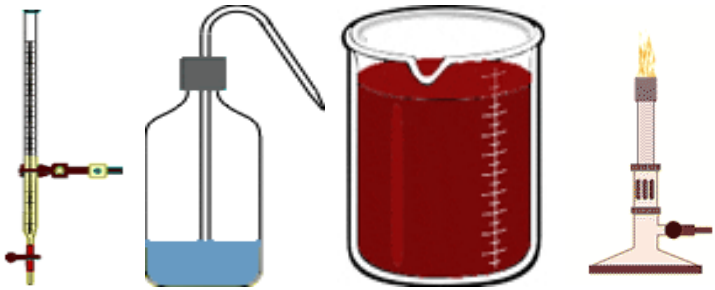
LABORATORY SAFETY HANDBOOK



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IUPUI

INDIANA UNIVERSITY–PURDUE UNIVERSITY INDIANAPOLIS

Our Mission

The Service Mission of the Department of Environmental Health & Safety (EHS) is to provide to our customers services that are courteous, high-quality and expeditious. The Department is dedicated to preserving and protecting the health and safety of students, faculty, staff and visitors as well as the assets of the University. The Department is dedicated to preserving the overall environment by minimizing the impact the university has on the external environment while enhancing the quality of the University's environment.

November, 1994
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NOTES:

I. INTRODUCTION

In January, 1990, the Occupational Safety and Health Administration (OSHA) enacted the regulation entitled *Occupational Exposure to Hazardous Chemicals in Laboratories* (29 CFR1910.1450 - commonly called "The Lab Standard"). This standard deals specifically with hazardous chemical recognition, safe use, storage, and disposal.

There are many hazards present in laboratories besides hazardous chemicals. Non-chemical lab hazards include compressed gases, cryogenic fluids, biohazards, electrical hazards, mechanical hazards, radiation, and radioisotopes. Non-chemical hazards are discussed in the latter part of this publication.

This handbook provides basic information for many important topics concerning laboratory safety. It is neither a complete nor comprehensive presentation of lab safety. Additional information may be obtained by calling the Department of Environmental Health and Safety at 274-2005.

II. PUBLICATIONS

The Department of Environmental Health and Safety (EHS) has produced several publications that are directly or indirectly related to lab safety. A description of each publication follows. All publications can be found by following the publications link on our web page at www.ehs.iupui.edu.

Chemical Hygiene Plan

This is the document written to respond directly to the OSHA Lab Standard involving hazardous chemicals. One copy was distributed to each affected department or sub-unit when the standard was enacted.

Waste Disposal Guidelines

Information concerning retention, treatment, and acceptable disposal of chemical waste is provided in this publication. Each department was provided with a copy of these guidelines.

Bloodborne Pathogens-Exposure Control Plan

This publication responds to the OSHA Regulation involving exposure to human blood and body fluids. One copy was distributed to each affected department or sub-unit when the standard was enacted.

Biosafety Manual

This publication contains guidelines for the safe use of biological agents in the laboratory. Areas covered include biological agent summaries and classification, biowaste decontamination and disposal, spill response, biosafety cabinets and biohazard shipments.

Emergency Procedures Handbook
This publication provides actions to take and telephone numbers to call in case of emergencies such as fire, chemical spill, or injury. Presented in a handy flip-chart format, these are posted inside each laboratory.

Lab Notes
This quarterly newsletter provides information on safety issues in the laboratory. It is sent to all people in leadership positions in laboratories with the request to post or circulate it to all affected staff members. Additional copies are provided for every laboratory on campus. You can sign-up to receive Lab Notes free of charge via email at www.ehs.iupui.edu.

Laser Safety Manual
This publication contains guidelines for the safe use of lasers in the laboratory. All personnel working in laboratories with a class 3b or class 4 laser are required to have access to this manual.

III. COMMITTEES

The University has organized committees to deal with safety issues relative to government regulations and guidelines, and prudent practices. Following are the committees that are involved with laboratory safety issues.

Laboratory Safety Committee
A campus-wide committee that is responsible for all laboratory safety issues not covered by other specific committees.

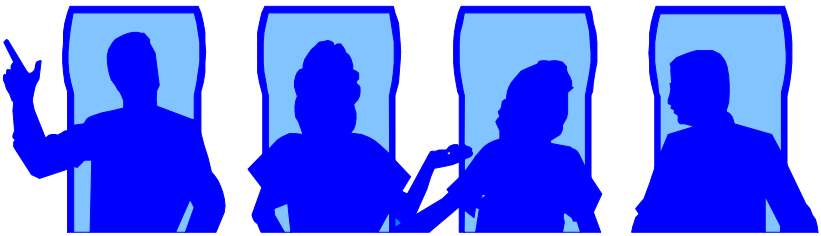
Institutional Biosafety Committee
This committee is responsible for review and approval of research activities and proposals involving recombinant DNA according to federal guidelines.

Biohazard Committee
All issues and research studies that involve non-recombinant DNA biological agents are reviewed by this committee.

Animal Care and Use Committees
The Schools of Dentistry, Medicine, and Science each have a committee to review and approve activities and proposals for experimental animal use in compliance with federal regulations.

Radiation Safety Committees
Several committees are responsible for review and approval of radiation source and use activities in compliance with federal regulations.

Departmental Laboratory Safety Coordinators
Although not a formal committee, each department (or sub-unit) with laboratories has appointed a safety coordinator. This person is responsible for providing appropriate safety information to staff in his department and coordinating safety improvements recommended for the department.



IV. LABORATORY SAFETY SURVEYS

Environmental Health and Safety conducts inspections of all campus labs on an annual basis. Each laboratory will receive a grade of A+ through F. All Labs receiving a grade of D or F will be re-inspected within 60 days to ensure that all deficiencies have been corrected.

Disciplinary action may be taken against the Primary Investigator if deficiencies are not corrected. Results of the inspections are provided to the department in writing, usually through the department Laboratory Safety Coordinator. The following general categories are examined relative to required or recommended practices.

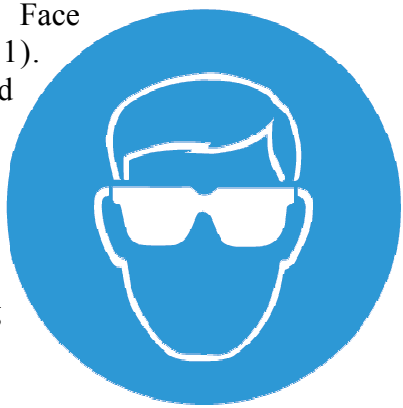
- Emergency Procedures Posting
- Emergency Equipment - eyewash, shower, etc.
- Fume Hood/Biological Safety Cabinet
- Personal Protective Equipment
- Housekeeping and Hygiene
- Chemical/Biological Storage
- Chemical and Biohazardous Waste
- Labeling
- Electrical
- Compressed Gas/Cryogenic Liquids
- Equipment Guarding
- Lab User Knowledge of Safety Materials
- Fire Safety
- Hazard/Safety Signage

V. IUPUI LABORATORY SAFETY POLICIES

Policy on Eye and Face Protection in Laboratory

Eye and face protection shall be used according to the laboratory classification system. Each department shall determine the hazard class of each laboratory. These requirements shall be posted outside each laboratory door. Protective equipment will be provided to employees at no charge. Each department will be responsible for enforcement of this approved policy. If the recommended policy does not apply to a particular situation, departments must provide an alternative policy for approval by the Laboratory Safety Committee.

