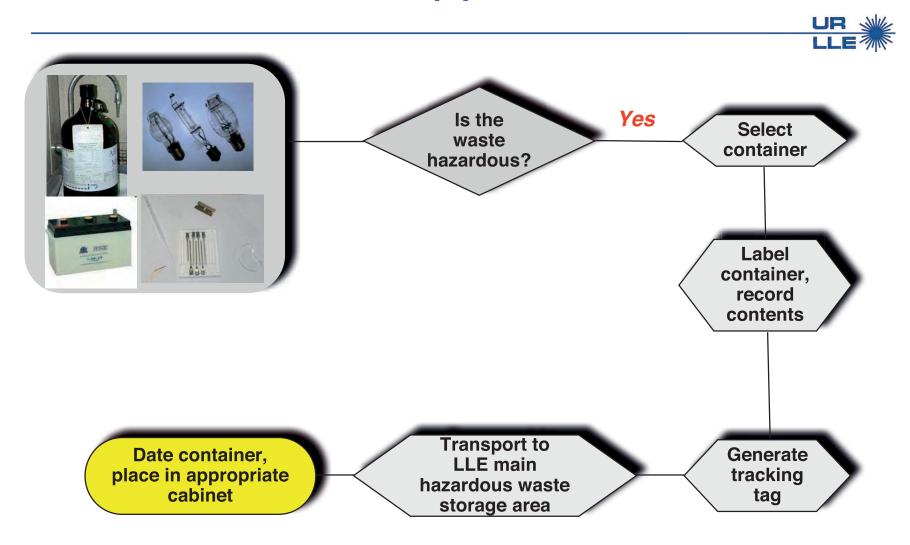




Secondary
containment
required when
transporting glass
containers

Weekly waste pickups are scheduled for Thursday afternoons

Proper management and disposal of hazardous waste follows a multi-step process



All waste containers must be "date-stamped" before placing in the appropriate hazardous waste cabinets



By law, all waste containers must be removed by HWMU within 90 days of the "accumulation date"



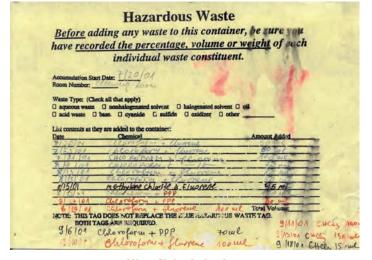
DO NOT leave empty containers or those with unidentified contents in the cabinets!

Any deficiencies in the disposal process will result in rejection of the waste by HWMU and require corrective action by the waste generator





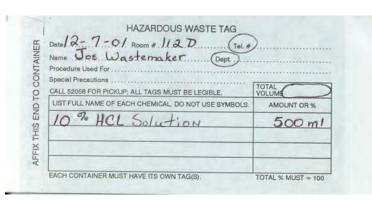
Missing date sticker



Illegible labels



Improper label



Missing information



"Rusty/crusty" containers



Unknowns

Chemical emergencies

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

UR LLE

Minor spills

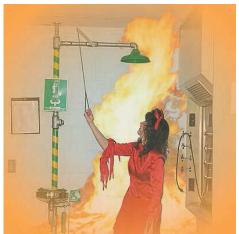
- Clean up using a spill control kit
- Dispose of absorbed material as hazardous waste

Major spills/injuries/ emergencies



After hours protocols





- Minimum of two people present when conducting a "chemical process"
- Supervisor consent must be obtained for working after hours

Work Habits

Unsafe work habits are one of the leading causes of laboratory accidents

















OSHA regulations specifically forbid food and beverage consumption in areas where hazardous materials are used or stored





Food and beverage in covered containers are NOT exempt!

The *GAWILT syndrome** has been identified as a root cause of many serious and fatal accidents in industry and academia





 Occurs at all levels, but especially virulent when found in supervisors, managers, and planners

The GAWILT syndrome* has been identified as a root cause of many serious and fatal accidents in industry and academia





"Blatant disregard of both well-known and accepted safety practices and sitespecific safety guidelines" *

Summary

Achieving and maintaining a safe working environment is *everyone's* responsibility!





- Learn material-specific hazards before starting experiments
- Make exposure minimization and containment your "S.O.P."
- Use proper-fitting PPE in every experiment every time
- Avoid risky, "quick and dirty" procedures to save time
- Know what to do and who to call when something goes wrong

When uncertain about proper procedure or operational safety: STOP and ASK!

Thanks for your attention - now it's time for the quiz





Did you remember to sign the training log??