Eastern Kentucky University

Chemical Hygiene Plan

2022 - 2024

TABLE OF CONTENTS

I. Purpose

It is the responsibility of Eastern Kentucky University, as an employer, to take every reasonable precaution to provide a workplace that is free from recognizable hazards. The purpose of this Chemical Hygiene Plan (CHP) is to describe occupation practices and procedures pertaining to handling or managing hazardous chemicals at Eastern Kentucky University laboratories. This CHP should assist and ensure employees are protected from physical and health hazards associated with hazardous chemicals. The U.S. Occupational Safety and Health Administration (OSHA) Standard 29 CFR 1910.1450, entitled "Occupational Exposures to Hazardous Chemicals in Laboratories," often referred, as the Laboratory Standard requires this CHP. The full text of the Laboratory Standard can be viewed at the OSHA web site (1). General information about OSHA Hazard Communication programs can also be found at the OSHA web site (2).

II. Definitions

The following definitions are taken/adapted from the Laboratory Standard (1). Other definitions are available from that document.

Chemical Hygiene Plan: A written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment, and work practices that (i) can protect employees from the health hazards presented by hazardous chemicals used in that workplace and (ii) meet the requirements of paragraph (e) of the Laboratory Standard.

Employee: An individual employed in a laboratory workplace who may be exposed to hazardous chemicals during his or her assignments.

Hazardous Chemical: The Occupational Safety and Health Administration (OSHA) defines a hazardous chemical as any chemical that is either a:

i) *Physical Hazard*: For a physical hazard, a chemical has scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive), or water reactive.

Or

ii) *Health Hazard:* For a health hazard, a chemical which is classified as posing one of the following hazardous effects: acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenicity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); or aspiration hazard.

See Appendix 1 for detailed definitions of individual physical and health hazards.

Laboratory: A facility where the "laboratory use of hazardous chemicals" occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

Laboratory Scale: Working with substances in which the containers used for reactions, transfers, and other handlings of substances are designed to be easily and safety manipulated by one person. "Laboratory scale" excludes those workplaces whose function is to produce commercial quantities of materials.

Designated Person in Charge: (Laboratory Supervisor, Principal Investigator, Lab Coordinator, etc.) Any faculty, staff, teaching assistants, and/or research assistants that have been placed in charge of supervising specified laboratories as well as the training and safety of laboratory workers. **A Designated Person in Charge must be identified and assigned to each individual laboratory.**

Laboratory Workers: Any person, employee, or student, working in a laboratory or involved in laboratory activities must adhere to the requirements of the CHP for their safety. Including students who have been hired by the university as student workers.

III. Applicability and Assistance

The Laboratory Standard applies to all employers engaged in the laboratory use of hazardous chemicals. This Chemical Hygiene Plan applies to all employees at Eastern Kentucky University.

If there are questions about this document, contact your Chemical Safety Officer or Division of Public Safety/ EHS (see Appendix 2 for a personnel listing).

IV. Responsibilities and Authority

Eastern Kentucky University is committed to providing a safe and healthful environment for all persons associated with the university. All administrators, faculty, staff, and students are expected to support these goals.

A. University Laboratory Safety Committee shall

1. Conduct the annual review of the Laboratory Safety Plan and modify as needed.
2. Provide technical advice to Department Chairs, Laboratory Supervisors and workers concerning requirements of the Laboratory Safety Plan.
3. Make recommendations to the Department Chairs and College Deans for safety improvements.
4. Serve as a liaison between safety personnel and the departments to improve communication
5. Maintain documentation relating to the Laboratory Safety Plan, including training records, internal inspection records, and copies of meeting minutes and memos.

B. The College Dean has the ultimate responsibility for implementation of the University Chemical Hygiene Plan. The Dean (or his/her designate) shall

1. Identify those departments within their College to which the Laboratory Standard applies.
2. Appoint a Chemical Safety Officer for their college, this individual will serve on the University Laboratory Safety Committee
3. Work with department Chairs and University administration to secure resources for health and safety improvements.
4. Have authority to halt operations of any laboratory that is not compliant with the Chemical Hygiene Plan (typically after consultation with the Chemical Safety Officer and appropriate departmental chair(s) and/or designated person in charge).
5. Ensure the college has procedures to maintain chemical inventories and record the purchasing and distribution of chemicals to laboratories throughout the college.
6. Ensure the college has procedures to properly handle storage and disposal of chemical waste.

C. The College Chemical Safety Officer (CSO) shall

1. Serve as a representative on the University Laboratory Safety Committee.
2. Serve as a liaison between Division of Public Safety/Environmental Health and Safety Department personnel and the departments to improve communication.
3. Look for modification to the CHP that would be necessary to your college operations. These modification requests should be sent to the University Laboratory Safety committee for approval/review.
4. Review/ consult with the department Chairs of their College to ensure that the provisions of the CHP are being implemented within the departments.
5. Provide technical advice to laboratory designated person in charge and their respective workers concerning requirements of this CHP. Coordinating efforts with the “Division of Public Safety/Environmental Health and Safety Department” to address any concerns.
6. Maintain and disseminate documentation relation to the CHP, such as amendments to the CHP, training records, internal inspection records, copies of meeting minutes and memos of the University Laboratory Safety Committee.

7. Inform laboratory faculty, staff, and student workers about chemical safety as required by the College.
8. Review and summarize annually, submitted laboratory safety inspections. Submit a written report of the inspection summary to the Department Chair and Division of Public Safety/EH&S outlining deficiencies.
9. Provide access to SDS sheets upon request found on MSDS online; *(College of STEM see Appendix 11)
10. Keep documentation of chemical purchases/inventory of college. *(College of STEM see Appendix 11)

E. Division of Public Safety/Environmental Health and Safety Department shall

1. Provide technical assistance as needed to the CSO of each college.
2. Provide technical assistance for training concerning personal protective equipment and laboratory safety equipment upon request.
3. Conduct exposure assessments upon request. A comprehensive EHS inspection is performed on an annual basis
4. Remain current on rules and regulations concerning chemicals used on campus.
5. Provide technical assistance as needed for other matters in environmental health and safety (aside from laboratory and chemical safety).
6. Maintain a current copy of the CHP.
7. Conduct an annual audit of the data gathered from the CSOs' annual laboratory safety inspection summaries and share findings with Provost and Dean's Council.

F. Department Chairs or Directors have the primary responsibility of implementation of the CHP within their departments/facilities and shall

1. Support the safety program and the college CSO, with the implementation of the CHP within their respective department/facility.
2. Work with faculty and staff to adapt the CHP to include department- or lab-specific guidelines.
3. Ensure that faculty and staff adhere to the CHP and to accepted safety practices.
4. Ensure that each laboratory in the department has a **designated person in charge** of laboratory (i.e., Laboratory Supervisor, Principal Investigator, Lab Coordinator, etc.). This is especially important for laboratories that have many users, such as a teaching laboratory. In absence of a designated person in charge being selected for a specific laboratory, the Chair is by default the designated person in charge.
5. Make budget requests and/or secure resources by working with upper administration for health and safety improvements.
6. Ensure that documented training is kept within the department for a time frame in accordance with University record retention policy or per regulatory requirement, whichever is longest.
7. Maintain a current copy of the Laboratory Safety Plan for each laboratory in accordance with University record retention policy or per regulatory requirement, whichever is longer.

G. Designated Person in Charge of Laboratory (Laboratory Supervisor, Principal Investigator, Lab Coordinator, etc.) shall

1. Comply with all the requirements of this CHP and follow accepted safety practices.
2. Ensure that all their laboratory workers receive appropriate training with respect to the CHP and any other special hazards encountered within a specific laboratory (all training must be documented).
3. Ensure all assigned laboratory workers comply with this CHP and accepted safety practices.
4. Identify hazards unique to their individual laboratories, develop and maintain written procedures and training to address safety issues pertinent to these special hazards, and add these to this CHP (consult the college CSO if necessary).
5. Control access to the laboratory.

6. Know what chemicals are stored and used in their laboratories and the hazards associated with them.
7. Maintain a current inventory of chemicals present in the laboratory, updated at least once a year, no later than end of the University spring break.
8. Provide access to SDS sheets.
9. Ensure that safety equipment and supplies are present and functional as well as training laboratory workers on the use of equipment as needed.
10. Request funds needed for specific health and safety improvements.
11. Report all accidents or incidents to the Department Chair and Division of Public Safety /EH&S.
12. Ensure that the contact and chemical information on laboratory signage is current.
13. Fall and spring semesters conduct periodic documented laboratory inspections for the months of September, October, November, February, March, April. Summer session at least one inspection is required between May and August.
14. Upload chemical inventories and laboratory inspection checklists to laboratory safety blackboard site. Contact your college CSO if you have a problem with access.
15. Correct any safety deficiencies identified during inspections.
16. Must comply with University Chemical Waste Handling Guide concerning generated waste from laboratory. Contact the Division of Public Safety /EH&S for waste pickup.

H. Laboratory workers shall

1. Comply with all the requirements of this CHP and follow provided procedures and/or training by the laboratory Designated Person in Charge.
2. Report all hazardous conditions to the laboratory Designated Person in Charge.
3. Wear or use prescribed protective equipment.
4. Report any suspected job-related injuries or illnesses to the laboratory designated person in charge and seek treatment immediately.
5. Refrain from the operation of any equipment or instrumentation without proper instruction and authorization.
6. Remain aware of the hazards of the chemicals in the lab and handle hazardous chemicals safely.
7. Request additional information and/or training when unsure how to handle a hazardous chemical or procedure.

Appendix 2- Chemical Safety Personnel listing that perform these duties

V. Standard Operating Procedures

The OSHA Laboratory Standard requires that operating procedures relevant to safety and health considerations be developed by the employer and followed by the employee for laboratory work involving the use of hazardous materials.

This CHP includes a minimum set of procedures for laboratory operations and for handling hazardous chemicals in laboratories at Eastern Kentucky University. Individual laboratories or research groups are required to develop more detailed procedures as their situations warrant. These procedures must be written, added to this CHP, and made available to laboratory workers. Acceptable lab safety references such as those listed in the OSHA Laboratory Standard, may be adopted in whole or may be useful in developing additional procedures. ***In all situations, the individual laboratory Designated Person in Charge will be responsible for enforcing adequate safety and hygiene measures in their specified laboratories***. The following standard operating procedures apply to all labs in the College.

A. General Safety Practices

1. Examine the laboratory signage for any special considerations orinstructions.
2. All laboratory employees, students, and visitors in laboratories must wear appropriate safety glasses, goggles, or face shields always where hazardous chemicals are stored or handled. Safety glasses with side shields or goggles are required when chemical splashes are possible. A set of guidelines for the use of personal protective equipment (PPE) is provided in Appendix 5. According to OSHA and the American Chemical Society, contact lenses may be worn in the laboratory, but they should not be considered eye protection devices. Safety glasses or splash goggles shall be worn over the lenses (3, 4).
3. While working in a laboratory, examine the known hazards associated with materials used. Make sure to read the label carefully and review the Safety Data Sheet (SDS) for storage specifications (*including temperature requirements*) as well as special handling information. Determine the potential hazards and use appropriate safety precautions with new material orprocess.
4. Know the location of emergency laboratory equipment including fire alarms, fire extinguishers, emergency eyewash, and shower stations. Also, be aware of emergency response procedures.
5. Know the location of chemical spill kits or procedures in case an incident occurs. Spills are to be cleaned up immediately according to the guidelines in Section (XA) of this CHP. Custodial staff are not responsible for cleaning unknown powders or chemicalspills.
6. Avoid distracting or startling other workers when handling hazardous chemicals or operating equipment. Horseplay, practical jokes, or other inappropriate and unprofessional behavior in the laboratory setting is forbidden.
7. Always use equipment and hazardous chemicals for their intended purposes.
8. Do NOT remove chemicals from the lab or storage area for personal use.
9. Always be alert and call attention to potential harmful conditions and resolve the situation(s) as quickly as possible.
10. Inspect equipment (including fume hoods, gloves, goggles, etc.) for damage and review labels before handling a hazardous chemical.
11. Avoid tasting or smelling hazardous chemicals.

B. Laboratory Safety Plans

1. In accordance with the Eastern Kentucky University Laboratory Safety Policy 4.4.14P (http://policies.eku.edu/sites/policies.eku.edu/files/policies/4.4.14_laboratory-safety.bor_.6.9.14.pdf) each laboratoryspace containing hazardous chemicals, physical hazards, radiation, biohazardous materials or any other potential hazards, must contain a Laboratory Safety Plan. Form can be located at https://labsafety.eku.edu/safety-forms-signs-and-documents
2. Laboratory workers must familiarize themselves with the individual Laboratory Safety Plan and standard operating procedures therein pertaining to the laboratory in which the work will be performed before work in the lab is commenced.