These requirements apply to all persons entering the laboratory. If a procedure creates a greater hazard than the laboratory classification would indicate, eye and face protection appropriate for the hazard shall be worn. Guidance for the selection of eye and face protection is given in the "American National Standard for Occupational and Educational Eye and Face Protection" (ANSI Z87.1). Environmental Health and Safety will assist in determining the appropriate eye and face protection for specific laboratory hazards and will provide vendor information for securing equipment.



Laboratory Classification System

CLASS 1 - EYE/FACE PROTECTION NOT REQUIRED

Laboratories that do not use chemicals, biologicals or physically hazardous materials.

Example: computer laboratory

CLASS 2 - EYE/FACE PROTECTION REQUIRED WHEN HAZARD EXISTS

Laboratories that use chemicals, biologicals or physically hazardous materials on an occasional basis.

Example: laser laboratory, some biological labs

CLASS 3 - EYE/FACE PROTECTION REQUIRED AT ALL TIMES

Laboratories that routinely use chemicals, biologicals, or machinery.

Example: most chemistry laboratories

Policy on Eating, Drinking, and Related Activities in Laboratories

Hazardous materials can be accidentally ingested when eating, drinking, smoking, gum chewing, or related activities are permitted within workplace and teaching laboratories. To eliminate this potential route of exposure, OSHA has developed guidelines which prohibit these activities in areas where laboratory chemicals are present. In addition, OSHA

recommends hand washing before these activities are conducted.

Eating, drinking, smoking, gum chewing, the application of cosmetics, and the storage of food and beverages are not permitted in laboratories containing hazardous materials. These activities may take place in a separate area which is a room with floor to ceiling walls and a door separating the area from the laboratory space in which hazardous materials are used, stored, or transported.

Laser Medical Surveillance Policy

Medical surveillance will be mandatory for students, research and maintenance personnel who will be operating or maintaining a non sealed-beam class 3b or class 4 laser as described in section 4.0 of the IUPUI Laser Safety Manual.

The medical surveillance will include a comprehensive ocular history and visual acuity examination performed in IUPUI Occupational Health Services by the clinical staff.

If the visual acuity is worse than 20/20 in on eye or both eyes for far/near vision, or if the ocular history is abnormal, or if there is a history of eye disease, then the employee will need to be seen by the designated physician or nurse practitioner for a comprehensive eye examination.

1. Prior to assignment/baseline.
2. As appropriate for emergency exposure.

The Principal Investigator (PI) listed on the Laser Registration Form (form LS-1 in appendix A of the IUPUI Laser safety Manual) is responsible for notifying department

heads and IUPUI Department of Environmental Health and Safety (EHS) as to which employees or students should be included in the medical surveillance program

Enrolled employees and students will schedule their medical surveillance examination with IUPUI Occupational Health Services.

If an exposure occurs, the employee/student should complete the Accident/Exposure report form. The manager, supervisor or PI signs the form. The employee/student reports to IUPUI Occupational Health Services. If the IUPUI Occupational Health Services is closed they should report to the Indiana University Hospital Emergency Department for evaluation and treatment if necessary. The employee/student should always follow up with IUPUI Occupational Health Services the next business day if seen by the Emergency Department.

The Principal Investigator listed on the Laser Registration Form (LS-1) is responsible to ensure compliance with the required program.

The Laser Safety Officer is responsible for providing education and training that includes: Online laser safety training, ANSI standard regarding laser usage available to all laser users. The Principle Investigator is responsible for laser specific training, Standard Operating Procedures, departmental policies or procedures and notifying IUPUI Occupational Health Services of personnel who are required to be enrolled in the program.

IUPUI Environmental Health and Safety (EHS) in collaboration with the Laboratory Safety Coordinators will identify areas where class 3b and class 4 lasers are utilized. The Laboratory Safety Coordinators will supply EHS with an

annual list of departments using class 3b and class 4 lasers and any environmental data available.

IUPUI Occupational Health Services will perform a baseline and post-exposure evaluations, review the medical surveillance program every 2 years and prepare an annual report to EHS regarding employees compliant with the program. EHS will be responsible for maintaining the medical/exposure records on each enrolled employee/student for at least 30 years.

Employees and students identified to be enrolled in the program are responsible to comply and understand that noncompliance may result in disciplinary action.

Chemical/Spill Reporting Policy

The prompt reporting of chemical spills to proper University authorities is an essential element in the protection of the health and safety of campus personnel, students, visitors, and patients. Prompt reporting is also essential in providing for the protection of the community environment.

In addition, the University must comply with local, state and federal spill reporting requirements. Spill residues often are classified as hazardous waste requiring proper management and disposal.

Spills that have gone unreported for extended periods of time have resulted in the unnecessary exposure of individuals outside

the immediate spill area and have resulted in significant environmental contamination.

This policy applies to all staff, faculty, students and guests of the University community that purchase, transport, store, utilize or otherwise handle chemical products. The policy applies to virgin products, intermediates and waste products. The policy applies to all chemicals whether they are liquid, solid or gaseous at room temperature.

The most senior staff member present at the time of the spill is responsible for ensuring that appropriate procedures listed in the "IUPUI Staff and Faculty Emergency Procedures Handbook" are implemented. The spill reporting procedure is outlined as follows:

Step 1. **Evacuate the Laboratory.** Immediately after a hazardous chemical is spilled you must evacuate the laboratory.

- Hazardous Chemical is defined as:
  Any Chemical with a Hazardous Materials Information System (HMIS) or National Fire Protection Association (NFPA) rating greater than 1 for health, fire and/or reactivity.

Step 2. **Shut the Door.** Laboratories on campus are under negative pressure which will pull air from the hallway into the laboratory. They are designed in this manner to contain vapors in the laboratory when a spill occurs.

Step 3. **Call 911.** Call 911 and inform them of the following

- Building name

- Room number or location
- Type of incident
- Name of chemical spilled or description of odor if unsure of the chemical
- Estimate of the volume of chemical spilled
- DO NOT call housekeeping
- DO NOT try to clean it up yourself

Step 4. **Assess the Situation.** Assess the situation to determine if the spill is immediately dangerous to life or health.

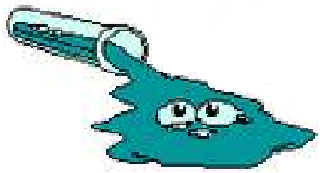
- If the spill does not pose a threat to the building occupants then you do not need to proceed further. Remain outside the entrance to the laboratory until the spill response team arrives. Representatives from Fire Protection Services and/or Environmental Health and Safety will respond to evaluate the release and determine the best course-of-action for the containment and cleanup of the spill.
- Proceed to the next step if you determine that the situation is immediately dangerous to life or health.

Step 5. **Pull the Fire Alarm.** After determining that the spill poses an immediate danger to the building occupants pull the fire alarm. Activating the fire alarm will evacuate the building occupants and will also notify the Indianapolis Fire Department.

Step 6. **Exit the Building.** Once the fire alarm has been activated exit the building remain near the main entrance of the building and give your information to the emergency response teams that will be arriving.

Please remember the **ESCAPE** acronym when you spill a hazardous chemical.

Evacuate the Laboratory
Shut the Door
Call 911
Assess the Situation
Pull the Fire Alarm
Exit the Building



The Department of Environmental Health and Safety may, at its discretion, refer costs incurred as a result of an improperly reported spill back to the department directly causing the spill. In the event the University is cited and fined by federal, state or local regulatory agencies for actions related to an improperly reported spill, the department(s) involved in the citation may be accountable for payment of the issued fine.

