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**CHEMICAL HYGIENE PLAN**

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This Chemical Hygiene Plan has been developed to help you work with laboratory chemicals safely and in a manner that complies with prevailing regulations and recommended standards.

The purpose of the Chemical Hygiene Plan is to describe proper practices, procedures, equipment and facilities that have been designed and implemented to protect faculty, staff, and students from the effects of hazardous chemicals in the laboratory. Each department or unit using lab chemicals will appoint a Chemical Hygiene Officer who is responsible for department-specific or unit-specific aspects of the Chemical Hygiene Plan. The Department of Environmental Health and Safety directs and supports individuals, supervisors, and Chemical Hygiene Officers in maintaining safe laboratory environments. This Chemical Hygiene Plan and OSHA's Standard, "Occupational Exposure to Hazardous Chemicals in Laboratories" (29 CFR 1910.1450), commonly referred to as the "Lab Standard," applies to all University laboratories handling hazardous chemicals.

## **1. RESPONSIBILITY, AUTHORITY, AND RESOURCES**

### **1.1 University Administration**

The Chancellor of the University is ultimately responsible for implementation and support of all compliance efforts; however, primary authority for development of and compliance with this Plan has been delegated to the Director of the Department of Environmental Health and Safety.

### **1.2 Deans, Directors, and Department Chairs**

Those having administrative authority of functions that operate laboratories with hazardous chemicals are responsible for the appointment of Chemical Hygiene Officers and implementation of this Plan in their functional units.

### **1.3 Chemical Hygiene Officers**

Each department or other administrative unit which uses laboratory chemicals must appoint a Chemical Hygiene Officer. The Chemical Hygiene Officer assists department chairs, principal investigators and laboratory supervisors in the implementation of the Chemical Hygiene Plan and unit-specific procedures by:

- 1.3.1 Working with laboratory supervisors to monitor and provide guidance for the safe procurement, use and disposal of chemicals.
- 1.3.2 Assisting with safety audits and training.
- 1.3.3 Assisting in the review of hazard assessments and engineering/process controls.
- 1.3.4 Assisting in the selection of protective equipment for laboratory workers.

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1.3.5 Serving on the Chemical Hygiene Officers' Committee.

#### 1.4 **Chemical Hygiene Officers' Committee**

The Chemical Hygiene Officers' Committee is comprised of all Departmental Chemical Hygiene Officers and is responsible for:

- 1.4.1 Establishing goals and acceptable performance levels for chemical hygiene activities and Chemical Hygiene Officers.
- 1.4.2 Performing an annual assessment of the effectiveness of the Chemical Hygiene Plan.
- 1.4.3 Providing recommendations on the type(s) and frequency of Chemical Hygiene training.
- 1.4.4 Determining the necessity of changes related to the Chemical Hygiene Plans.
- 1.4.5 Promoting information exchange on chemical use, storage, and disposal.

#### 1.5 **University Chemical Hygiene Officer**

The Department of Environmental Health and Safety designates the University Chemical Hygiene Officer, who is responsible for:

- 1.5.1 Review of all department or unit specific procedures to ensure they meet the goals and objectives of the University Chemical Hygiene Plan.
- 1.5.2 Provision of resources to support program goals such as chemical waste disposal, spill response, hazard assessment, exposure monitoring, chemical fume hood monitoring, and Chemical Hygiene training.
- 1.5.3 Advising departmental Chemical Hygiene officers on the current legal requirements concerning hazardous chemicals.

#### 1.6 **Laboratory Supervisors and/or Principal Investigators (PI)**

The laboratory supervisor or PI:

- 1.6.1 Ensures implementation of the Chemical Hygiene Plans in compliance with the OSHA Lab Standard.
- 1.6.2 Maintains an inventory of hazardous chemicals or regulated substances in use in his or her laboratory, and provides lab workers ready access to

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material safety data sheets (MSDS).

- 1.6.3 Reports incidents with potential for exposures or environmental contamination to EH&S and the departmental Chemical Hygiene Officer.
- 1.6.4 Instructs lab workers in the conduct of lab procedures, in the handling of hazardous substances, and in the proper disposal of chemicals.
- 1.6.5 Ensures that engineering controls such as chemical fume hoods are used properly and are in good working order.
- 1.6.6 Ensures that appropriate personal protective equipment is available at no cost to staff and is in use.
- 1.6.7 Contacts EH&S to arrange for workplace air sampling, wipe sampling or other monitoring in response to potential exposures as required.
- 1.6.8 Encourages lab personnel to maintain cleanliness and minimize clutter in the lab.
- 1.6.9 Ensures all teaching assistants and **students** are aware of the chemical, health, and safety hazards they may encounter in the laboratory. Students in the lab must follow procedures outlined in this Plan. Teaching assistants ensure that students follow established procedures and maintain safety in the lab.