C. Individual Health and Hygiene Practices

1. Avoid direct contact with hazardous materials. All laboratory employees, students, and visitors must wear or use personal protective equipment (PPE) as appropriate and needed. Appendix 5 provides guidelines for the appropriate PPE for various operations and information is available with respect to PPE (3, 4).
2. Eating, drinking, smoking and the application of cosmetics are strictly prohibited in areas where hazardous chemicals are used.
3. Do NOT store food intended for human consumption in the same refrigerator with chemical, biohazard, or radioactive materials.
4. Rooms or areas which are adjacent, but separated by floor to ceiling walls, and do not have any chemical, biohazard, or radioactive materials present, may be used for food consumption,

preparation, or applying cosmetics.

5. Hands should be washed frequently throughout the day, before leaving the lab, after contact with any hazardous material, and before eating/drinking.
6. Loose hair and clothing must be confined. Shoes are to be always worn in the laboratory. Closed toe shoes must be worn in laboratories where hazardous materials will be handled.
7. Do NOT mouth pipette
8. Pregnant workers or students should inform the laboratory Designated Person in Charge of their pregnancy. The laboratory Designated Person in Charge can provide the pregnant woman with information about the hazardous materials that will be encountered during the course of the laboratory work. The decision about whether to continue to work in the lab or remain in a laboratory-based teaching course is made by the student and her physician.
9. No one shall work in the laboratory while under the influence of alcohol or drugs.

D. Laboratory Maintenance

1. Laboratory areas shall be kept clean and uncluttered. This will help prevent spills, breakage, injuries, unnecessary contact with chemicals, and accidents.
2. Access to all exits, aisles, safety showers, eyewash fountains, and fire extinguishers shall not be obstructed in any way with equipment, furniture, supplies, etc. that would prevent use.
3. Maintain an unobstructed clearance of 30" for circuit breaker panels.
4. All designated persons in charge are responsible for cleaning the laboratory benches and/or table surfaces. The custodial staff will be responsible for routine cleaning of the floors (does not include chemical spills) and chalkboards as well as emptying regular waste containers. The custodial staff will not be responsible for cleaning unknown chemicals that might be present on the benches and/or table surfaces.
5. Keep the floor clean and free of slip hazards by reasonable cleaning.
6. Do NOT place hazardous materials or broken glass into the regular waste containers. The custodial staff is not responsible for the disposal of hazardous materials or broken glass from these regular waste containers.
7. Conduct periodic laboratory inspections for the months of September, October, November, February, March, April, and one during the summer semester to ensure that safety precautions are being followed and compliant to the CHP.
8. Designate a separate waste container for non-contaminated glass. Do NOT place hazardous materials into the broken glass container.
9. Wear cut resistant gloves if one needs to handle a broken glass container.
10. Any other sharps or needles must be placed into a specific and labeled container.
11. Do NOT place paper, plastic, or miscellaneous waste into the broken glass or sharps waste containers.
12. Make certain that all appropriate utility services (e.g., water, electricity, gas) or appropriate equipment (circulating pumps, vacuum systems, portable air conditions, etc.) are shut down at the end of daily operations. If continuous or overnight use is needed, see below.

E. Unattended Operations / Working Unaccompanied in Laboratories

Working alone or having unattended chemical operations in process should be avoided and only be a rare occurrence. The Division of Public Health and Safety/ EHS believes this is an unsafe practice by its' very nature and lends to incidents or accidents that could lead to disastrous outcomes. Workers or students that are not certified by degrees or professionally trained should rarely (if ever) be allowed to work unsupervised in laboratories with chemicals that present a significant risk. Professionally trained being defined **by "an appropriately degreed individual" and "of a 3rd. party**

to the university with recognized competence or expertise in the particular area being trained". Operations during evenings and weekends or periods of less occupancy in the building should be carefully assessed. If lone work occurs, Department Chairs or appropriate designees shall implement a plan to ensure the safety of their employees and students.

Moreover, if such a case arises then at minimum the following must occur:

1. For laboratory operations carried out continuously or overnight, it is essential to plan for interruptions in utility services such as electricity, water, and gas. Plans must be made to avoid hazards in case of failure. If necessary, arrangements for routine inspection of the operation are to be made.
2. In all cases of unattended experiments, leave the laboratory lights on and post an appropriate sign on the door (see appendix 8 for signage). The identity of the materials being used, hazard labels, correct action to take in case of emergency, and the phone number of a contact person should be included.
3. **Avoid working alone whenever possible. When working with materials or equipment that present a significant hazard, a second person should be present (whenever practical) who can assist in case of an emergency.**
4. Notify the Chemical Safety Officer and the Designated Person in Charge of the laboratory when a person is working unaccompanied. In addition, these same individuals should be notified if equipment is to be left running unattended.
5. Departments that require lone workers in laboratory environments shall develop a plan to ensure the safety of workers and students. At a minimum, the plan will include:
    - Name, contact information and explanation of the work to be performed (to include a listing of any hazardous chemicals)
    - Start time and end time of the experimentation/ work
    - Contact a College representative at defined intervals based on the nature of the operations taking place in the laboratory environment.

F. Hazardous Material Handling / Labeling / Transportation

Handling

1. Information on proper handling of hazardous chemicals presented from SDSs should be made available to all laboratory employees prior to the use of the chemical.
2. Chemicals used in the laboratory must be appropriate for the laboratory's ventilation system. Do NOT use extremely hazardous materials that would impair respiratory functions on open laboratory benches.
3. Chemicals should be transferred from one container to another with care. Place labels on the new container with the chemical name and hazard warnings. Containers that hold more than five gallons of a flammable material must be grounded when transferring the liquid.
4. Always add concentrated acid/base to water. Never add water to concentrated acid/base. A list of all common laboratory corrosives can be found at www.labsafety.eku.edu.
5. Consider any chemical solution or mixture toxic according to the most toxic component.
6. Consider materials of unspecified toxicity to be toxic.
7. Do NOT use perchloric acid at Eastern Kentucky University laboratories since no fume hoods are currently designed for perchloric acid use.

When perchloric acid is heated above ambient temperature, vapors may condense in the exhaust system to form explosive perchlorates. Specially designed fume hoods with dedicated exhausts and a water wash-down system are used for such perchloric acid applications.

A list of common shock sensitive and explosive chemicals that might be found in the laboratory is found at www.labsafety.eku.edu. Special care should be used for these types of materials.

8. The following apply to novel materials developed in synthetic laboratories:
    a. If the composition of a chemical is known, either the PI or the laboratory Designated Person in Charge must determine if the chemical is hazardous. An assessment can be done through a literature search for similar substances. If the chemical is established to be hazardous, the PI or the Designated Person in Charge must provide training to protect employees.
    b. If a chemical generated is a product or a by-product whose composition is unknown, the PI or laboratory Designated Person in Charge must assume the substance is hazardous and must comply with the practices of the CHP.
    c. The PI or laboratory Designated Person in Charge must prepare an appropriate SDS in accordance with the OSHA Hazard Communication Standard if a generated chemical is to be sold or used outside of the laboratory
9. The OSHA Laboratory Standard requires that laboratory Designated Person in Charge identify operations that pose a sufficient hazard and will warrant prior approval before implementation by an employee. (See the following section, Section VI, of this CHP for additional information).

Labeling

1. All containers must be labeled. All labels must be legible and in English. The label should include the chemical/product name (product identifier), signal word, pictogram, date prepared, received, or opened, and name of the user, and hazard statement, precautionary statement, first aid, and supply company contact info. Contact the CSO or EHS for additional information.
    a. Signal words are either “Danger” for severe hazards or “Warning” for less severe hazards.
    b. Pictograms and descriptions are found in Appendix 3.
2. Labels on incoming containers must not be removed or defaced.
3. Replace damaged or semi-attached labels.
4. For transferred products or prepared solutions, the user must label each chemical container in accordance with GHS requirements refer to Appendix 3
5. If multiple small containers of solutions, mixtures, etc. are prepared, the following alternative labeling methods may be used.

    a. Legend Method
        - Containers will be labeled with abbreviated chemical name(s) and hazard warning(s).
        - A key to the abbreviations with the complete chemical names will be provided in a clearly visible location

          Document that employees have been properly trained with the labeling system.

    b. Box or Tray Method
        - Place the multiple containers in a box or tray
        - Label the individual containers with appropriate abbreviation(s) and the box/tray with the complete chemical name(s), hazard warning(s), and related abbreviation(s).
        - If containers are removed from the box/tray, the individual containers must be labeled with the complete chemical name(s) and hazard warning(s) or returned to the box/tray immediately after use.
        - Document that employees have been properly trained with the labeling system.
7. All substances that can form explosive peroxides and other chemicals that may become unstable

over time (e.g., picric acid, ethers) must be dated when received and opened. These materials should be used promptly and disposed of appropriately. Contact the Division of Public Safety/EH&S. A list of peroxides can be found www.labsafety.eku.edu.

8. Stationary process containers such as tanks may be identified with signs, placards, process sheets, batch tickets or other written materials instead of affixing labels to process containers. The sign or placard must convey the same information that a label would and be visible to employees at any time. Must comply with GHS labeling process in appendix 3.

Transportation

1. Always use plastic-coated bottles or bottle carriers for transporting chemicals housed in regular glass containers. Caps should be closed securely.
2. When transporting chemicals on a cart, use a cart that is suitable for the load and one that has high edges to contain leaks or spills.
3. When possible, transport chemicals in freight elevators to avoid the possibility of exposing people on passenger elevators.
4. Chemicals should never be transported in personal vehicle. This includes pressurized gas cylinders.
5. If chemicals need to be transported in a vehicle, the department must contract a licensed chemical hauling company.
6. If exemptions need to be made for on campus building to building transport of chemicals, contact the Division of Public Safety/EH&S for coordination.

G. Hazardous Material Storage

1. Information on proper storage of hazardous chemicals presented from SDSs should be made available to all laboratory employees prior to the storage of the chemical.
2. When ordering materials, purchase only the minimum amount to sustain operations.
3. Check the integrity of containers. If they are found to be damaged or leaking, transfer material to an acceptable container with appropriate labels.
4. Store chemicals based on compatibility, not simply by alphabetical arrangement. Oxidizers must be separated from organics, air/water reactive chemicals must be kept dry, and cyanides should be stored away from acids. See Appendix 1 for detailed definitions and www.labsafety.eku.edu. for examples of common incompatible chemicals. More information on chemical compatibility is available. (5,6)
5. Do NOT store chemical containers on high shelves. Large containers should be stored no more than two feet (sixty centimeters) above the floor level.
6. Keep the storage of chemicals at the lab bench or other work areas to a minimum.
7. Do NOT use hoods for long-term storage of chemicals.
8. Store volatile toxic substances in cabinets designed for this purpose. When volatiles must be stored in a cooled atmosphere, flammable refrigerators or similar specially designed equipment must be used.
9. Ensure that chemicals are stored at appropriate temperature; reference the SDS or container labels.
10. Laboratory refrigerators needed to store or cool flammable liquids will follow NFPA 45 - Fire Protection for Laboratories Using Chemicals, section 9.2.2.2, and A.9.2.2.2. Self- defrosting refrigerators, either modified or unmodified, will not be used for storing or cooling flammable liquids. General-purpose refrigerators are not to be used for the storage of flammable or reactive liquids or solids. They shall be labeled "Not for Storage of Flammable or Reactive Liquids or Solids." Refrigerators used for storage of chemicals must not be used to store food, beverages, or cosmetics. They shall be labeled "Not for Storage of Food, Beverages or Cosmetics." Example signs are available at (www.labsafety.eku.edu).

11. Substances with an NFPA flammability rating of 3 or 4 or GHS flammable symbol must be stored in approved flammables cabinets. No more than 500 mL (total) of flammable material should be on a bench or table surface at any given time.

H. Pressurized Gas Cylinders

Special consideration should be taken for materials stored under pressure. Cylinders pose significant physical and/or health hazards, depending on the nature of the material in the cylinder.

1. Secure cylinders with suitable straps, chains, racks, or stands to support the cylinders against an immovable object (e.g., bench, wall, etc.) in an upright position at all times.
2. Do NOT allow cylinders to fall or lean against each other.
3. Stored cylinders must be in well-ventilated approved gas cylinder storage areas with their protective caps fastened. If protective caps are fastened, then multiple cylinders can be safely gang-secured (secured in groups).
4. Store cylinders with other compatible cylinders. Do not store flammables and oxidizers together.
5. Do NOT store cylinders in or near heat or high traffic areas.
6. Do NOT store empty and full cylinders together.
7. In-use cylinders with regulators must be individually secured.
8. Appropriate regulators, gauges, and fittings that are material compatible with the gas must be used.
9. When moving a cylinder, use appropriate handcarts.
10. When moving a cylinder, make sure the protective cap is fastened to protect the stem.
11. Extremely toxic gases (e.g., hydrogen sulfide, chlorine, and arsine) should not be moved through regular exit corridors, particularly during business hours.
12. Toxic, corrosive, and reactive gases must be used and stored according to the specific handling and/or storage requirements of the gas (e.g., lab hood or gas cabinet specific to gas).
13. Always consider cylinders as full and handle them with corresponding care.
14. Never allow a cylinder to completely empty. A slight pressure in the cylinder will keep contaminants out.