Any person affected by any such cost or fine assessment may appeal the assessment provided that a written request for such a review is submitted to the current Chairperson of the IUPUI Environmental Safety Committee within thirty (30) days of issuance of the assessment.

The Department of Environmental Health & Safety will provide a written, itemized assessment of the incurred costs to the responsible department or party(ies) and a copy of the Environmental Safety Committee Appeals Procedures. All appeals will be acted upon and reviewed in accordance with the established IUPUI Environmental Safety Committee appeals review procedures.

All University departments are responsible for ensuring their staff are adequately trained to comply with provisions of the policy.

PROCEDURES FOR SMALL QUANTITY SPILLS EXEMPTIONS:

The following spills are exempted from the reporting requirements provided that all the following conditions are met:

1. Personnel directly involved in the spill have immediate access to the Hazardous Materials Information System (HMIS) rating for the chemical and the chemical has a rating of 0 or 1 for health, fire and reactivity.
2. The amount spilled is less than one (1) pint (500 milliliters), if liquid, or one (1) pound (500 grams) if solid unless it is lubricating oil or latex paint, then the amount spilled may not exceed 1 gallon (4 liters). It is the responsibility of the spiller to ensure that spills involving small quantities of chemicals are cleaned up immediately, stored and disposed of properly. Regularly occurring leaks or spills are not exempted from the reporting requirements.
3. The material does not possess a noxious, nauseating or otherwise irritating odor or property.
4. The released material is contained on an impervious surface and has not and is not immediately threatening to contaminate soil, groundwater or surface water.

Waste Disposal Policy

All IUPUI staff are responsible for assuring that all waste discarded in campus dumpsters or compactor units are free of untreated infectious waste, special waste, hazardous waste, regulated radioactive waste, regulated pharmaceutical waste, and other miscellaneous liquid or semi-liquid wastes.

Untreated infectious waste, liquid or special waste, hazardous waste, radioactive or pharmaceutical waste are not to be discarded in campus dumpsters or compactor units.

Producers of campus refuse are responsible for the proper segregation of wastes into six primary waste categories.

1. **General Refuse Waste** - disposal is coordinated by Campus Facility Services in accordance with state and federal regulations. General refuse waste includes:

- Food waste
- Metal products (excluding metals such as Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, Silver)
- Paper, cardboard and newsprint
- Plastic products
- Rubber and leather products
- Scrap wood
- Textile products
- Yard waste

2. **Pharmaceutical Waste** - determination and disposal are established by Pharmacy guidelines and state and federal regulations. Pharmaceutical waste includes:

- Antineoplastic or Cytotoxic Drugs as defined by the U.S. Food and Drug Administration (FDA).
- Controlled Substances as defined by the U.S. Drug Enforcement Administration (DEA).
- Legend Drugs as defined by the U.S. FDA.
- Live Virus Vaccine

3. **Infectious Waste** - determination and disposal are established by departmental protocols in accordance with local and state regulations.

Infectious waste includes any waste item that is contaminated with a disease agent potentially capable of transmitting a communicable disease to humans.

Infectious waste can be divided into three primary groups. These include:

- Liquid wastes such as blood, other bodily fluids or culture media which is known or suspected to be contaminated with a disease agent.
- Soft materials such as dressings, bandages, bedding, toweling etc. that are saturated to the point that they are capable of releasing blood, body fluids or other potentially infectious materials when handled or compressed.
- Any object, commonly referred to as sharp, that has been contaminated with blood, body fluids or other infectious agent which could penetrate the skin or could do so if broken. Examples of sharps waste include:
  - ⇒ broken glass
  - ⇒ pipettes (glass and hard plastic)
  - ⇒ scalpel blades
  - ⇒ lancets

4. **Liquid or Special Waste** - determination and disposal are coordinated by the Department of Environmental Health and Safety in accordance with local, state and federal regulations. Liquid or special waste include but is not limited to:

- Bacteriocidal or sanitizing solutions
- Concrete and asphalt sealants

- Degreasing agents
- Floor sealers, waxes and strippers
- Heating or air-conditioning treatment solutions
- Lubrication oils
- Paints, latex and oil-based
- Related paint products including thinners, solvents and strippers
- Pesticide or herbicide products
- Sludge wastes, including cooling tower sludges
- Vehicle maintenance fluids
- Water treatment solutions

5. **Radioactive Waste** - determination and disposal are coordinated by the Radiation Safety Office in accordance with local, state and federal regulations. Radioactive waste includes, but is not limited to:

- General laboratory refuse (e.g., gloves, glassware, paper, plastic, etc.) that is contaminated with radioactive materials.
- Liquid wastes which include a radioactive material component, and
- The remains of animals that contain radioactive materials as a result of administration of such material for research.

Radioactive waste is required to be labeled in accordance with procedures established by the Radiation Safety Office and typically exhibits the universal radiation precaution symbol for radiation.

6. **Hazardous or Chemical Waste** - Determination and disposal are coordinated by the Department of Environmental Health and Safety in accordance with local, state and federal regulations. Hazardous or chemical waste includes but is not limited to any stock chemical or chemical reagent that may inhibit one or more of the following physical hazards:

- Corrosivity - The material has a pH, whether acidic or basic, that will corrode steel or injure human tissue. This includes materials with a pH less than 5 or greater than 10, regardless of the strength of the acid or base.
- Ignitability - The material presents a significant fire hazard at room temperature.
- Reactivity - The material reacts violently with water; forms potentially explosive mixtures with water; generates toxic gases, vapors or fumes when mixed with water; or is unstable and can undergo a violent physical change.
- Toxicity - The material exhibits a significant characteristic of toxicity to human health or the environment.

The Department of Environmental Health and Safety will be responsible for assisting producers of wastes with the proper categorization and disposal of their waste.

Waste producers will be responsible for the proper segregation of their waste. Only wastes which meet the criteria of being general refuse waste or treated infectious waste are to be disposed of in campus dumpsters or compactor units.

Procedures for the proper classification, packaging, labeling, and disposal of radioactive waste have been developed by the Radiation Safety Office. Such procedures are specified in the Radiation Safety Procedures Manual, published by the Radiation Safety Office.

Pharmaceutical Waste disposal guidance is available through campus pharmacies or the Department of Environmental Health and Safety.

- **Controlled Substances** - The handling and disposal of Controlled Substances are tightly controlled by the regulations of the U.S. Drug Enforcement Administration (DEA). The proper handling and disposal of Controlled Substances remains the sole responsibility of the DEA Registrant who originally purchases the material. Disposal guidance is available through the Department of Environmental Health and Safety.

- **Antineoplastic Drugs** are to be referred to the Department of Environmental Health and Safety as hazardous wastes as specified below.

- **Legend Drugs** and **Live Virus Vaccines** - Campus pharmacies or the Department of Environmental Health and Safety will provide guidance and assistance with the proper disposal of Legend Drugs.

Producers of Infectious waste must autoclave the infectious waste on site or collected in a biohazard container for treatment. If waste is autoclaved, the container must be labeled as "treated" prior to disposal with general refuse. If an autoclave is unavailable for treatment on site, collection and transportation must be contracted out and paid for by individual labs. All infectious waste shall be kept separate

from other wastes. Guidance on the determination and proper handling of infectious waste can be found within department guidelines, IUPUI/IUMC Bloodborne Pathogens Standard Exposure Control Plan or by contacting the Department of Environmental Health and Safety.