I. Cryogens

Cryogens are cold substances (gases, solids, and liquids at or below -100° F). Cryogenic liquids, include nitrogen (N_2), helium (He), argon (Ar), hydrogen (H), methane and carbon dioxide (CO_2), have boiling points below -130° F (-90° C). Hazards associated with cryogens include exposure (e.g., cold burns, frostbite). Contact (even brief) with liquefied gases at extremely low temperatures can cause severe burns. Additionally, hazards could also be associated with an increase in pressure leading to explosions or implosions, toxicity, and asphyxiation. These low temperatures can also make many materials brittle. Visit www.labsafety.eku.edu for more details on cryogenic materials and associated hazards. Departments that use cryogens should take special precautions.

Personnel who are responsible for any cryogenic equipment must conduct a safety review prior to the dispensing of cryogenic materials and/or the use of the equipment that utilize these materials.

Cryogenic Safety Key Elements:

1. Always wear safety glasses with side shields or goggles when handling. If there is a chance of a splash or spray, a full-face protection shield, an impervious apron or coat, cuff-less trousers, and high side shoes should be worn. Watches, rings, and other jewelry should not be worn.
2. Appropriate gloves should be worn when handling. Gloves should be impervious and sufficiently large to be readily thrown off should a cryogen spill occur. Potholders may be used for specific and

appropriate applications.

3. These liquefied gases have the potential to condense oxygen from the air, create an oxygen rich atmosphere and increase potential for fire if flammable or combustible materials and a source of ignition are present. Mixtures of gases or fluids should be strictly controlled to prevent formation of flammable or explosive mixtures.
4. Containers and systems containing cryogens should have pressure relief mechanisms.
5. Containers and systems should be capable of withstanding extreme cold without becoming brittle.
6. Since glass ampoules can explode when removed from cryogenic storage if not sealed properly, storage of toxic or infectious agents should be placed in plastic cryogenic storage ampoules. Reheat cold sample containers slowly.
7. Equipment should be kept clean, especially when working with liquid or gaseous oxygen.

Handling Cryogens:

If a Department houses large storage tanks of cryogenic materials used for dispensing smaller volumes for various purposes, the Department Chair should appoint a person as Cryogen Manager. This assigned person will have the following duties:

1. Training faculty and students on the safe use, handling, and dispensing of cryogenic materials. All users should receive proper training regarding safe practices of cryogenic materials before they are allowed to individually use a large storage tank.
2. Maintaining appropriate Personal Protective Equipment (PPE) as outlined in Appendix 5 (listed under "Temperature extremes"). One must ensure these items are always available and being used. Ensure students and faculty are using the appropriate containers (dewars) and keeping inventory of available containers for a department, as well as ordering new equipment as needed.
3. Monitor and track cryogenic material usage. The use of a log sheet near the large storage tank.
4. Inform the college CSO or Cryogenic Manager when the large storage tank is empty and needs to be replaced.
5. Create a yearly summary report and distribute to departments, chemical storage, and/or other necessary personnel.
6. Ensure that other departmental equipment / instrumentation requiring cryogenic materials, mandated by the Department Chair, is appropriately handled.
7. Consult with the Department Chair to identify auxiliary personnel to appropriately handle specific duties requiring cryogens on a permanent or temporary basis (e.g., Cryogen Manager is away from campus).

J. Mercury

The presence of mercury in a laboratory, while not desirable, may be necessary with specific applications. Mercury thermometers are the single most common response incident pertaining to mercury spills. Each laboratory designated person in charge should evaluate whether the use of mercury is necessary or consider if alternative *safe solutions* are possible.

Safe Solutions:

1. Stand-alone Hg-thermometer: *Replace* with chemical-based thermometers or electronic temperature sensors for most uses, and expansion or aneroid devices in high temperature ovens. Mercury thermometers can be the single most common HazMat emergency response incident.
2. Hg-filled manometers: *Replace* mercury with phthalate or another suitable liquid
3. Hg-filled McLeod gauges: *Replace* with electronic version

4. Hg-filled bubblers: *Replace* with a safer device such as check valves or mineral oil bubblers

Requests for mercury or mercury containing compounds will occur with a Request for Mercury / Mercury Compounds form that can be found at www.labsafety.eku.edu.If the decision to use mercury in the laboratory is made, training to ensure the safe handling and storage of mercury (including the procedures for cleaning up mercury spills provided below) is required for those that will use the metal. This training needs to be documented with the Mercury / Mercury Compound Training form that can be found at www.labsafety.eku.edu and is the responsibility of the laboratory designated person in charge. This documented training must be completed prior to any use of mercury.

***Mercury Spill Procedures (7)*:**
While a set of general chemical procedures exist in Section X of the CHP, a specific set of steps for the clean-up of mercury is provided below given the unique nature of the material (Procedure adapted from the Environmental Protection Agency (EPA): 'Mercury Releases and Spills': http://www.epa.gov/hg/spills/). This procedure is also available in handout form in Appendix 8.

LARGE or SMALL MERCURY SPILL
(Greater than Thermometer but Less than Two Tablespoons or One Pound)
CALL EKU Division of Public Safety/Environmental Health and Safety through EKU Police Dispatch: 622-1111

1. *Have everyone else leave the area; don't let anyone walk through the mercury on the way out.*
2. *Open all windows and doors to the outside.*
3. *Turn down the temperature.*
4. *Shut all doors to other parts of the room and leave the area.*
5. *DO NOT attempt to vacuum.*

Any time one pound or more of mercury is released to the environment, it is mandatory to call the National Response Center (NRC). The NRC hotline operates 24 hours a day, 7 days a week. Call (800) 424-8802. Note that because mercury is heavy, only two tablespoons of mercury weigh about one pound.

K. Laser Radiation Safety

Laser (acronym: Light Amplified by the Stimulated Emission of Radiation) is any device producing an intense, coherent, directional beam of light by stimulating electronic or molecular transitions to lower energy levels. The following guidelines were developed from the American National Standard Institute's Standard For The Safe Use of Lasers (ANSI z136.1-2000), which is the laser industry's standard for all persons who operate Class II, Class III, or Class IV laser products. The following are Laser Product Classifications:

Class I Laser Product: Poses no threat of biological damage.

Class II Laser Product: Output can cause biological damage if the beam is stared into for long periods of time.

Class IIIa Laser Product: Output can cause biological damage to the eyes if the beam is collected by an optical instrument and directed into the eye.

Class IIIb Laser Product: Can cause biological damage to the eyes if viewed briefly.

Class IV Laser Product: Direct viewing and specular as well as diffuse reflections can cause biological damage to the eyes or skin.

Principle Laser Manager

An individual faculty or staff should be identified as the Principal Laser Manager for a particular laser found in a teaching or research laboratory and would be responsible for:

1. The immediate supervision of lasers in the laboratory.
2. Providing, implementing, and enforcing the safety recommendations and requirements prescribed in this program.
3. Placing appropriate warning signs for each laboratory and while lasers are in operation. Each

entrance must be posted with a danger sign in accordance with ANSI Z136.1-1993.
4. Classifying and labeling all their lasers.
5. Ensuring laser laboratories and other controlled areas must be designed so that personnel can enter and leave under emergency conditions.
6. Completing a Laser Registry Form (www.labsafety.eku.edu.) and sending it to the Department Chair and the Division of Public Safety/EH&S.
7. Training all students / employees who work with and around Class IIa, II, IIIa, IIIb, and IV lasers in the safe use of lasers. This training must be documented and accessible.
8. Registering for the Medical Surveillance program for users of Class 3b and Class 4 lasers.
9. Notifying the RSO immediately in the event of an exposure to a Class 3b or Class 4 laser.

Laser Operators

Faculty, staff, or students that plan on using a laser in a specific teaching or research laboratory, but has not been identified, as the Principal Laser Manager, must do the following:

1. Receive laser safety and operating training from the Principal Laser Manager. This training must be documented and accessible.
2. Read all the safety and instructions found in the operator manual for a specific type of laser equipment.
3. Follow appropriate alignment and standard operating procedures while operating a laser.
4. Keep the Principal Laser Manager fully informed of any departure from established safety procedures. This includes notification of an exposure incident.

General Laser Safety Recommendations and Requirements

1. Eye Protection: Principal Investigators or staff who operate or supervise the operation of a laser is responsible for determining the need for laser eye protection for a particular laser. If required, the supervisor for staff and visitors to the area will provide eye protection. The booklet "Guide for Selection of Laser Eye Protection" produced by the Laser Institute of America may aid in eyewear selection. Check with your Principal Investigator or our EKU Occupational Health and Safety specialist for a copy.
2. The minimum laser radiant energy or laser power level required for the application should always be used.
3. Beam Control: To minimize direct eye exposure, observe these precautions:
   a. Do not intentionally look directly into the laser beam or at a specular reflection, regardless of its power.
   b. Terminate the beam path at the end of its useful path.
   c. Locate the beam path at a point other than eye level when standing or when sitting at a desk.
   d. Orient the laser so that the beam is not directed toward entry doors or aisles.
   e. Minimize specular reflections.

   f. Securely mount the laser system on a stable platform to maintain the beam in a fixed position during operation and limit beam traverse during adjustments.
   g. Confine primary beams and dangerous reflections to the optical table.
   h. Clearly identify beam paths and ensure that they do not cross-populated areas or traffic paths.
   i. When the beam path is not totally enclosed, locate the laser system so that the beam will be outside the normal eye-level range, which is between 1.2 to 2 meters from the floor. A beam path that exits from a controlled area must be enclosed where the beam irradiance exceeds the Maximum Permissible Exposure (MPE).

Controlling Associated Hazards

Many chemical and physical hazards other than laser radiation can be found in the laser area that must also be adequately controlled.

1. Electrical Equipment and Systems
   a. Always be aware of the high risk of injury and fire in laser operations because of the presence of electrical power sources.
   b. The installation, operation, and maintenance of electrical equipment and systems must conform to the standards stated in the National Electric Code (NFPA 70). Contact Division of Facility Service for assistance.
2. Lighting

a. Adequate lighting is necessary in controlled areas.
b. If lights are extinguished during laser operation, provide control switches in convenient locations, or install a radio-controlled switch.
c. Luminescent strips should be used to identify table and equipment corners, switch locations, aisles, etc.
d. When ambient light is not sufficient for safe egress from a laser area during an electrical power failure, install emergency lighting.

3. Ionizing and Non-ionizing Radiation
   a. A laser operation may involve ionizing radiation that originates from the presence of radioactive materials or the use of electrical power more than 15kV.
   b. If radioactive material is present in the laser system, "CAUTION RADIOACTIVE MATERIAL" sign must be prominently displayed. If X-rays are generated a "CAUTION-X-RAYS" sign must be prominently displayed.
   c. Microwave and radio frequency (RF) fields may be generated by laser systems or support equipment.
4. Hazardous Materials
   a. Bring into the laser area only those hazardous materials that are needed for the operation.
   b. All hazardous materials must be properly used, stored, and controlled. Consult Safety Data Sheets.
   c. Do not allow laser beams and strong reflections to impinge on combustible materials, explosives, highly flammable liquids or gases or substances that decompose into highly toxic products under elevated temperatures, without providing adequate controls.
   d. Conduct or sponsor tests that establish the effects of beam interactions with hazardous materials. Test results can be used to determine safe parameters for laser operation.
5. Dyes and Solutions
   a. Dye lasers normally use a lasing medium composed of a complex fluorescent organic dye dissolved in an organic solvent. These dyes vary greatly in toxicity, mutagenicity, and potential carcinogenicity.
   b. All dyes must be treated as hazardous chemicals. Most solvents suitable for dye solutions are flammable and toxic by inhalation and/or skin absorption.
   c. Obtain Safety Data Sheets for all dyes and solvents. Use and store all dyes and solvents in accordance with the Safety Data Sheets.
   d. Prepare and handle dye-solutions inside a chemical fume hood.
   e. Wear appropriate PPE (e.g., lab coat, eye protection and gloves).
   f. Pressure-test all dye laser components before using dye solutions. Pay particular attention to tubing connections.
   g. Install spill pans under pumps and reservoirs.
   h. Be alert to contaminated parts.
   i. Keep dye-mixing areas clean

L. Radioactive Materials

All matters pertaining to radioactive material must be discussed with the Division of Public Safety/EH&S. EKU has been decommissioned for radioactive material on its campuses. The Division of Public Safety/EH&S will need to be notified if projects require use, even low-level radiative material.

M. Hazardous Material Disposal – General Guidelines

1. Information on proper disposal of hazardous chemicals presented from SDSs should be made available to all laboratory employees prior to discarding the chemical.

2. All procedures for handling hazardous chemical waste are found in the University *Chemical Waste Handling Guide* www.labsafety.eku.edu

3. All hazardous waste must be placed into appropriate containers and labeled clearly with the identity of the waste(s), the approximate amount of each material; the dates when wastes were added to the container, and the name of the person who added the waste. Each container must be clearly marked with the words “Hazardous Waste” at the top of each label. An example label that can be used is found in appendix 9.

4. Segregate waste by type. Mixing of waste material must be avoided because this complicates disposal and creates a potentially dangerous condition. Contact the Division of Public

Safety/EH&S with questions concerning mixtures.

5. Chlorinated solvents must be separated from non-chlorinated solvents in wastecontainers.
6. Special care should be taken when disposing of compounds that are shock sensitive or explosive.
7. All sharp objects, needles and glass must be disposed of in an approved labeled container. Glass objects and other potentially sharp objects shall not be disposed of in regular waste containers. These types of materials in regular waste will significantly increase the risk of injury to the custodial staff. Containers must not be overfilled and must be labeled and sealed for proper handling and disposal.
8. Bio-hazardous waste must be placed into a container that is appropriately marked for such waste.
9. All waste containers that are rejected by the Division of Public Safety/ EH&S and Health office for pickup will be returned to the responsible faculty member. ***Departments will be responsible for the cost of characterization and disposal of unmarked hazardous waste.***

MI. Laboratory Decommissioning

Laboratories vacated by University personnel should not contain abandoned equipment, chemicals, biological specimens, sharps, and a variety of waste materials. Those leaving the space are instrumental in assisting the departments in decommissioning space by identifying potential hazards in the area. Those entering these spaces (cleaning staff, contractors, new occupants, etc.) can be placed at great risk. The implement of this Laboratory Decommissioning Policy is to maintain safety for these individuals.

Laboratory Decommission General Principles

1. The policy is applicable for all laboratories and auxiliary spaces serving laboratories. This policy provides requirements for the removal of hazards from laboratory spaces when space is vacated. These moves can include:
    a. Leaving Eastern Kentucky University (all campuses).
    b. Moving to another building on campus; or
    c. Relocating to another laboratory within the same building
2. When laboratories are vacated, all chemical, radioactive, and biological materials, sharps and other wastes must be removed and disposed of properly.
3. When laboratories are vacated, all non-fixed pieces of laboratory equipment must be decontaminated, then removed from the location and appropriately placed back into service, stored in another location, or arranged for surplus (see www.labsafety.eku.edu: Equipment Release Form).

    Surplus Note: Items that have been marked for surplus must be decontaminated (see www.labsafety.eku.edu : Equipment Release Form) to avoid injury. Once released, please DO NOT place these items in the hallway or stairwell while waiting for a Facility Services pick-up. The Fire Marshall can shutdown entire facilities/ buildings if items are found in these locations until the items are removed. Please keep these items in the existing location or in a separate storage space and direct Facility Services to those locations for pick- up.
4. The laboratory must be cleared of all possible hazards to reduce / eliminate risks of injury or potential for exposure (see www.labsafety.eku.edu.: Laboratory Clearance Checklist).
5. The person vacating the space MUST perform this decommissioning process, so all materials found within the lab DO NOT become the responsibility of the new designated person in charge.

VI. Provisions for Particularly Hazardous Substances

A. Permissible Exposure Limits (PELs)

1. The Laboratory Standard requires the employer to assure that employees' exposures to regulated substances do not exceed the Permissible Exposure Limits (PELs), specified in 29 CFR part 1910, subpart Z. The PELs represent Time Weighted Averages (TWAs) in parts per million (ppm) or milligrams of substance per cubic meter of air (mg/m^3). The TWA represents the ratio between exposure and work shift. Exposure limits can be found on a particular chemical SDS.
2. The American Conference of Governmental Industrial Hygienists (ACGIH) has established Threshold Limit Values (TLVs), which are TWA values like PELs but in some cases lower than the PELs. To keep employee exposures as low as reasonably achievable, employers are expected to uphold the lowest exposure limit, whether PEL or TLV.

B. Employee Exposure Determination

1. Initial monitoring. The employer shall measure the employee's exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels for that substance routinely exceed the action level (or in the absence of an action level, the PEL).
2. Periodic monitoring. If the initial monitoring prescribed by the previous paragraph of this section discloses employee exposure over the action level (or in the absence of an action level, the PEL), the employer shall immediately comply with the exposure monitoring provisions of the relevant standard.
3. Termination of monitoring. Monitoring may be terminated in accordance with the relevant standard.
4. Employee notification of monitoring results. The employer shall, within 15 working days after the receipt of any monitoring results, notify the employee of these results in writing either individually or by posting results in an appropriate location accessible to the employees.

C. Special Provisions for Select Carcinogens, Reproductive Toxins, and Acutely Toxic Chemicals

In addition to the general safety guidelines mentioned throughout this CHP, special precautions are needed when handling genotoxins, reproductive toxins and chemicals with a high degree of acute toxicity. The laboratory designated person in charge must make provisions for additional employee protection for work with particularly hazardous substances and information about these substances can be found at www.labsafety.eku.edu.

The following provisions and practices must be included with these materials:

1. Consult the SDS(s) for toxic properties of highly hazardous materials and follow the specific precautions and practices that are listed.
2. Quantities of these chemicals used and stored in the laboratory must be minimized, as should their concentrations in solution or mixtures.
3. Establish a designated area to use and store highly hazardous materials. The designated area may be a specific portion of the laboratory, the entire laboratory (biosafety level three or four require the *entire* laboratory be the designated area), or a device such as a fume hood or glove box.
4. The laboratory signage should have the appropriate symbols and special hazards in the appropriate sections (see Section VIIIA) and the designated area should be marked with a **DANGER, specific agent, AUTHORIZED PERSONNEL ONLY** sign, or a comparable warning sign will assure that all personnel with access are aware of necessary safety precautions.
5. Label all containers, storage, and use areas appropriately.
6. Recommended that materials in breakable containers should be stored in chemical-resistant

7. Work with genotoxins, reproductive toxins and acutely toxic chemicals must be performed within a certified functioning fume hood, biological safety cabinet, ventilated glove box, sealed system, or other system designed to minimize exposure to these substances. (The exhaust air from the ventilation systems may require scrubbing, or other treatment, before being released into the atmosphere.) In all cases, work with these types of chemicals must be done in such a manner that the OSHA permissible exposure limits or similar standards are not exceeded.
8. The ventilation efficiency of the designated fume hood, glove box or gas cabinet, and the operational effectiveness of mechanical and electrical equipment used to contain or manipulate these special substances should be evaluated periodically by the Division of Public Safety/ EH&S at regular intervals.
9. Compressed gas cylinders that contain acutely toxic chemicals such as arsine, chlorine, and nitrogen dioxide must be kept in well-ventilated areas.
10. Establish procedures for safe removal of contaminated waste. Detection equipment may be required in laboratories where chemicals (especially poisonous gases) with a high degree of acute toxicity are utilized.
11. Establish decontamination procedures. The designated working area must be thoroughly and appropriately decontaminated and cleaned at regular intervals determined by the laboratory designated person in charge. The interval may be as short as one day or as long as six months depending upon the frequency of usage and level of hazard.
12. All laboratory workers who work in a laboratory which has an area designated for use with genotoxins, reproductive toxins, and acutely toxic chemicals must be trained about the deleterious effects of these substances as well as signs and symptoms regarding exposure to these substances, whether they work with the substance themselves. Training to ensure the safe handling and storage of these substances is required for those who use these materials. This training is the responsibility of the laboratory designated person in charge and must be done prior to the use of any of these materials.
13. Laboratory workers working with these chemicals must have access to appropriate protective equipment and clothing and must be trained on how to properly utilize the safety equipment.
14. Special precautions to avoid release and exposure to highly toxic chemicals, genotoxins and reproductive toxins must be utilized. For instance, volatile substances should be kept cool and contained; gases should have properly functioning valves, check valves, regulators, containment which can withstand pressure buildup, and appropriate piping; and dispersive solids should be kept in closed containers, used in places with minimum air currents, and appropriate contact materials should be used to avoid static charging.

VII. Prior Approval

The responsibility for approval of the acquisition and use of toxic chemical agents rests with the laboratory designated person in charge. Some materials including toxic compressed gases, radioactive materials, and certain recombinant DNA and biohazards require prior internal or external approval at various levels. The laboratory designated person in charge should contact the Chemical Safety Officer and the Division of Public Safety/EH&S regarding the approval process for use of highly hazardous materials or operations. This is also necessary since the Department of Homeland Security has issued a regulation entitled "Chemical Facilities Anti- Terrorism Standards" (CFATS). This rule applies to all entities that possess certain hazardous chemicals and is intended to prevent the intentional misuse of these chemicals. The regulation requires subject facilities to estimate the types and quantities of the chemicals, *Chemicals of Interest* (COI), on hand, and, in some cases, to develop site security plans and measures, perform training and drills, and maintain records. The list of COI can be found at www.labsafety.eku.edu.

An approval form for certain materials may need to be processed before the purchase of these materials occurs. This form at www.labsafety.eku.edu.. If a laboratory already has a significant amount of a COI, then the Division of Public Safety/EH&S needs to be notified.

VIII. Standard Laboratory Equipment

A. Laboratory Information and Signage

1. A Safety Data Sheet (SDS) is a document containing chemical hazard identification and safe handling information and is prepared in accordance with the OSHA Hazard Communication Standard.

   Chemical manufacturers and distributors must provide the purchasers of hazardous chemicals an appropriate SDS for each hazardous chemical/product purchased.

   The Departments and/or laboratory designated person in charge are required to keep SDSs and are readily accessible to laboratory employees. The system a laboratory uses to store SDSs can vary from keeping them in a notebook or file cabinet to using an on-line database. EKU has purchased an online system (MSDSONLINE). All EKU personnel can access it at www.labsafety.eku.edu.> safety data sheets. Once there you will find a general user quick start guide to help with site access. The system adopted must provide easy access to SDSs for hazardous chemicals used by all employees in the lab.

2. A standardized laboratory sign that should be used for Eastern Kentucky University laboratories is found at www.labsafety.eku.edu. These signs should be filled out according to the instructions provided below, and then affixed to each laboratory door/entrance.

   a. The top portion of the form should be filled in with appropriate symbols that pertain to the conditions of the laboratory. Every form already includes the "No Food/Drink" and "Eye Protection" symbol. Simply place the appropriate symbols in the provided boxes. If more symbols are needed than boxes are present, then multiple forms should be used.

   b. Under the symbols, a section exists called *"Necessary Information"* to include any special hazard instructions. For example, a statement is required in this section if more than 10 gallons of flammable liquid is present in a laboratory. Any information in this section would be important to aid in emergency response personnel.

   c. The next section will illustrate what types of hazardous material exist in the laboratory according to classification. Simply place the "Check-mark" symbol by the appropriate classifications. Detailed definitions of the hazardous chemical classifications can be found in Appendix 1.

   d. The final information is the names and contact information (including office location with phone numbers along with emergency phone numbers) for the laboratory designated person in charge and two additional personnel associated with the lab. Additional information in this section must be the room number, department contacts, and emergency 9-1-1.

   e. An example of a laboratory sign filled out for a mock laboratory is provided at www.labsafety@eku.edu.

B. Safety Showers / Eye Wash Stations

1. Safety showers and eye wash stations shall be available in or near all laboratories where hazardous materials are in use.

2. Safety showers provide an immediate water drench of an affected person. The American National Standards Institute (ANSI) has the following guidelines for location, design, and maintenance of safety showers:

   a. Showers shall be located within 25 feet of areas where chemicals with a pH of 2.0 or 12.5 are used.

   b. Showers shall be located within 100 feet of areas where chemicals with a pH of > 2 and < 4 or 9 and < 12.5 are used.

   c. The location of the shower should be clearly marked, well lite and free from obstacles and in the immediate vicinity of the laboratory.

   d. Safety showers are checked and flushed once a month by EHS. EHS maintains documentation of these inspections.

3. Eye Wash Facilities. Eye wash facilities should be within 25 feet or 10 seconds travel of laboratories where injurious or corrosive chemicals are used or stored.

b. Optimally, those affected must have both hands free to hold open the eye to ensure an effective wash behind the lids. This means providing eye wash facilities that are operated by a quick release system and simultaneously drench both eyes.
c. Eye wash facilities must provide the minimum of a 15-minute water supply at no less than 0.4 gallons per minute.
d. Eye wash facilities must not exceed 25 pounds per square inch (PSI).
e. Eye wash facilities need to be flushed out for five minutes at a time, once per week, by the laboratory designated person in charge. The laboratory designated person in charge also maintains documentation of these inspections. This will prevent buildup of materials or organisms that could damage the eye if the eyewash were used for an emergency.

C. Ventilation Controls

Ventilation controls are those controls intended to minimize employee exposure to hazardous chemicals by removing air contaminants from the work site. There are two main types of ventilation controls:

1. General (Dilution) Exhaust: a room or building-wide system that brings in air from outside and ventilates within. Laboratory air must be continually replaced, preventing the increase of air concentration of toxic substances during the workday. General exhaust systems are not recommended for the use of most hazardous chemicals.
2. Local Exhaust: a ventilated, enclosed work area intended to capture, contain and exhaust harmful or dangerous fumes, vapors and particulate matter generated by procedures conducted with hazardous chemicals, e.g., fume hood.