All other waste, except radioactive waste, is to be referred to the Department of Environmental Health and Safety for proper classification or disposal. Producers are to follow established and approved protocols for proper waste processing as defined for hazardous wastes within the "IUPUI Chemical Hygiene Plan" and the "Waste Disposal Guidelines" published by the Department of Environmental Health and Safety.

- Waste pickup will be initiated by completing of our online Waste Disposal Manifest Form found at ehs.iupui.edu. When the online form has been completed and submitted, EHS will schedule a pickup of the waste material.
- Wastes are to be packaged in containers suitable for the waste material. All wastes are to be labeled as to the specific contents.
- Wastes that may undergo dangerous decomposition or reactions are to be kept separate from other waste items.
- EHS staff will ensure that the waste is disposed of in accordance with applicable local, state and federal regulations.
- Additional handling information is available in the "IUPUI Chemical Hygiene Plan" and "Waste Disposal Guidelines."
- All exceptions to the procedures will be approved by the Director of the Department of Environmental Health and Safety or his designee.

The Department of Environmental Health and Safety may, at its discretion, refer costs incurred from the improper handling or disposal of any waste back to the producing or generating department. This cost will end with the proper transfer of the waste to the department or office as defined within this policy and compliance with other waste handling and disposal guidelines approved by the Environmental Safety Committee.

In the event the University is cited and fined by federal, state or local regulatory agencies for action or activities related to improperly disposed waste, the department(s) involved in the citation may be accountable for payment of the issued fine.

Any person affected by any such cost or fine assessment may appeal the assessment provided that a written request for such a review is submitted to the current Chairperson of the IUPUI Environmental Safety Committee within thirty (30) days of issuance of the assessment.

The Department of Environmental Health and Safety will provide a written, itemized assessment of the incurred costs to the responsible department or party(ies) and a copy of the IUPUI Environmental Safety Committee's Appeals Procedures.

All appeals will be acted upon and reviewed in accordance with the established IUPUI Environmental Safety Committee appeals review procedures.

Waste Minimization Policy

As the generation of waste is an integral part of the day-to-day operations of the University, and as virtually all employees produce waste as part of their University activities, this policy applies to all staff, faculty, students and guests of the University.

This policy also, by definition, applies to all University personnel that purchase or otherwise obtain chemical products whether the material be liquid, solid, or gaseous at room temperature. The policy applies to stock chemicals most frequently associated with laboratory environments and chemical-based products utilized in the maintenance of University buildings, grounds, property, equipment and supplies.

♦ **Waste Minimization Coordinator-** Each department shall assign a representative to serve as waste minimization coordinator(s) for specific areas, sections, laboratories, etc. within the department. Coordinators shall serve as resources for other departmental staff, facilitate implementation of waste minimization techniques within the area and may monitor and evaluate the effectiveness of the waste minimization program.

♦ **Waste Minimization Techniques-**All University employees should objectively evaluate waste minimization opportunities in their work area. The following waste minimization techniques are to be considered when evaluating opportunities for minimizing the volumes of waste produced:

Purchasing Control

⇒ Order only the volumes of materials necessary to complete the desired activity or project.

⇒ Purchase smaller lots of materials on a more frequent basis. Purchase only volumes that can be utilized during a defined period of time (e.g. every 3 or 6 months)

⇒ Utilize suppliers that can offer quick delivery of needed materials.

⇒ Purchase chemicals in smaller containers for easier management of unused chemicals unless it is known for certain that bulk volumes can be used expeditiously.
⇒ Be aware of any physical property of the material or chemical that may preclude long-term storage of the material. (e.g. peroxide formation).
⇒ Establish a centralized purchasing system within the department or area to monitor chemical purchase in an effort to avoid duplicate orders.

Inventory Control

⇒ Attempt to redistribute unused materials and chemicals to other campus users. Objectively evaluate the potential use of chemicals offered for redistribution by other campus users.
⇒ Attempt to return unused, unopened materials to vendor for credit.
⇒ Ensure all containers containing chemicals, whether virgin or waste, whether in the original or secondary container, are labeled at all times.

Operational Controls

⇒ Periodically review each experimental or research protocol to assure that chemical usage is minimized.
⇒ Reduce chemical usage in experimentation through the use of microscale techniques whenever practical.
⇒ Substitute less hazardous agents whenever feasible. Examples include but are not limited to:
  - Utilizing water-soluble, biodegradable scintillation fluids in place of solvent-based fluids.
  - Utilizing specialty, biodegradable glass cleaning detergents in place of sulfuric acid/chromic acid cleaners.

- Utilizing a heat gun in place of chemical-based paint strippers.
- Utilizing specimens preserved in less toxic preservatives in place of those preserved in formaldehyde-based preservatives where feasible.
- Utilizing aqueous-based degreasers in place of chlorinated solvent or petroleum-based degreasers where feasible.
- Avoiding wet chemistry techniques when practical.
- Reclaim and reuse materials when feasible (e.g., utilizing spent solvent for initial gross cleaning step and utilizing fresh solvent only for the final rinse).(e.g. Having a naphtha-based parts washer serviced by a reputable service company that reclaims the spent degreaser).
- Neutralizing corrosive wastes as a final step of an experiment or procedure.
- Avoid mixing hazardous and non-hazardous wastes.

Recycling

Participating, to the fullest extent possible, in University -sponsored recycling programs.

These programs include:

⇒ Paper recycling
⇒ Beverage can recycling
⇒ Cardboard box recycling
⇒ Nickel/Cadmium and larger lead/acid battery recycling
⇒ Fluorescent light tube recycling

♦ NONCOMPLIANCE/PENALTIES-The Department of Environmental Health and Safety may, at its discretion, refer costs incurred from the disposal of wastes generated by actions contrary to the principles of pollution prevention and waste minimization back to the producing or generating department.

In the event the University is cited and fined by federal, state or local regulatory agencies for actions or activities contrary to waste minimization or pollution prevention regulations, the department(s) involved in the citation may be accountable for payment of the issued fine.

Staff, faculty, students and guests of the University whose willful actions violate pollution prevention and waste minimization regulation may be held criminally and civilly liable for their actions.

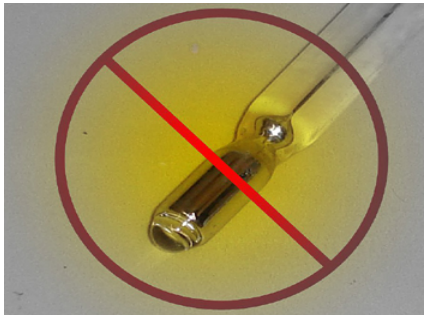
Any person affected by any such cost or fine assessment may appeal the assessment provided that a written request for such a review is submitted to the current Chairperson of the IUPUI Environmental Safety Committee within thirty (30) days of issuance of the assessment.

The Department of Environmental Health and Safety will provide a written, itemized assessment of the incurred penalties to the responsible department or party(ies) and a copy of the IUPUI Environmental Safety Committee Appeals Procedures.

All appeals will be acted upon and reviewed in accordance with the established IUPUI Environmental Safety Committee appeals review procedures.

In addition, the University may initiate disciplinary actions, up to and including dismissal, against any staff or faculty found to be in violation of this policy.

Mercury Elimination Policy



Mercury is recognized by national public health experts as one of the most significant environmental toxicants facing the United States. The public health effects of mercury in the environment are well researched and documented.

The United States Environmental Protection Agency and the Indiana Department of Environmental Management have identified the elimination of mercury sources and the proper disposal of mercury as priority public outreach projects for each agency.

Mercury is the most commonly spilled chemical product on campus. A significant expenditure of resources is expended each year by University personnel in the remediation of these spills. Improper disposal and/or unrecognized or unreported releases of mercury pose a significant threat to the community and can lead to significant regulatory consequences for the University. In many, if not most cases, effective (from both a performance and cost perspective) alternatives for mercury have been developed and are readily available.

The Administration of IUPUI recognizes the threat presented by mercury and is committed to reducing this threat to the lowest level practical in as timely fashion as possible.

Effective December 31, 2007, no mercury-containing devices, elemental mercury or mercury-based chemicals may be acquired without the expressed written consent of the Laboratory Safety Committee and all nonessential uses of elemental mercury or mercury-based compounds are to be eliminated from campus laboratories.

An essential use of mercury is defined as that given circumstance where no acceptable alternative for the current use can be located or where it is found that implementation of the alternative would create a significant, long term financial hardship to the department or research project.

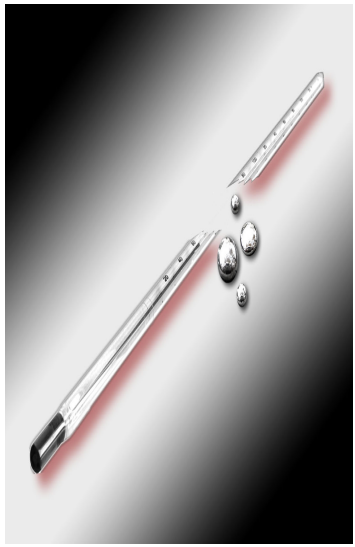
Laboratories wishing to maintain inventories of mercury products after December 31, 2007 shall contact the IUPUI Environmental Manager at 274-4351 and request an exception to this policy. The Department of Environmental Health and Safety (EHS) will take the request under consideration, will review all appropriate documentation and will render an opinion in writing as to whether the request, in the opinion of the Department, is of merit.

In the event of disagreement, EHS will offer an opinion in writing the next regularly-scheduled Laboratory Safety Committee meeting for consideration by the Committee at large. The laboratory in question will be given an opportunity to present a case in favor of the continued use of the material or item. By means of a vote of a simple majority of those members present at that meeting, a final decision as to whether the proposed use is considered as essential will be rendered.

For those uses found to be essential, the mercury is to be eliminated from the laboratory's inventory once an ongoing need can no longer be demonstrated.

- NONCOMPLIANCE/PENALTIES- The Department of Environmental Health and Safety may, at its discretion, refer costs incurred from the disposal of wastes generated by actions contrary to the principles of this policy back to the producing or generating department.

  Staff, faculty, students and guests of the University whose willful actions violate existing federal and state regulation may be held criminally and civilly liable for their actions.

  In the event the University is cited and fined by federal, state or local regulatory agencies for actions or activities contrary to applicable regulations, the department(s) involved in the citation may be accountable for payment of the issued fine.

  In addition, the University may initiate disciplinary actions, up to and including dismissal, against any staff or faculty found to be in violation of this policy.

- PROGRAM OVERSIGHT AND EMPLOYEE ASSISTANCE:- The Department of Environmental Health and Safety will serve as a technical resource for the implementation of this program. The Department will also serve to oversee the development and implementation of mercury educational materials as needed.

VI. CHEMICAL HAZARD CLASSES

Laboratory chemicals may be catagorized according to the type of hazard that they present. Following are major hazard classes and examples of chemicals belonging to each class.

Toxic - Materials causing immediate (acute) or long-term/ delayed (chronic) health effects. Exposure limits for many chemicals have been established according to the toxicity of the material. Examples: f**ormaldehyde, methylene chloride, phenol.**

Flammable - Material that can burn or explode when exposed to heat, sparks or open flames. Examples: **ethanol, hexane, xylene.**

Oxidizers - Materials that provide oxygen or other oxidizing elements that can cause fires in contact with flammables or can cause significant burns/irritation to the skin. Examples: **hydrogen peroxide, perchloric acid, potassium dichromate.**

Corrosive - Substances that can damage exposed body tissue, including acids and bases. Examples: **acids - hydrochloric, sulfuric; bases - sodium hydroxide, ammonia (ammonium hydroxide).**

Peroxide formers - Chemicals that produce explosive peroxides when concentrated or exposed to oxygen (air). Examples: **ethyl ether, dioxane, THF.**

VII. TYPES OF EXPOSURES AND CONTROL METHODS

Chemicals can cause illness according to the type of exposure experienced. Following are the routes of entry for chemical exposure.

- **Inhalation** — absorption through the respiratory tract by inhalation. This is probably the easiest way for chemicals to enter the body.
- **Ingestion** — absorption through the digestive tract by eating or smoking with contaminated hands or in contaminated work areas. Depending on particle or droplet size, aerosols may also be ingested.
- **Skin or eye contact** — absorption through the skin or eyes. Skin contact is the most common cause of the widespread occupational disease dermatitis. The eyes are very porous and can easily absorb toxic vapors that cause permanent eye damage.
- **Injection** — percutaneous injection through the skin. This can occur through misuse of sharp items, especially hypodermic needles.

Toxic effects can be immediate or delayed, reversible or irreversible, local or systemic.

Acute and Chronic Toxicity.

Toxicity is the measure of a poisonous material's adverse effect on the human body or its ability to damage or interfere with the metabolism of living tissue. Generally, toxicity is divided into two types, acute and chronic. Many chemicals may cause both types of toxicity, depending on the pattern of use.

Acute toxicity is an adverse effect with symptoms of high severity coming quickly to a crisis. Acute effects are normally the result of short-term exposures and are of short duration. Examples of acutely toxic chemicals are hydrogen cyanide and ammonia.

Chronic toxicity is an adverse effect with symptoms that develop slowly over a long period of time as a result of frequent exposure. The dose during each exposure period may frequently be small enough that no effects are noticed at the time of exposure. Chronic effects are the result of long-term exposure and are of long duration. Carcinogens as well as many metals and their derivatives exhibit chronic toxicity.

Cumulative poisons are chemicals that tend to build up in the body as a result of numerous chronic exposures, leading to chronic toxicity. The effects are not seen until a critical body burden is reached. Examples of cumulative poisons are lead and mercury.

With substances in combination, such as exposure to two or more hazardous materials at the same time, the resulting effect can be greater than the combined effect of the individual substances. This is called a **synergistic** or **potentiating** effect. One example is concurrent exposure to alcohol and chlorinated solvents.

The published toxicity information for a given substance is general—human data may not be available—and the actual effects can vary greatly from one person to another. Do not underestimate the risk of toxicity.

All substances of unknown toxicity should be handled as if they are toxic, with the understanding that any mixture may be more toxic than its most toxic component.

Prevention of illness caused by chemical exposure relies on preventing the chemical contacts listed above. One or more of the following control measures should be employed when hazardous chemicals are involved in any lab procedure.

- **Engineering**- substitution, isolation, enclosure, ventilation.
- **Administrative**- scheduling, training, medical monitoring.
- **Personal Protective Equipment (PPE)**- gloves, safety glasses, lab coats, face shields.

VIII. Material Safety Data Sheets

MSDSs are a very important aspect of both Hazard Communication and Laboratory Standards. MSDSs are required to provide the employee with the information he/she needs to know about the hazards of materials being handled.