To determine ventilation requirements, assess the SDS. Some SDS terminology, as listed below, may indicate a need for special ventilation considerations beyond general exhaust ventilation:

a. Use with adequate ventilation
b. Avoid vapor inhalation
c. Use in a fume hood
d. Provide local exhaust ventilation

Proper Use of Local Ventilation Systems: Once a local ventilation system is installed, they must be used properly to be effective. For use of hazardous chemicals warranting local ventilation controls, the following practices should be observed:

1. Conduct all operations that may generate air contaminants at or above the appropriate PEL or TLV inside a fume hood.

   All fume hoods at Eastern Kentucky University facilities should have face velocities between 80 and 120 fpm with the sash at a "working height" (approximately 12 inches). As a rule, fume hoods should not be operated with the sash fully open and should have the sash closed when not being used.

   The Environmental Health and Safety conducts a fume hood inspection and certification program for all fume hoods at the university. The CSO should be provided with a copy of the hood inspection results.

   All fume hoods should have spill protection lips (at the front of hood and for cup sinks located in the hood).

   Fume hoods with face velocities below 80 feet per minute must be marked with a sign indicating that the hood may not be used for chemical manipulations. A work order to repair these hoods should be processed as soon as possible.
2. Keep the slots in the hood baffle free of obstruction by apparatus or containers.
3. Keep all apparatus at least 6 inches back from the face of the hood. A stripe on the bench surface is a good reminder. Large equipment should be elevated at least two inches off the base of the fume hood, to allow for the passage of air underneath the apparatus.

4. Do not put your head in the hood when contaminants are being generated.
5. Do not use the hood as a waste disposal mechanism.
6. Excessive storage of chemicals or any apparatus in the hood will impair the performance of the chemical fume hood. Store flammable chemicals in an approved flammable storage safety cabinet. Store corrosive chemicals in a corrosive storage cabinet.
7. Be sure the switch is in the "on" position whenever the hood is in use and test hood often for airflow. Periodically check the airflow in the hood using a continuous monitoring device or another source of visible air flow indicator (e.g., attaching a lightweight ribbon to the bottom of the sash).
8. Minimize foot traffic past the face of the hood.
9. Do not remove hood sash or panels except when necessary for apparatus set-up; replace sash or panels before operating.
10. Do not place electrical receptacles or other spark sources inside the hood when flammable liquids or gases are present. No permanent electrical receptacles are permitted in the hood.
11. Use an appropriate safety shield/barricade if there is a chance of explosion or eruption.
12. If the hood sash is supposed to be partially closed for operation, the hood should be so labeled, and the appropriate closure point clearly indicated.

Proper use of Ductless Ventilation Systems: If any ductless, or portable fume hoods, which employ filtration media, will be acquired, and used instead of conventional local exhaust hoods, contact the CSO and or the Division of Public Safety/ EH&S office for consultation before acquisition.

IX. Controlling Chemical Exposures

The Laboratory Standard requires the employer to determine and implement control measures to reduce employee exposure to hazardous chemicals. Particular attention must be given to the control measures for chemicals that are known to be extremely hazardous. There are three major routes of entry for a chemical to enter the body: inhalation, absorption, and ingestion. The controls for prevention of these various routes of entry include engineering controls, personal protective equipment, and administrative controls.

A. Inhalation

Inhalation of chemicals is the most common route of entry a chemical can take to enter the body. The best method for reducing inhalation risk is using a less hazardous material in place of a more hazardous one. If substitution is not practical, engineering controls such as ventilation should be used to lessen the chance of exposure. The use of properly functioning local exhaust ventilation such as fume hoods, biological safety cabinets, and vented glove boxes is often required to minimize exposure to hazardous chemicals. Dilution ventilation may be used to reduce exposure to nonhazardous nuisance odors. For extremely toxic chemicals such as those classified as poison gases by State or Federal agencies (e.g., arsine, phosgene) the use of closed systems, vented gas cabinets, fail-safe scrubbing, detection, or other stricter controls may be required.

If neither substitution nor engineering controls are practical, the use of personal protective equipment, such as dust masks or respirators may be required to reduce inhalation exposures. If laboratory employees wear respirators, requirements of the OSHA Respirator Standard (1910.134) must be met, and a written respirator program must be implemented.

In addition to the controls discussed above, the following general guidelines should be followed to reduce the risk of exposure to hazardous chemicals:

- Minimize exposure time to hazardous materials
- Restrict access to an area where a hazardous chemical is used
- Maintain proper signs on lab doors to indicate special hazards within

B. Absorption

To reduce the risk of a chemical entering the body via skin and eye contact, engineering controls include substitution and ventilation as described above in Section VIA. The more obvious means of preventing skin and eye contact is by wearing personal protective equipment such as eye protection, face shields, gloves, appropriate shoes, lab aprons, lab coats, and other protective equipment as appropriate to the hazard. Since the chemical resistivity of the different types of protective equipment varies significantly, the lab designated person in charge should consult references to be sure that the protective equipment material is resistant to the chemical being used. Safety showers/eye wash equipment is required where corrosive chemicals are used. Such equipment should be prominently labeled and not obstructed.

C. Ingestion

Ingestion of chemicals is the least common route of entry into the body. However, a laboratory worker can easily ingest chemicals into the body via contaminated hands if they are not washed prior to eating, smoking, or placing part of the hand into the mouth. Some controls for preventing this route of exposure include engineering controls, such as isolating the hazardous substance so minimal contact is required (e.g., use glove box), personal protective equipment such as gloves, and administrative controls such as avoiding mouth pipetting, encouraging good personal hygiene, and designating a well-marked nonchemical area where eating, drinking and the application of cosmetics is permitted.

X. Emergency / Medical Practices

Planning for emergencies is an essential component of laboratory safety. Workers in labs should have the knowledge necessary to assess their risks from a small spill or release of a chemical or a fire, if they have received proper training. **Generally, laboratory personnel should respond to emergencies situations only if they are formally trained or certified to do so.** Employees are expected to respond to non- emergency situations. The most important aspect of this section is being able to differentiate between an incidental situation and an emergency.

A. Emergency and Spill Response – Basic Steps

1. Releases of hazardous substances that pose a significant threat to health and safety or that, by their very nature, require an emergency response regardless of the circumstances surrounding the release, or the mitigating factors, are emergency situations. The following definitions indicate an ***Emergency Situation***:
   a. Situation is unclear to the person causing or discovering a spill.
   b. Person causing or discovering the release does not understand the properties and can make no informed decision as to the exposure level, because it is beyond their knowledge and skill set.
   c. Release requires evacuation of people in the area.
   d. Release involves or poses a threat of fire, suspected fire, explosion, or other imminent danger; conditions that are Immediately Dangerous to Life and Health (IDLH); high levels of exposure to toxic substances.
   e. People in the work area are uncertain they can handle the severity of the hazard with the personal protective equipment (PPE) and response equipment that has been provided and/or the exposure limit could easily be exceeded.
   f. The spill or release is entering, or is about to enter, a drain.

   Once assessed to be an emergency Call 9-1-1 or other emergency response personnel (859-622-1111) from a safe location.

2. Releases that do not pose significant safety or health hazards to people in the immediate vicinity, or to the individuals cleaning up the material, and do not have the potential to become emergencies within a short time frame, are not emergency situations. The following situations ***ARE NOT Emergency Situations:***

   a. The release is a controlled release of a chemical by a trained professional for instructional purpose.

   b. The release of the chemical is small enough to be in scope of the documented training of the

individual overseeing the operation of the area.

c. Person causing or discovering the release understands the properties and can make an informed decision as to the exposure level based upon their knowledge and skill set.
d. Laboratory Supervisor/Designated person in charge of laboratory and/or workers can appropriately clean the release.
e. Materials are limited in quantity, exposure potential, or toxicity, and present minor safety or health hazards to persons in the immediate work area, or those assigned to clean up the activity.
f. Incidental releases of hazardous substances that are routinely cleaned up by the laboratory Designated Person in Charge or his or her designee.
g. The spill or release is contained on a bench top or with a working surface.

3. Laboratory Fires

a. *Small Localized Fires Unintended:* Smothering the fire with a fire-resistant material can put out fires isolated in a chemical container. A person trained in the use of fire extinguishers can extinguish slightly larger fires. A controlled burn can be extinguished by removing oxygen, fuel, or heat from the fire.
b. *Emergency Fires*: If an employee judges that the fire, or fire-related emergency, is uncontrolled or too large to be handled without danger to the employee, then:
   i. Alert personnel in the area through voice and/ or touch.
   ii. Pull the fire alarm or instruct another to do so.
   iii. Confine the fire if it is possible to do so without endangering yourself.
   iv. If the fire is in a fume hood, shut the hood sash if possible.
   v. Close doors to prevent the spread of fire.
   vi. Evacuate the hazardous area and the building.
   vii. Call 9-1-1 or other emergency response personnel (859-622-1111) from a safe location. Remain on the line until all necessary information has been given to the responding organization.

Actual fire emergency conditions may require that the previous actions be followed in a different order, depending on the layout of the laboratory, time of day, the number of people present and the location of the emergency relative to doors and alarm stations or telephones.

4. Laboratory Spills

In all spill situations remove victim(s) from spill area to fresh air only if an attempt to rescue victim(s) does not present a danger to the rescuers.

a. *Minor Spills*: If the spill is less than one liter, and the chemical involved is of low toxicity and a low flammable hazard, lab personnel should clean up the spill immediately. The person cleaning up the spill should avoid direct contact with the hazardous material.
   i. Non-reactive Spills: Cover liquid spills with absorbent and scoop it into a plastic disposal bag. Sweep solid materials into a dustpan and place it in a sealed container. Refer to the Chemical Waste Handling guide on disposal or contact Division of Public Safety/ EH&S.
   ii. Reactive or Potentially Reactive Spills: Absorbent materials will be available in all laboratories to absorb acidic, basic, or organic spills. Absorbent towels will also be available. Wet mop dry substances to avoid spreading hazardous dust, provided it is non-water reactive. If spilled chemical is a volatile solvent, transfer disposal bag to a hood for containment. Refer to the Chemical Waste Handling guide on disposal or contact EH&S.

b. *Emergency Spills*: If the spill is of high toxicity or flammability, or you are unsure of how to proceed, or is more than one liter, execute the following:
   i. If a victim is unconscious back out, and call emergency medical services at 9-1-1 or 859-622-1111.
   ii. Evacuate personnel from the spill area and alert neighbors to the spill.

iii. Isolate the spill area and close doors to the room where the spill occurred.
iv. Shut down equipment if possible.
v. Call 9-1-1 or 859-622-1111 from a safe location.
vi. If the victim is unconscious call 9-1-1 or 859-622-1111. Don't attempt to remove or perform first aid measures if you have not received documented training.
vii. Provide information on the nature the location of the spill to emergency response personnel.

c. *Attend to Victims for a Body Splash*:

i. Escort victim with chemical body splash from the spill area to an emergency shower.
ii. Direct all persons in the area, not involved to leave the area. Remove victim's contaminated clothing while under an emergency shower.
iii. Flood affected area with water for at least 15 minutes or longer if pain persists.
iv. Wash skin with mild soap and water – do not use neutralizing chemicals, unguents, creams, lotions, or salves.
v. Contact emergency response personnel and assure they know the chemical(s) involved. Have SDS(s) available if possible.

d. *Attend to Victims for an Eye Splash*:

i. Lead the victim(s) immediately to an emergency eye wash facility.
ii. Hold eyelids open.
iii. Flush eyes for at least 15 minutes or longer if pain persists.
iv. Contact emergency response personnel and assure they know the chemical(s) involved. Have SDS(s) available if possible.

5. Hazardous Material (HazMat) Emergency

The following are examples that would require a HazMat response:

a. Spill or release of significant quantities of toxic or highly toxic substances (e.g., mercury, carcinogens, chemicals with very low exposure limits).
b. Release or spill of significant quantities of chemicals with other dangerous properties (such as highly corrosive, or water reactive).
c. Condition that poses a fire or explosion hazard.

Call 9-1-1 or other emergency response personnel (859-622-1111) from a safe location.

6. Power Outages. If emergency lighting and fire alarms ARE NOT operable, evacuate the building after the following steps have been taken:

a. Stop, and render safe all experimentation
b. Place lids on all open containers of volatile chemicals.
c. Lower the sash on chemical fume hoods.
d. Shut down all equipment (leave cooling water and purge gases on as necessary).
e. Turn off ignition sources.
f. Secure or isolate reactions that are underway (boiling liquid on a hot plate, distillations).
g. Take your books, coats, purse/wallet, keys, etc.
h. Close fire doors.

In anticipation of possible power outages, do the following:

a. Have a flashlight conveniently located or another type of emergency lighting.
c. Make sure that all emergency contact numbers on the door are accurate and updated.
d. Shut down experiments.

B. Injury and Illness

Any incident resulting in injury (example list of common injuries are found below) in the laboratory must be documented with a Laboratory Incident / Injury Report (www.labsafety.eku.edu.), which consists of two different forms. Form A of the Report needs to be completed by the injured party and returned to the immediate Principal Investigator or Instructor or Supervisor, or Designated Person in Charge within 24 Hours of the event. Form B of the Report needs to be completed by the Principal Investigator or Instructor or Supervisor and returned to the appropriate Departmental Office (copy to Chemical Safety Officer) within 24 Hours of the incident. The time for the entire Report completion may be dependent on the conditions of an incident. A copy of both forms A and B must be forward to the EH&S (ehs@eku.edu) of all completed forms should be sent to Division of Public Safety/EH&S.

1. Minor burns or injuries: Minor burns or injuries are those that can be easily treated by the injured person. Treatment could include running cool water over a burn or applying a bandage to a small cut.
2. Serious but not life-threatening burns or injuries: If the burn or injury is serious enough that self-care is not sufficient, the person should seek medical attention. The student health center is in the Rowlett Building 859-622-1761. For regional campuses, the student should be directed to a local health care facility or emergency room that can treat the injury. Another person should accompany the person who needs medical attention.
3. Life-threatening burns, injuries, or illness: In situations where burns or injuries may be life threatening, medical personnel should be summoned to the lab by calling 9-1-1 or other emergency response personnel 859-622-1111 laboratory personnel should take only those actions that will prevent additional harm to the person. No medical treatment should be administered to the injured person unless the person administering the treatment is trained and certified to perform the treatment.
4. If a person is on fire, the following actions can be taken:
    a. Stop the person on fire from running! Do not allow anyone to run, not even to a fire blanket.
    b. Drop the person, to the floor. Standing will allow flames to spread upward to the eyes, nose, and mouth.
    c. Roll the person to snuff out the flames.
    d. Get medical assistance immediately by calling 9-1-1 or 859-622-1111.
5. Chemical exposure: If a person has suffered a widespread chemical exposure to the body and/or eyes, other persons should help the injured person get to the safety shower and eyewash. The most important emergency measure if chemicals are splashed to the eyes or skin is immediate flushing with water. Most splashes need at least 15 minutes of continual flushing. Get medical assistance immediately by calling 9-1-1 or (859-622-1111).

C. Medical Consultations

An opportunity for laboratory workers to receive medical consultation must be provided if an employee develops any symptoms thought to arise from chemical overexposure or after an event such as a major spill, leak, or explosion which may have resulted in an overexposure.

These suspected or actual exposures requiring medical evaluation, can and should be treated as a regular Workers Compensation claim for employees of the University. For student this situation requires you to fill out a Laboratory Incident/Injury Report www.labsafety.eku.edu.The injured employee must fill out an Accident - Occupational Injury/Illness Report Form found at https://universityclaims.eku.edu/report and go to an appropriate medical facility (e.g. occupational medicine clinic, employee health, qualified outside physician, etc.) for treatment. In the case of a student, the Laboratory Incident/Injury Report must fill out as outlined above. Following notification of overexposure, arrangements for an appropriate medical examination must be completed before the exposed individual may return to work.

Any medical examination required by this CHP must be provided without cost to an employee, without loss of pay and at a reasonable time and place. Records of any medical examination will be maintained at the medical facility providing service and with personnel at the University Claims personnel.

D. University Guide for General Emergency Response

The EKU Emergency Response Guides contains information about responding to general emergencies, such as fires, severe weather, medical emergencies, hazardous material release or spills, etc. These documents can be accessed at the EKU Emergency Management & Security page at https://emergency.eku.edu/building-emergency-response-guides

XI. Employee Information and Training

A. Information

All individuals who work in laboratories where they may be exposed to hazardous chemicals must be informed about the hazards of chemicals and equipment present in their work area. This information and training must be provided before initial assignment and before new exposure situations. The employer must provide equipment necessary for the safe handling of hazardous substances. **It is the responsibility of the Designated Person in Charge of the laboratory (Laboratory Supervisor, Principal Investigator, Lab Coordinator, etc.) to ensure that all laboratory workers have proper documented training.** The College Chemical Safety Officer will provide general training materials concerning lab safety and the EKU CHP. However, training specific for the lab where an employee is assigned is the responsibility of that employee's supervisor. The designated person in charge of the laboratory must maintain a written record, showing the content of the training, the date, and the names of the trainer and employee. The Designated Person in Charge of the laboratory must determine the frequency of refresher information and training.

B. Training

General training will be provided to all Designated Person in Charge of the laboratory (Laboratory Supervisor, Principal Investigator, Lab Coordinator etc. and Workers and may take the form of individual instruction, group seminars, webinars / web-tutorials, handout materials, or any combination of these.

Laboratory workers must be familiar with and adhere to the requirements of the CHP, other specific laboratory safety plans developed by their Designated Person in Charge of the laboratory, EKU requirements and other relevant regulatory requirements (e.g., Biohazard Safety).

1. General Training: Laboratory worker training must include information on:

    a. Location and availability of the OSHA Laboratory Standard.
    b. Location and availability of this Chemical Hygiene Plan (CHP).
    c. Methods that can be used to obtain reference materials on chemical safety (including safety data sheets (SDSs).
    d. Handling hazardous waste.
    e. Labelling.
    f. The work practices, personal protective equipment, and emergency procedures to be used to ensure that the employee may protect himself/herself from overexposure to hazardous chemicals.

    The manufacturer's safety data sheets (SDS) will generally contain much of the information needed to comply with the information and training requirements of the OSHA Laboratory Standard. The designated person in charge and employees should understand the relevant SDS and/or other comparable literature on the hazardous chemicals, which are used or stored in their laboratory. The employee's supervisor must provide additional training for specific lab hazards.

    Copies of SDS may be obtained from the chemical supplier. In addition, EKU has purchased an online system (MSDSONLINE) EKU personnel can access it at www.labsafety.eku.edu> safety data sheets. Individual departments or laboratories are strongly encouraged to maintain their own files of reference materials.

2. Special Hazards: Special hazards that apply only to a specific laboratory are to be identified by the Designated Person in Charge of the laboratory. The Designated Person in Charge of the laboratory is responsible for training the workers in that laboratory on these special hazards, and for maintaining documentation of this training. The training should include information on:
    a. The permissible exposure limits for OSHA regulated substances.
    b. Signs and symptoms associated with exposure to the hazardous chemicals found in the lab.
    c. Detection methods that may be used to detect the presence or release of a hazardous chemical.
3. Documentation: General awareness training about the OSHA Laboratory Standard and waste handling in accordance with the Resource Conservation and Recovery Act (RCRA) will be performed by the CSO and will be recorded when complete. It is necessary that the Designated Person in Charge of the laboratory or the department retain records of specific laboratory training needed for individual laboratories (departments will need to identify those labs that need specific training (example: Handling of Mercury or Mercury Compounds). The amount of time a unit chooses to retain training records is not specified in the Laboratory Standard.

4. Accident Reports: Designated person in charge, Laboratory workers, Principal Investigators, Instructors or Supervisors must be aware that any incident resulting in injury in the laboratory must be followed by filling out and filing a Laboratory Incident / Injury Report (www.labsafety.eku.edu.), which consists of two different forms. Form A of the Report needs to be completed by the injured party and returned to the immediate designated person in charge, Principal Investigator, Instructor or Supervisor within 24 Hours of the event. Form B of the Report needs to be completed by the Principal Investigator or Instructor or Supervisor and returned to the appropriate Departmental Office (copy to Chemical Safety Officer) within 24 Hours of the incident. The time for the entire Report completion may be dependent on the conditions of an incident. A copy of both Forms A and B must be forwarded to the EH&S at ehs@eku.edu when they are complete.

XII. Inspections

A. Inspection and Maintenance

1. Temperature control and over-temperature shutoff devices on heating equipment should be tested in accordance with manufacturer recommendations to ensure proper operation.
2. All automatic shutoff devices should be tested in accordance with manufacturer recommendations to ensure proper operation.
3. The user should visually inspect explosion shields and isolation devices for cracks or other damage before each use.
4. Laboratory (or related areas) Inspections:
    - Laboratories need to be inspected on a periodic basis. Designated person in charge of Laboratory, Principle Investigators, Instructors, or Supervisors shall conduct internal laboratory inspections based on the Laboratory Safety Inspection Checklist (www.labsafety.eku.edu.) These inspections will be performed, at minimum, the months of September, October, November, February, March, April and once during summer semester as needed. The purpose of this checklist is to provide the Designated Person in Charge of the laboratory a tool to help perform a self-audit of each laboratory. The frequency of these internal inspections can be more often than monthly at the discretion of the individual departments. A section at the end of the checklist is available where department specific items that require inspection can be added. The internal inspection can be delegated to laboratory workers as needed.
    - Laboratories shall be inspected externally at least annually by the CSO.

XIII. Records

The following records shall be maintained:

1. Safety training records are maintained by the CSO or, for special hazards training, by the Designated Person in Charge of the laboratory in accordance with the University policy of record keeping and/or regulatory requirement, whichever is longer.
2. Annual inspection reports of the laboratories are maintained by the CSO.
3. Each department should maintain a list of all personnel who have access to the building after hours. For regional campuses, the director of the regional campus should maintain this list of personnel. This list should include emergency contact information for each person.
4. The department chairs or regional campus director shall maintain copies of all incident reports submitted to them.
5. An accurate and up to date report of hazardous chemical inventory shall be maintained for all laboratories in each department. This report will be submitted to the Division of Public Safety/EH&S for an annual review.

REFERENCES

References Cited in Text

1. The 2012 OSHA Hazard Communication: http://www.osha.gov/dsg/hazcom/ghs-final-rule.html

2. General information about the OSHA Hazard Communications Program: http://www.osha.gov/dsg/hazcom/index.html

3. *Safety in Academic Chemistry Laboratories*, Volume 1 and 2. American Chemical Society, 7th Edition, 2003.

4. Personal Protective Equipment:
   a. United States Department of Labor: Occupational Safety and Health Administration: Safety and Health Topics: http://www.osha.gov/SLTC/personalprotectiveequipment/
   b. Gloves: search for the best glove for a variety of hazardous materials: http://www.chemrest.com/

5. The Chemical Reactivity Worksheet is a free program you can use to find out about the reactivity of substances or mixtures of substances. http://response.restoration.noaa.gov/chemaids/react.html

6. Furr, A. Keith. *CRD Handbook of Laboratory Safety*. Boca Raton: CRC Press, 2000, pp. 243-244.

7. Environmental Protection Agency (EPA): 'Mercury Releases and Spills': http://www.epa.gov/hg/spills/

General References

Prudent Practices in the Laboratory: Handling and Disposal of Chemicals, National Academy of Sciences, National Academies Press, 1995. Online version: http://books.nap.edu/books/0309052297/html/index.html

American Industrial Hygienists Association (AIHA) Laboratory Safety Information and Links
http://www.aiha.org/Pages/default.aspx

NIOSH links to many topics on chemical safety:
http://www.cdc.gov/niosh/topics/chemical-safety/

Appendix 1. Detailed Definitions (Physical and Health Hazards)

A. Physical Hazards (definitions):

Hazard Definition

Cryogens Cryogenic liquids such as oxygen, nitrogen, argon, helium, and hydrogen are substances that are normally in the gaseous state but are cooled to extremely low temperatures so that they are liquids. Some of the hazards associated with cryogens are fire, pressure, weakening of materials, and skin or eye burns upon contact with the liquid.

Hazard Category The division of criteria within each hazard class, e.g., oral acute toxicity and flammable liquids include four hazard categories. These categories compare hazard severity within a hazard class and should not be taken as a comparison of hazard categories more generally.

Hazard Class The nature of the physical or health hazards, e.g., flammable solid, carcinogen, oral acute toxicity.

Hazard Statement A statement assigned to a hazard class and category that describes the nature of the hazard(s) of a chemical, including, where appropriate, the degree of hazard.

Heavy Metals Any metal with a specific gravity of 5.0 or greater and that can be toxic to organisms at certain concentrations. Heavy metals include antimony, arsenic, bismuth, cadmium, cerium, chromium, cobalt, copper, gallium, gold, iron, lead, manganese, mercury, nickel, platinum, silver, tellurium, thallium, tin, uranium, vanadium, and zinc.

Light Sensitive Materials that degrade in the presence of light forming new compounds that can be hazardous or resulting in conditions such as pressure build-up inside a container, which may be hazardous. Examples of light sensitive materials include chloroform, tetrahydrofuran, ketones, and anhydrides.

Pictogram A composition that may include a symbol plus other graphic elements, such as a border, background pattern, or color that is intended to convey specific information about the hazards of a chemical. Eight pictograms are designated under this standard for application to a hazard category.

Product Identifier The name or number used for a hazardous chemical on a label or in the SDS. It provides a unique means by which the user can identify the chemical. The product identifier used shall permit cross-references to be made among the list of hazardous chemicals required in the written hazard communication program, the label and the SDS.

Pyrophoric gas A chemical in a gaseous state that will ignite spontaneously in air at a temperature of 130 degrees F (54.4 degrees C) or below.

Signal Word A word used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label. The signal words used in this section are "danger" and "warning." "Danger" is used for the more severe hazards, while "warning" is used for the less severe.

B. Health Hazards (definitions):

Hazard Definition

Carcinogens Chemicals that cause cancer.