The following information is contained in the MSDS sheets:

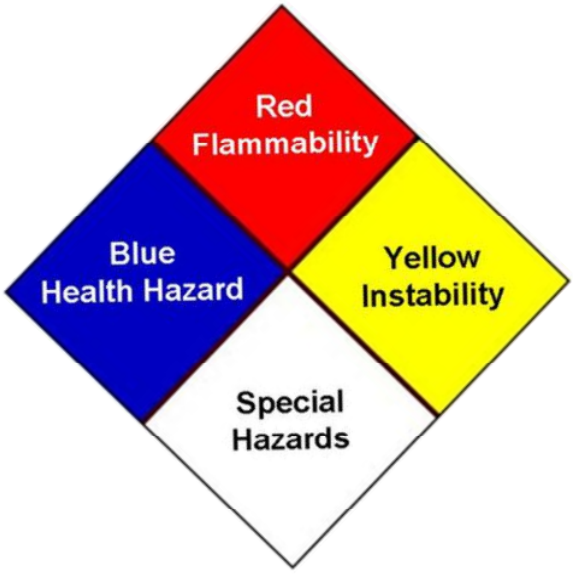
- Definitions and acronyms
- Chemical product and Manufacture Identification
- Composition -- Information on Ingredients
- Physical Data
- Fire Fighting Measures
- Hazardous Identification and First Aid Measures
- Stability and Reactivity
- Accidental Release Measures
- Handling and Storage Measures
- Exposure Controls/Personal Protection

- Toxicological Information
- Ecological Information
- Disposal Considerations
- Transport Information
- Regulatory Information
- Other Information

Training on how to read MSDS sheets is given during Laboratory Safety Training.

National Fire Protection Association (NFPA) Ratings

The NFPA rating is a quick way of ascertaining a chemicals hazards and is often found in the MSDS sheet. The diamond is broken into four sections. Numbers in the three colored sections range from 0 (least severe hazard) to 4 (most severe hazard) for health, fire and instability.



The fourth (white) "special notice" area uses symbols to indicate if the chemical is water reactive, an oxidizer, a corrosive, biohazardous, radioactive or cryogenic.

The definitions of the hazards located in each section of the NFPA diamond are as follows:

Blue-Health Hazard	
4	Very short exposure could cause death or serious residual injury even though prompt medical attention was given.
3	Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.
2	Intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical attention is given.
1	Exposure could cause irritation but only minor residual injury even if no treatment is given.
0	Exposure is not hazardous

Red-Flammability	
4	Will rapidly or completely vaporize at normal pressure and temperature, or is readily dispersed in air and will burn readily.
3	Liquids and solids that can be ignited under almost all ambient conditions.
2	Must be moderately heated or exposed to relatively high temperature before ignition can occur.
1	Must be preheated before ignition can occur.
0	Materials that will not burn.

Yellow-Instability	
4	Readily capable of detonation or of explosive decomposition or reaction at normal temperatures and pressures.
3	Capable of detonation or explosive reaction, but requires a strong initiating source or must be heated under confinement before initiation, or reacts explosively with water.
2	Normally unstable and readily undergo violent decomposition but do not detonate. Also: may react violently with water or may form potentially explosive mixtures with water.
1	Normally stable, but can become unstable at elevated temperatures and pressures or may react with water with some release of energy, but not violently.
0	Normally stable, even under fire exposure conditions, and are not reactive with water.

IX. PARTICULARLY HAZARDOUS SUBSTANCES

Although care must be taken with all chemicals, certain chemical classes require special attention due to their potential to cause significant health effects. Specific precautions must be taken according to the **Standard Safety Operating Procedures (SSOPs)** developed for the chemical to be used. SSOPs should be developed by the department or lab using the chemical in conjunction with EHS.

Types

- **Carcinogens** - A listing of select carcinogens is in the Chemical Hygiene Plan Reference Manual.
- **Reproductive Toxins** - Mutagens and teratogens
- **Acute Toxics** (HMIS rated 3 or 4)
- **Chemicals of Unknown Toxicity**

X. STANDARD SAFETY OPERATING PROCEDURES

The OSHA Laboratory Standard, which requires the preparation of a Chemical Hygiene Plan, also requires written standard safety operating procedures (SSOPs) to be followed when laboratory work involves the use of hazardous chemicals. A separate SSOP must be completed for every hazardous material and procedure that has characteristics different from other materials and procedures used. Hazardous materials with the same safety procedures may be grouped together in the same SSOP.

Written SSOPs should be kept in an accessible location with other safety information (such as MSDSs) so that lab users can check safety procedures prior to their use of a new chemical or procedure. The following are key issues to consider for preparing SSOPs:

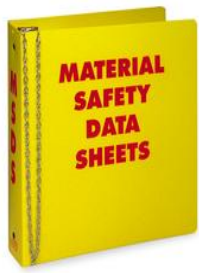
- Personal protective equipment (eye, face, hand protection, etc.)
- Procedures to minimize chemical exposure (splashing and aerosol minimization)
- Location for use (designated area such a fume hood)
- Labeling information (hazard information on the container)
- Methods of measuring and transferring materials (weighing and dispensing equipment)
- Decontamination procedures (materials used for routine or spill cleanups)
- Locations for storage (flammable, refrigerated, or other storage requirements)

- Waste disposal (containers, labeling, segregation, and storage)
- Transportation of hazardous materials outside of the lab

XI. CHEMICAL HAZARD INFORMATION RESOURCES

Determining the hazards presented by chemicals in use is the first step in preventing adverse health effects. The following information resources will provide the type and relative severity of chemical hazards and control measures to prevent overexposure.

- **Container labels**
- **Material Safety Data Sheets (MSDSs)**
  - ⇒ Your departmental collection
  - ⇒ EHS collection
  - ⇒ Internet
    - http://hazard.com/msds/
    - http://ehs.iupui.edu
    - http://ccinfoweb.ccohs.ca/default.html
    - http://www.sigma-aldrich.com
- **Computer databases and the internet**
- **EHS library**



XII. CHEMICAL PROCUREMENT

When purchasing chemicals for lab use, the person who intends to use the chemicals should know the proper handling, storage and disposal procedures for each chemical being ordered. To minimize storage space problems and waste disposal costs, only quantities anticipated for particular experiments planned, or those anticipated for ongoing laboratory courses, should be purchased.

When purchasing chemicals for lab use, there are several considerations that should be taken.

- Investigate the use of less hazardous materials.
- Plan for containment, storage, disposal, and personal protective equipment.
- Order appropriate (minimal) amount - limit storage space and disposal costs.
- Date chemicals when received and opened.
- Insure that all manufacturer's chemical bottles and secondary containers are properly labeled.

XIII. CHEMICAL STORAGE

Proper storage of chemicals helps eliminate breakage, chemical spills and inadvertent mixing of non-compatible materials. The following are precautions that should be taken.

- Store chemicals by hazard class and segregate each class in a separate area. A ***Chemical Incompatibility Chart*** is provided on page 51. A list of the minimum number and type of hazard classes are as follows:

    ⇒ Flammables
    ⇒ Acids
    ⇒ Bases
    ⇒ Oxidizers
    ⇒ No hazard

- Chemical bottles should not be stored on the floor or above eye level.
- Store over 10 gallons of flammable materials in an approved flammable storage cabinet.
- Only chemicals in current use should be on the lab bench or in the fume hood.

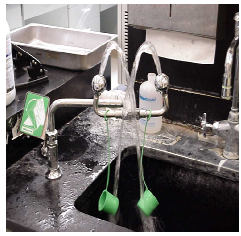
XIV. PRIOR APPROVAL

Certain activities may create special hazardous situations and require prior approval. The OSHA Lab Standard requires each employer to assess activities and determine which will require prior approval. Prior approval policies and procedures are initiated by each department according to their needs.

Examples of activities that may require prior approval:

- Sole occupancy of a laboratory or building
- Hazardous operations, equipment and/or chemicals
- New procedures or new chemical use
- Unattended operations

XV. SAFETY AND EMERGENCY EQUIPMENT AND PROCEDURES



In order to be prepared before an emergency incident occurs, knowledge of safety equipment use/location, and appropriate room layout are necessary. All lab workers should be aware of the following for the lab that they work in.

Know:

- Location of Emergency Procedures Handbook.
- Location of nearest eyewash and shower.
- Location and use (if trained) of fire extinguisher.
- Location of nearest fire alarm pull station.
- Two ways to exit the building.

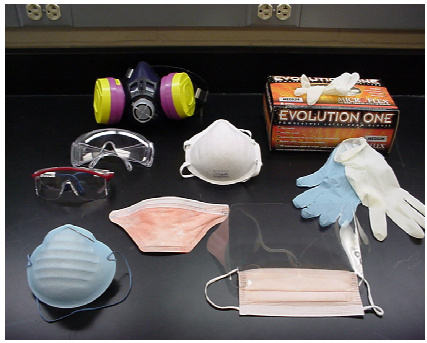
Avoid:

- Blocking emergency equipment - fire extinguishers, emergency showers, eyewashes, and electrical panels.
- Storing materials on floors, in aisles, and in exits.

Eyewash stations must be flushed weekly to ensure proper operation. Documentation of weekly eyewash station flushing must be maintained in the laboratory. Emergency eyewash units and emergency showers are inspected by EHS annually.

If you do not have an emergency eyewash flush documentation form, or if your emergency equipment is not operating properly please contact EHS at 274-2005 immediately.

XVI. PERSONAL PROTECTIVE EQUIPMENT (PPE)



Personal protective equipment includes clothing and devices that are worn by the lab worker to protect him/her from hazards. The following are PPE equipment categories and recommendations.

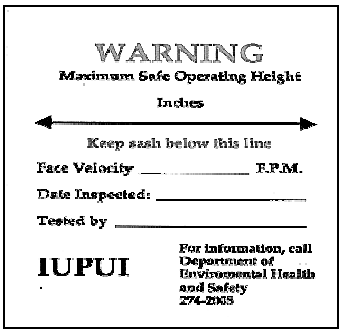
Eye protection - In addition to the safety glasses requirements stated in the IUPUI Policy (see pages 13-14), goggles (and a face shield in certain cases) are required for the use of liquids that could damage eyes if splashing occurs. Eye protection equipment should be stored in its original container or a sealed plastic bag.

Gloves - Gloves appropriate for the material handled should be worn when there is potential for chemical exposure, injury or irritation (see Section XVII in the *Reference Manual* of the *Chemical Hygiene Program* for glove selection criteria).

Body protection - Street clothing should be covered with a lab coat or other protective clothing when working with chemicals in the lab. Waterproof clothing or a rubber apron may be needed to prevent soak through or caustic burns. **Shorts and sandals MUST NOT be worn in labs**. Long hair and baggy clothing should be properly confined.

Note: PPE should remain in the lab when exiting.

XVII. FUME HOODS



Chemical fume hoods are tested annually for acceptable airflow by EHS. Following are recommendations to help maintain a safe atmosphere for the fume hood operator.

Confirm airflow - Use a hood monitor, flow indicator, or strip of tissue taped to the bottom of the hood sash for airflow confirmation.

Sash position - Maintain bottom of hood sash at indicated level (arrows) or lower, as shown on the hood certification sticker.

Work position - Position equipment and chemicals at least six inches inside the face of the hood or sash.

Avoid - Blocking face or back baffle with large equipment (elevate equipment about two inches) and using hood as a chemical storage area.

Please contact Environmental Health and Safety at 274-2005 if your fume hood is not working properly.

XVIII. BIOLOGICAL SAFETY CABINETS

Biological safety cabinets (BSC) (also known as laminar flow hoods) are different than fume hoods in that they capture microbiological materials using a High Efficiency Particulate Air (HEPA) filter.

Most BSCs are not vented to the outside of the building.

Recommendations for the safe use of BSCs follow.

Annual Certification– Biological Safety Cabinets must be certified annually. Contact the cabinet manufacturer if you do not have an existing certification contract. EHS does not certify biosafety cabinets.

Flammable material use - This is usually prohibited because of the potential for an explosive mixture to develop due to the recirculation of air within the cabinet.

Volatile toxic material use - Gases are not removed by the HEPA filter and are therefore released to the lab unless the BSC is vented to the outside of the building.

Air intake grill - Avoid blocking this grill at the front of the cabinet as this can affect product and personnel safety.

UV light - A UV lamp is often used inside BSCs to disinfect the inside surfaces of the cabinet. This type of disinfection should only be done when no one is using the BSC.

Clean benches - These provide HEPA-filtered air from the back of the cabinet, across the work surface, and out the face of the cabinet. Clean benches do not provide personal protection from materials used in them.

XIX. MEDICAL CONSULTATION

Incidents or conditions that cause a significant health effect require medical attention in person. For minor exposures with no symptoms, a telephone call to Occupational Health Services may be adequate follow-up. Following are instances when a medical consultation is necessary. Information on how and when to report an incident is also provided.

Cases requiring medical consultation

- If a chemical exposure occurs, including 1) skin or eye contact with hazardous materials, 2) exposure during a chemical spill, or 3) health symptoms (such as headache , nausea, vomiting, dizziness, rash ,burning or itching eyes) develop while working with chemicals.
- When air sampling indicates exposure above OSHA's action level or permissible exposure level.
- For any “on the job” injury.

Reporting procedures for medical consultation.

- Complete Occupational Illness/Injury Report.
- Report to Student Employee Health Service during normal work hours.
- Report to University Hospital Emergency Admitting for evening and weekend incidents.

For a seriously ill or injured person who requires transportation, call Wishard Ambulance Service at 9-911 and IUPUI Police Dispatch at 274-7911.

XX. WASTE SEGREGATION AND DISPOSAL

Laboratory waste must be segregated into the waste streams listed below for safe storage and disposal. Information about each waste stream disposal follows.

Chemical waste

- Follow all provisions of the ***Waste Disposal Guidelines.***
- Segregate chemical wastes into separate containers. Certain similar chemical groups, such as flammable solvents, can be consolidated in the same bottle.
- Label waste containers using a "Waste Chemical Label" available from EHS. Stock chemical wastes in their original container with original label do not need to be relabeled.
- Recap chemical waste containers when not adding waste to them and store chemical waste in closed containers.
- Store waste containers in an appropriate location prior to pickup.
- For disposal, complete the online *Waste Disposal Manifest Form* located at the following link:

  ⇒ **http://ehs.iupui.edu/ehs/manifest_form.asp**
- When preparing for waste pickup, package waste containers according to compatibility with dividers or packaging that will prevent breakage in transit. Cardboard boxes for chemical waste packaging are available by calling EHS.

Biological waste

Segregate biological waste into sharp and non-sharp categories.