Select carcinogens Compounds including those which are regulated by OSHA as carcinogens (20 CFR 1910); are listed under the category, "known to be carcinogens," (www.labsafety.eku.edu.) in the Annual Report on Carcinogens published by the National Toxicology Program, or are listed under group 1 ("carcinogenic to humans") by the International Agency for Research on Cancer Monographs.

Corrosives Chemicals that cause visible destruction or, or irreversible alterations in, living tissue by chemical action at the site of initial contact.

Irritants Chemicals which are not corrosive, but which cause a reversible inflammatory effect on living tissue by chemical action at the site of contact.

Sensitizers Chemicals that cause a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical.

Target organ effects The following is a target organ categorization of effects that may occur, including examples of signs and symptoms and chemicals that have been found to cause such effects. These examples are presented to illustrate the range and diversity of effects and hazards found in the workplace, and the broad scope employees must consider in this area. The examples are not intended to be all-inclusive:

Hepatotoxins Chemicals, which produce liver, damage. Example of signs and symptoms include jaundice and liver enlargement. Examples of chemicals, which are hepatotoxins, include carbon tetrachloride, nitrosamines.

Nephrotoxins Chemicals, which produce kidney damage. Examples of signs and symptoms include edema (retention of water) and proteinuria (protein in the urine). Examples of chemicals, which are nephrotoxins, include halogenated hydrocarbons and uranium.

Neurotoxins Chemicals that produce their primary toxic effects on the nervous system. Examples of signs and symptoms include behavioral changes, decrease in motor functions. Examples of chemicals, which are neurotoxins, include mercury and carbon disulfide.

Agents, which act on the hematopoietic system Chemicals that act on the blood system. Examples of signs and symptoms include cyanosis and loss of consciousness. Examples of chemicals, which act on the hematopoietic system, include carbon monoxide and cyanides.

Agents, which damage the lungs Chemicals that irritate or damage the pulmonary tissue. Examples of signs and symptoms include tightness in the chest and shortness of breath. Examples of chemicals, which damage the lungs, include silica and asbestos.

Reproductive toxins Chemicals, which affect the reproductive capabilities including chromosomal damage (mutagens) and effects on the fetuses (teratogens). Examples of signs and symptoms include birth defects and sterility. Examples of chemicals that are reproductive toxins include lead and DBCP (dibromo chloropropane).

Cutaneous hazards Chemicals, which affect the dermal layer (skin) of the body. Examples of signs and symptoms include defatting (drying) of the skin, rashes, and irritation. Examples of chemicals that are cutaneous hazards include ketones and chlorinated compounds.

Eye hazards Chemicals that affect the eye or visual capacity. Examples of signs and symptoms include conjunctivitis and corneal damage. Examples of chemicals that are eye hazards include acids, bases, and organic solvents.

Toxic All chemicals are considered toxic, or capable of producing injury to some degree, should they gain access into the body in sufficient concentration.

The Occupational Safety and Health Administration defines "toxic" as chemicals which have an average lethal dose (LD_{50}) or lethal concentration (LC_{50}, indicates average lethal inhalation exposure) of:

Ingestion: LD_{50} between 50 and 500 mg/kg body weight when administered orally to albino rats.

Skin Contact: LD_{50} between 200 and 1000 mg/kg body weight when administered by continuous dermal contact over a 24-hour period to albino rabbits.

Inhalation: LC_{50} between 200 and 2000 parts per million of gas or vapor or between 2 and 20 mg/l of mist, fume, or dust, when administered continuously by inhalation for one hour to albino rats.

Highly toxic: Chemicals, which have an average lethal dose of:

Ingestion: LD_{50} of less than 50 mg/kg body weight when administered orally to albino rats.

Skin Contact: LD_{50} of less than 200 mg/kg body weight when administered by continuous dermal contact over a 24-hour period to albino rabbits, or

Inhalation: LC_{50} of less than 200 parts per million of gas or vapor or 2 mg/l of mist, fume, or dust, when administered continuously by inhalation for one hour to albino rats.

Appendix 2. Chemical Safety Personnel

Listing Academic Year 2022-2024

Division of Public Safety

AVP Facilities Management & Public Safety	Bryan Makinen	893-6503
Director of Environmental Health & Safety	Dekia Gaither	625-3437
Director of Emergency Management & Security	Gary Folckemer	625-8370

College of STEM

Dean	Dr. Tom Otieno	622-1405
Associate Dean	Dr. Tim Ross	622-1197
Biological Sciences Department Chair	Dr. Sherry Harrel	622-1531
Chemistry Department Chair	Dr. Tanea Reed	622-1459
Geosciences Department Chair	Dr. Alice Jones	622-1424
Physics Department Chair	Dr. Anthony Blose	622-1521
Agriculture Department Chair	Dr. William Davis	622-2228
Chemical Safety Officer	Tracy Gastineau-Stevens	622-6355
Chemical Storage Facility Manager	Dr. Mary Lamar	622-6709

College of Education

Dean of the College of Education	Dr. Sherry Powers	622-1175
Model Representative	Dr. Stacy Thomas	622-7066

College of Letters, Arts and Social Sciences

Dean of the College of Letters, Arts & Social Sciences	Dr. Murcy Cannon	622-2222
Chemical Safety Officer	Dr. David Mohallatee	622-1633

College of Justice and Safety

Dean of the College of Justice and Safety	Dr. Derek Paulsen	622-3562
Chemical Safety Officer	Dr. David Stumbo	622-9954

College of Health Sciences

Dean of the College of Health Science	Dr. Daniel Czech	622-1137
Chemical Safety Officer	Travis Altheide	622-1975

Appendix 3. Label Elements

Labels on chemical containers will comply with the Globally Harmonized System (GHS) for labeling of chemicals. As stated in Section V part F of this Chemical Hygiene Plan, all labels will contain the following parts:

a. Product Identifier: Chemical name, code number, or batch number determined by the supplier.

b. Signal Word: Either “Danger” for severe hazards or “Warning” for less severe hazards.

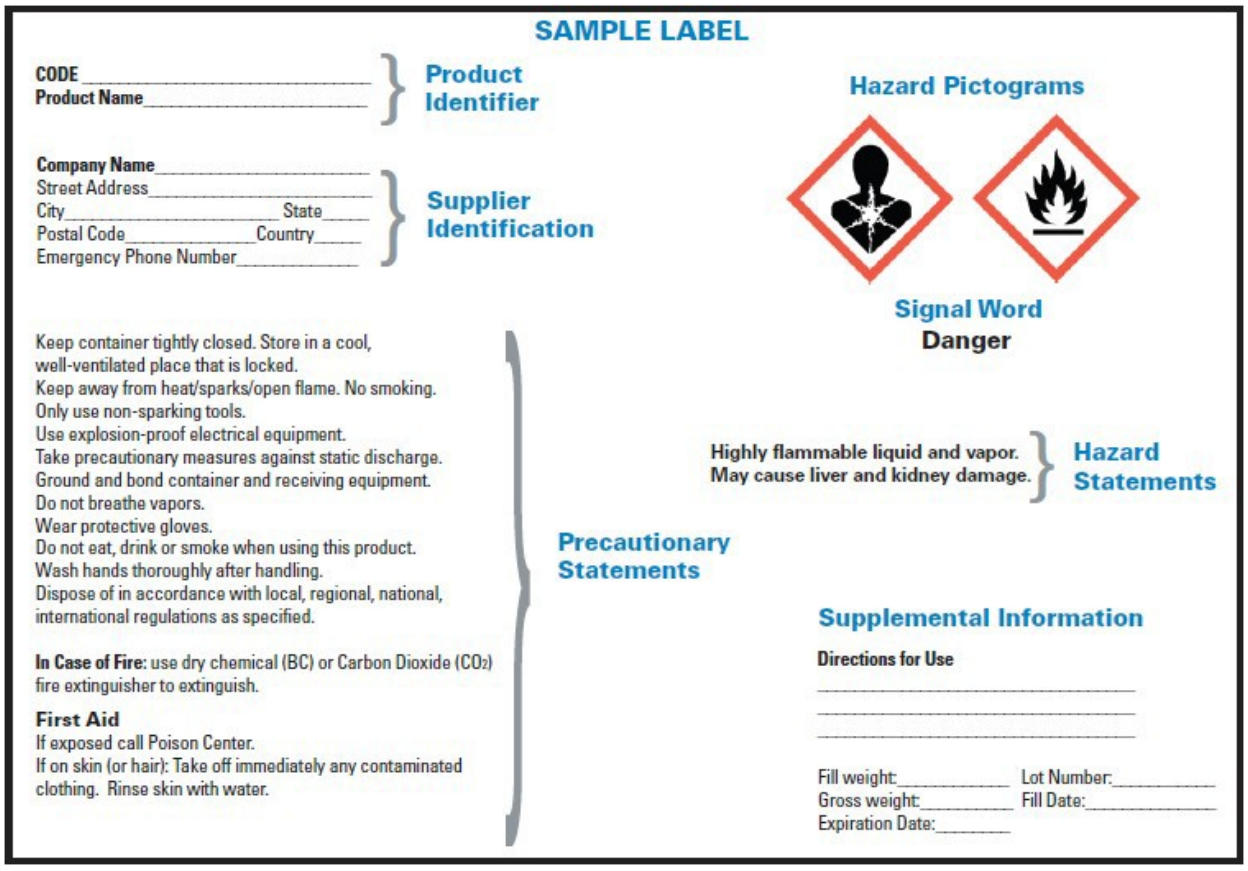
c. Pictogram: Symbols used to depict the hazard categories associated with the chemical. The eight possible pictograms include: Health Hazard, Flame, Exclamation Mark, Gas Cylinder, Corrosion, Exploding Bomb, and Flame over Circle, Environment, and Skull and Crossbones. See HCS Pictograms and Symbols below for all symbols and definitions.

d. Hazard Statement(s): A description of the hazard(s) of the chemical. For example: “Causes damage to kidneys through prolonged or repeated exposure when absorbed through the skin.” Hazard Statements are specific to the hazard classification categories, and chemical users should always see the same statement for the same hazards.

e. Precautionary Statement(s): A phrase that describes recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a hazardous chemical or improper storage or handling.

f. Name, address and phone number of the chemical manufacturer, distributor, or importer.

An example of a chemical label and pictograms are found below.



HCS Pictograms and Definitions

Health Hazard  • Carcinogen • Mutagenicity • Reproductive Toxicity • Respiratory Sensitizer • Target Organ Toxicity • Aspiration Toxicity	**Flame**  • Flammables • Pyrophorics • Self-Heating • Emits Flammable Gas • Self-Reactives • Organic Peroxides	**Exclamation Mark**  • Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity (harmful) • Narcotic Effects • Respiratory Tract Irritant • Hazardous to Ozone Layer (Non-Mandatory)
Gas Cylinder  • Gases Under Pressure	**Corrosion**  • Skin Corrosion/ Burns • Eye Damage • Corrosive to Metals	**Exploding Bomb**  • Explosives • Self-Reactives • Organic Peroxides
Flame Over Circle  • Oxidizers	**Environment** (Non-Mandatory)  • Aquatic Toxicity	**Skull and Crossbones**  • Acute Toxicity (fatal or toxic)

***The new SharePoint label site is http://sp.eku.edu/sites/ekughs . All EKU faculty and staff have access to this SharePoint site. It is written in Word and all labels can be copies to a desktop and changed anyway they are needed. The changes cannot be upload back to this SharePoint sites. So, faculty or staff must keep their own changes to their computers.

Appendix 4. Safety Data Sheet (SDS) Format and Information

Previously, Material Safety Data Sheets (MSDSs) could vary in format and information from one manufacturer to another. Under the new GHS protocol, Safety Data Sheets (SDSs) all must include a standardized 16-section format:

1. **Identification**: Product identifier, manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use.

2. **Hazard(s) identification** includes all hazards regarding the chemical; required label elements.

3. **Composition/information on ingredients** includes information on chemical ingredients, trade secret claims.

4. **First-aid measures** includes important symptoms/effects, acute, delayed; required treatment.

5. **Fire-fighting measures** lists suitable extinguishing techniques, equipment, chemical hazards from fire.

6. **Accidental release measures**: lists 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**: lists OSHA's Permissible Exposure Limits (PELs); Threshold Limit Values (TLVs); appropriate engineering controls; personal protective equipment (PPE).

9. **Physical and chemical properties** list the chemical's characteristics.

10. **Stability and reactivity**: list chemical stability and possibility of hazardous reactions.

11. **Toxicological information**: includes routes of exposure; related symptoms, acute and chronic effects; numerical measures of toxicity.

*12. Ecological information

*13. Disposal information

*14. Transport information

*15. Regulatory information

16. **Other information** includes the date of preparation or last revision.

*Note: Sections 12-15 are not regulated by OSHA (29 CFR 1910.1200(g) (2)).