- Sharp biohazards, including syringes, needles, all glass, rigid plastic pipets, and Petri dishes, must be placed in a "sharps container" (i.e. red plastic container with "biohazard" symbol).
- Non-sharp biohazards must be placed in a bag marked with the "biohazard" symbol.

Disposal of biological waste must be accomplished by autoclaving in department, identify container as being "treated" using autoclave tape and dispose as ordinary trash.

Glass and non-biologically contaminated sharps

All uncontaminated glass to be disposed should be placed in a cardboard box marked "glass for disposal". When two-thirds full, the box should be taped shut and placed with ordinary trash.

Radioactive and mixed wastes

All wastes with radioisotope content should be referred to the Radiation Safety Office for disposal.

XXI. LASER SAFETY

Potential hazards when working with Lasers include skin burns, retinal burns, cataract formation, blindness, electrocution, impaired vision and other injuries related to the eye and skin.

Lasers are classified into hazard classes that are based upon relative dangers associated with them.

Possible laser classifications are class 1, class2, class 3A, class 3B and class 4. All laser operators at IUPUI using a class 3B or class 4 laser with a non-sealed beam are required to take the online Laser Safety Training Module and the Post -test. A baseline eye examination is also required.

Safety measures to be followed during laser use are as follows:

- Completely enclose the laser system.
- Use non-reflective and fire resistant background materials.
- Provide warning signs at the room entry for Class 3B and 4 lasers.
- Provide interlock device or "laser in use" light for Class 4 lasers.
- Protect eyes with source and wavelength - specific safety glasses/goggles.

For more information on lasers, please read the IUPUI Laser Safety Manual.

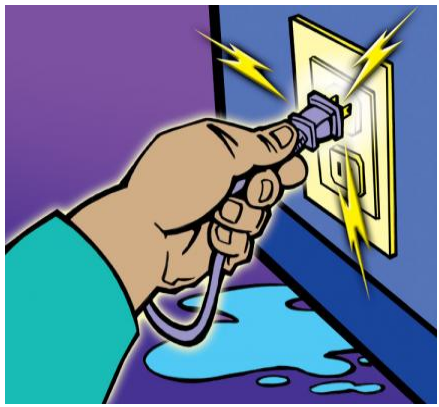
XXII. COMPRESSED GASES AND CRYOGENIC LIQUIDS

Potential hazards encountered with these materials include explosion, overexposure, crushed feet, a broken-off valve, and frostbite. The following are measures that will limit or eliminate injury when working with compressed gases and cryogenic liquids.

- Wear safety glasses when working with compressed gas cylinders.
- Wear goggles and a face shield when using cryogenic liquids.
- Secure gas cylinders in the upright position.
- Keep valve cover on cylinder except when regulator is attached.
- Open main valve slowly.
- Leak-test all connections, especially when using hazardous gases.
- Use a hand truck to move gas cylinders.
- Wear loose-fitting thermal gloves when working with cryogenic liquids.
- Insure that cylinders remain labeled during their entire life in the lab.
- Store gas cylinders in a non-corrosive environment.

XXIII. ELECTRICAL SAFETY

The following are recommendations for the safe use of electrical equipment:



- Outlet expanders (3:1) and grounded-to-ungrounded converters (cheater plugs) are not allowed.
- Extension cords should have overload breaker protection and be used only as temporary

- All sources of harmful electrical energy must be isolated to prevent electrical shock by contact.

XXIV. BIOLOGICAL SAFETY

Biological Safety is a complete program of recognition, evaluation, and control to minimize the health risk of students, faculty, staff, and the public from potential exposure to recombinant DNA and biohazardous materials that are used in the research and teaching activities at IUPUI.

Biohazards are divided into biosafety levels 1 to 4, with 4 being the most significant health hazards. Practices for safe use of biological agents at each level are provided in the Biosafety Manual and the Bloodborne Pathogens Exposure Control Plan.

XXV. ELECTROMAGNETIC RADIATION

Equipment commonly used in laboratories can produce hazardous amounts of electromagnetic radiation. Information on the radiation types, sources, and means of personal protection follow.

Ultraviolet Light (UV)

Depending on the wavelength and intensity, overexposure to ultraviolet light can result in injury to the skin and/or eyes. Several measures can be taken to avoid this.

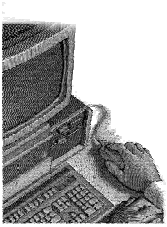
- Enclose or shield the UV source - acrylic plastic material, such as plexiglass, is an effective absorber of UV light.
- Protect eyes with UV-rated safety glasses or goggles.
- Protect exposed skin with face shields, long sleeves, and long pants.

X-Ray Radiation

X-Rays and electron beams are produced by laboratory instruments such as diffractometers, gauging systems, and electron microscopes. X-Ray radiation safety services are provided by the Radiation Safety Office.

XXVI. CHEMICAL INCOMPATIBILITY CHART

Chemical	Incompatibilities
Acetic acid	Chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates
Acetylene	Chlorine, bromine, copper, fluorine, silver, mercury
Alkali/alkaline earth metals (e.g. potassium, sodium, powdered magnesium)	Water, chlorinated hydrocarbons, carbon dioxide, halogens
Ammonia (anhydrous)	Mercury, chlorine, iodine, bromine, HF
Carbon tetrachloride	Sodium, potassium
Chromic acid/chromium	Acetic acid, naphthalene, glycerol, alcohol, flammable liquids, camphor
Chlorine (also bromine)	Ammonia, acetylene, butadiene, butane, methane, propane, hydrogen, sodium carbide, finely divided metals, turpentine, benzene
Cyanides	Acids
Flammable liquids	Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, halogens
Hydrofluoric acid (anhyd)	Ammonia (aqueous or anhydrous)
Hydrogen peroxide	Copper, chromium, iron, most metals or their salts, alcohols, organic and conbustible matls.
Iodine	Acetylene, hydrogen, ammonia (aq or anh)
Mercury	Acetylene, ammonia, fulminic acid
Nitric acid (concentrated)	Acetic acid, aniline, chromic acid, hydrogen sulfide, flammables, any heavy metals (brass)
Nitrites	Acids
Oxygen	Oils, grease, flammables, hydrogen
Perchloric acid	Acetic anhydride, alcohol, paper, wood, grease, oils, bismuth and its alloys
Peroxides (organic)	Acids (organic or mineral), friction, heat
Phosphorus pentoxide	Water, halogenated agents
Sulfuric acid	Potassium chlorate, potassium perchlorate potassium permanganate, (similar compounds of light metals such as sodium and lithium)



CONTACT INFORMATION

Environmental Health and Safety

Director 274-1388
Environmental Manager (Hazardous and Infectious Wastes) 274-4351
Industrial Hygiene Manager 274-2829
Laboratory Safety Manager 278-6150
Biosafety Manager.....274-2830
Emergency Preparedness Manager 274-8108
All Other Areas.....274-2005
Web Page……www.ehs.iupui.edu

Other Safety/Health Areas

Radiation Safety Office.....274-4797
Clarian Safety Office 274-0400
Wishard Safety Office.....274-2830
Occupational Health Services 274-5887

Emergencies

Police..... 911
Fire 911
Emergency Medical Service 9-911
Utilities.....278-1900
State Poison Control Center.....962-2323
Bloodborne Pathogen Information Line 274-OUCH
Emergency Preparedness Information Page……..www.iupui.edu/~prepared
(In the event of a disaster or emergency, this site will contain regularly updated news, instructions, and information.)