Appendix 5. Personal Protective Equipment (PPE) Guidelines for Hazardous Material Handling

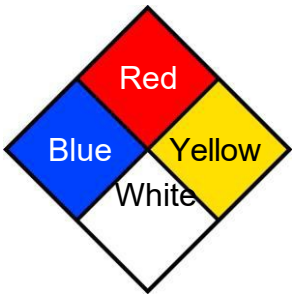
Hazard Assessment and Personal Protective Equipment Guidelines for General Laboratory Operations

Hazard	Personal Protective Equipment (PPE) Recommended		
	Eye	**Face**	**Hand/Skin/Body**
Any laboratory uses of hazardous chemicals or potential for impact hazard	Safety glasses with side shields **required** at all times		Lab coat*
Any use of corrosive chemicals, strong oxidizing agents, carcinogens, mutagens, etc. where a reasonable probability of splash exist.	Chemical splash goggles	Full face shield with chemical splash goggles when working with larger quantities including i) acid baths, ii) over 4 liters of corrosive liquids, iii) any volume of concentrated corrosives, or iv) highly reactive chemicals.	Resistant gloves (See www.labsafety.eku.edu.. Edu. for chemical resistance of common glove materials) *Impervious lab coat, coveralls, apron, protective suit (for work with over 5 gallons corrosive liquids)
Temperature extremes	Face shield required for transfer of cryogenic materials	Face shield required for transfer of cryogenic materials	*Insulated gloves for handling ovens, furnaces, cryogenic bath, and other devices over 100° C or below -1° C
Sharp objects (broken glass, insertion of tubes or rods into stoppers)	Safety glasses with side shields		*Heavy cloth barrier or leather gloves

* These garments should not leave the work site.

Appendix 6. National Fire Protection Association (NFPA) Hazard Diamond

This labeling system uses 4 diamonds of different colors to denote various types of hazards. Within each colored diamond is a number that indicates the level of hazard for the material.



Health (Blue Diamond)

0 No health hazard when used with responsible care.
1 *Slightly toxic material*. May cause irritation, but only minor residual injury even without treatment.
2 Moderately toxic material. Intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical treatment is given.
3 *Seriously toxic material*. Short-term exposure could cause serious temporary or residual injury even though prompt medical treatment is given. Includes known or suspect small animal carcinogens, mutagens, or teratogens.
4 *Highly toxic material*. Very limited exposure could cause death or major injury even though prompt medical treatment is given. Includes known or suspect human carcinogens, mutagens, or teratogens.

Flammability (Red Diamond)

0 Materials that will not burn.
1 *Slightly combustible*. Material that requires considerable preheating before ignition can occur. This rating includes most ordinary combustible materials.
2 *Combustible*. Materials that must be moderately heated before ignition can occur. Includes liquids having a flash point above 100°F, and solids, which readily give off flammable vapors.
3 *Flammable*. Liquids and solids that can be ignited under almost all ambient temperature conditions. Includes liquids with a flash point below 73°F and a boiling point above 100°F, solid materials which form coarse dusts that burn rapidly without becoming explosive, materials which burn rapidly by reason of self-contained oxygen (i.e., organic peroxides), and materials which ignite spontaneously when exposed to air.
4 *Extremely flammable*. Materials that will rapidly vaporize at normal pressure and temperature and will burn readily. Includes gases, cryogenic materials, any liquid or gaseous material having a flash point below 73°F and a boiling point below 100°F, and materials that can form explosive mixtures with air.

Reactivity (Yellow Diamond)

0 Materials that are normally stable, even under fire conditions, and which are not reactive with water.
1 Materials that are normally stable, but which can become unstable at elevated temperatures and pressures, or which may react with water with some release of energy, but not violently.
2 Materials themselves are normally unstable and readily undergo violent chemical change, but do not detonate. It includes materials which may react violently with water, or which may form potentially explosive mixtures with water.
3 Materials themselves are capable of detonation but which require a strong initiating source, or which must be heated first. This rating includes materials which are shock sensitive at elevated temperatures, and which react explosively with water without requiring heat.
4 Materials themselves are readily capable of detonation or explosive decomposition at normal temperatures and pressures. Includes shock sensitive materials at normal temperatures/pressures.

Special Notice (White Diamond)

OX Denotes materials that are oxidizing agents. These compounds give up oxygen easily, remove hydrogen from other compounds or attract negative electrons.
W Denotes materials that are water reactive. These compounds undergo rapid energy releases on contact with water.

Appendix 7. Hazardous Waste Labels and Satellite Accumulation Waste Signage

EKU * Office of Environmental Health & Safety * 622-3437 or 622-1258 * Hazardous Waste Pick-up

Pick-Up Date:	Contents:			
	Container Size:		Amt. of Material:	
Accumulation Start Date:	Contact Person:		Contact Phone #:	
	Precautions:	Combustible Corrosive Explosive Flammable Oxidizer Toxic		
	Notes:			

EKU * Office of Environmental Health & Safety * 622-3437 or 622-1258 * Hazardous Waste Pick-up

Pick-Up Date:	Contents:			
	Container Size:		Amt. of Material:	
Accumulation Start Date:	Contact Person:		Contact Phone #:	
	Precautions:	Combustible Corrosive Explosive Flammable Oxidizer Toxic		
	Notes:			

EKU * Office of Environmental Health & Safety * 622-3437 or 622-1258 * Hazardous Waste Pick-up

Pick-Up Date:	Contents:			
	Container Size:		Amt. of Material:	
Accumulation Start Date:	Contact Person:		Contact Phone #:	
	Precautions:	Combustible Corrosive Explosive Flammable Oxidizer Toxic		
	Notes:			

EKU * Office of Environmental Health & Safety * 622-3437 or 622-1258 * Hazardous Waste Pick-up

Pick-Up Date:	Contents:			
	Container Size:		Amt. of Material:	
Accumulation Start Date:	Contact Person:		Contact Phone #:	
	Precautions:	Combustible Corrosive Explosive Flammable Oxidizer Toxic		
	Notes:			

Satellite Accumulation Waste

"Hazardous Waste"

Contact Person _____ Accumulation start date: _____

OSHA requires us to record the type and amount of chemicals that we place in a container. Attach this manifest to any container that is used for used chemicals. Record the information in the proper spaces.

Name of Chemical or Solution	Amount
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Federal Law Prohibits Improper Disposal. If found contact the nearest police or public safety authority or the U.S. Environmental Protection Agency.

Appendix 8. Unattended Operation/ Experiment in Progress Signage

UNATTENDED OPERATION/EXPERIMENT IN PROGRESS

Materials/Chemicals used:

CHEMICAL HAZARD CATEGORIES

Compressed Gas ☐	Halogenated Solvents ☐
Heavy Metals ☐	Oxidizers ☐
Mineral Acids ☐	Organic Acids ☐
Bases ☐	Reactive Wastes ☐

Corrective Action in case of emergency

Contact information for faculty or staff running experiment must be listed below.

Name: **Number:**

For Emergency Assistance (24 hrs): 9-1-1
EKU Police: 859-622-1111

Appendix 9. Mercury Spill Procedures

Cleanup Instructions

CALL EKU Director of Environmental Health and Safety through EKU Police Dispatch: 622-1111

1. Have everyone else leave the area; don't let anyone walk through the mercury on the way out.
2. Open all windows and doors to the outside.
3. Turn down the temperature.
4. Shut all doors to other parts of the house and leave the area.
5. *DO NOT attempt vacuum.*

EXCESSIVE MERCURY SPILL (More than Two Tablespoons or One Pound)

Contact the Director of the EKU Environmental & Health Safety (E&HS) Office immediately!

Any time one pound or more of mercury is released to the environment, it is mandatory to call the National Response Center (NRC). The NRC hotline operates 24 hours a day, 7 days a week. Call (800) 424-8802. Note that because mercury is heavy, only two tablespoons of mercury weigh approximately one pound.

Procedure adapted from the Environmental Protection Agency (EPA): 'Mercury Releases and Spills': http://www.epa.gov/hg/spills/

Appendix 10

Emergency Numbers
2022-2024

Campus Emergency 9-1-1

EKU Police Dispatch 622 – 1111

EKU Public Safety 622 – 1111

EKU Student Health Services 622 – 1761

Energy Management System 622 – 2966
(Physical plant problems after regular hours, weekends)

Facilities Management 622 – 2966
(Physical plant problems during regular working hours)

Chemical Storage Manager:
Mary Lamar 622 – 6355
mary.Lamar@eku.edu

EHS contact

AVP Facilities Management & Safety 893-6503
Bryan Makinen bryan.makinen@eku.edu

Director Environmental Health & Safety 622-3437
Dekia Gaither dekia.gaither@eku.edu

Director of Emergency Management & Security 625-8370
Gary Folckemer gary.folckemer@eku.edu

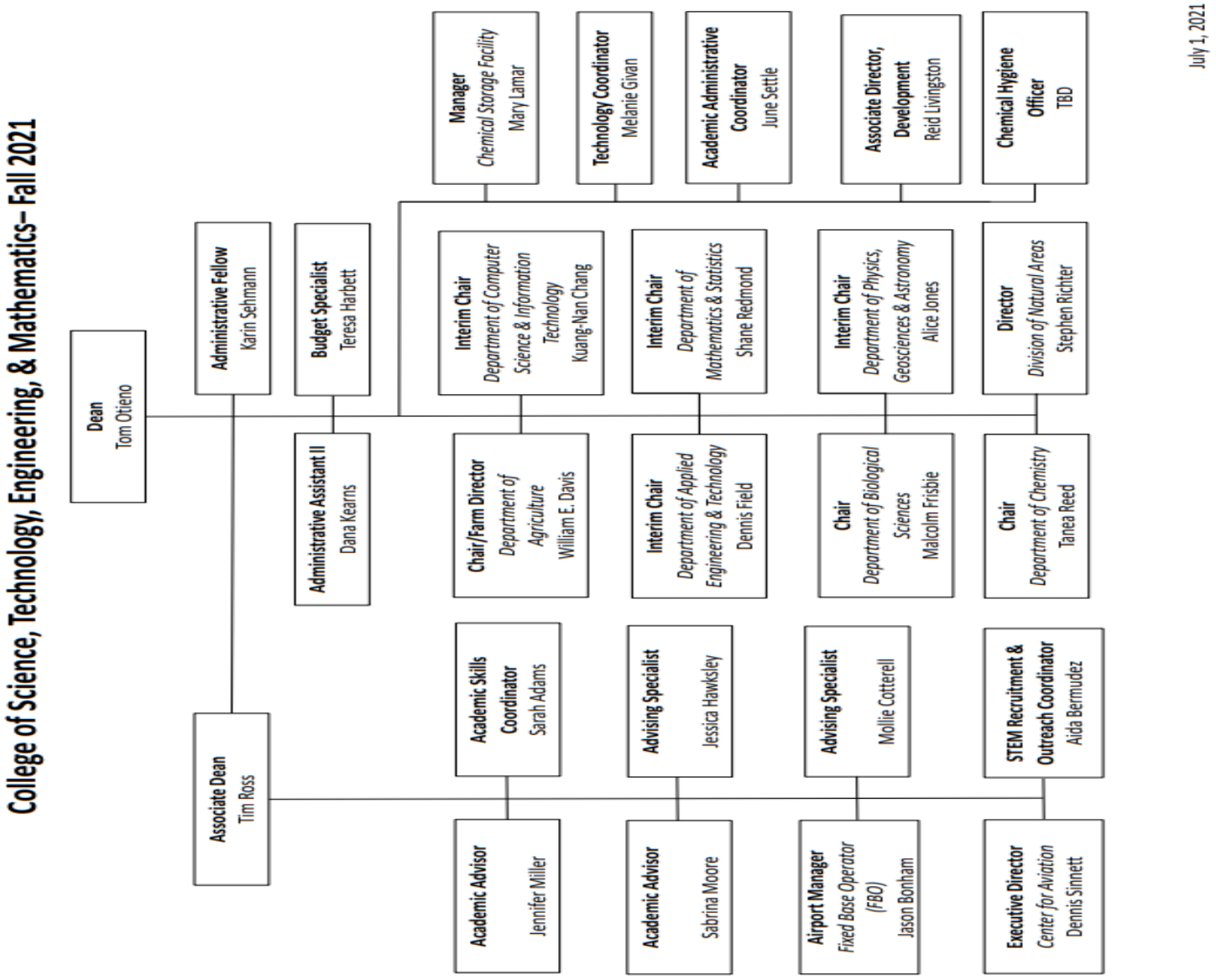
Appendix 11
Amendments/ Exemptions

Under Roles and Responsibilities of the CSO the college of STEM has the following amendments

9.) The Chemical Storage Manager will provide access to SDS sheets upon request – found on MSDS Online; and this duty will not be performed by the CSO.

10.) The Chemical Storage Manager will keep documentation of chemical purchases/inventory of college. This duty will not be performed by the CSO.

College of Science, Technology, Engineering, & Mathematics
Chemical Safety Organization / Task Structure



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Richmond, Kentucky 40475-3102
Phone: (859) 622-3884
FAX: (859) 622-8136

TO: Dekia Gaither on behalf of the University Laboratory Safety Committee

FROM: Jerry Pogatshnik, Provost

DATE: October 21, 2019

RE: Approval of the 2019-21 Chemical Hygiene Plan

The proposed 2019-21 University Chemical Hygiene Plan was reviewed and approved by the Deans' Council at its meeting on October 2, 2019.