## **1.7 Laboratory Workers**

Faculty and staff working in laboratories are subject to the requirements of this Chemical Hygiene Plan and to lab-specific procedures as directed by a laboratory supervisor. All laboratory workers must:

- 1.7.1 Attend required Chemical Hygiene training within 30 days of appointment to a position using chemicals in a lab and every three years thereafter.
- 1.7.2 Consult with the lab supervisor before initiating unfamiliar, non-standard, or hazardous laboratory procedures.
- 1.7.3 Understand the function and use of protective equipment.
- 1.7.4 Use all available safety devices and engineering controls.
- 1.7.5 Consult the MSDS before handling a chemical with which they are not familiar.

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1.7.6 Immediately report to their supervisors any problems, accidents or observations regarding chemical health and safety.

## **1.8 University Support Services**

1.8.1 Facilities Management maintains engineering control systems according to required specifications, tests safety showers, and maintains safety showers and eye washes.

1.8.2 Purchasing transfers any MSDS and other hazardous chemical information to the purchaser and to the Department of Environmental Health and Safety.

1.8.3 Human Resources maintains demographic information on employees covered by the Plan and supports the administration of training programs.

## **2. GENERAL GUIDELINES FOR HANDLING HAZARDOUS CHEMICALS**

2.1 It is possible to handle all chemicals safely, especially in a controlled laboratory environment. Understand the potential hazards associated with materials and procedures in your lab. Obtain and review Material Safety Data Sheets (MSDS) before using chemicals.

2.2 Ensure that necessary supplies and equipment are available for handling small spills. See procedures in following section. Also, know emergency numbers of the University (x4-2121) and basic emergency response actions. A basic chemical spill procedure should be posted in each lab or area where chemicals are handled.

2.3 Know the location and proper use of safety equipment such as emergency showers, eye wash stations, fire extinguishers, and fire alarms. In the event of skin or eye contact with chemicals, immediately flush the area of contact with cool water for 15 minutes. Remove affected clothing. Get medical help by calling x4-2121.

2.4 Do not work alone in the laboratory if you are working with chemicals.

2.5 Purchase minimum amounts of hazardous materials necessary to accomplish work and dispense only amounts necessary for immediate use.

2.6 Use hazardous materials only as directed and for their intended purpose.

2.7 Never smell or taste any chemical as a means of identification.

2.8 Avoid direct contact with any chemical. Use engineering controls (such as

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certified fume hoods) or personal protective equipment to avoid exposure.

- 2.9 Smoking, drinking, eating, the storage of foodstuffs, and the application of cosmetics are forbidden in areas where chemicals are in use.
- 2.10 The American Chemical Society and the University of Pittsburgh recommend that all chemicals be dated upon delivery to the laboratory, and be checked for integrity on an annual basis at a minimum.
- 2.11 Label all secondary containers with a common name or chemical description.
- 2.12 Store chemicals in compatible categories, not alphabetically.
- 2.13 DO NOT USE damaged, cracked, or badly scratched glassware.
- 2.14 Never use mouth suction for pipetting or to start a siphon.
- 2.15 Wash hands immediately after working with chemicals.
- 2.16 Only trained personnel are permitted to handle hazardous chemicals in the lab.

### **3. GENERAL CHEMICAL SPILL PROCEDURE**

- 3.1 Evaluate the Spill
  - a. Determine the hazards associated with the spilled material. For example, is the material corrosive, flammable, toxic, or explosive?
  - b. Identify all materials by common or chemical name.
  - c. Estimate how much is spilled.
  - d. Evaluate the degree of danger to employees, students, or visitors.
  - e. Evaluate the degree of danger to equipment or property.
- 3.2 Contain the spill if safe to do so. Utilize absorbent pads and other materials or action designed to prevent the spilled material from spreading and causing increased damage.
- 3.3 Evacuate the area if the spill cannot be contained, or if the spilled material produces irritating odors, flammable vapors or explosive vapors (extinguish all sparks or ignition sources).
- 3.4 Clean up the spilled material.

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- a. Large spills (> 1 gallon) of toxic, corrosive or flammable materials shall be handled by EH&S. Immediately call the Emergency Telephone Number (Oakland 412-624-2121). Have the following information available:
    - Your name and phone number.
    - Location of spill.
    - Description of what was spilled (state any compounds which may form toxic compounds).
    - Any steps you have taken to control the spill.
    - Any injuries that have occurred.
  - b. Spills of acids, bases, and flammables (less than one gallon) can be cleaned up by laboratory personnel using appropriate neutralizers/absorbents and proper personal protective equipment. If assistance is requested, contact EH&S.
  - c. Spills of innocuous material can be cleaned up by laboratory personnel or equipped staff.
- 3.5 Dispose of all contaminated materials through the University Chemical Waste Program.
  - 3.6 Employees who have been exposed to hazardous chemicals due to a spill or other uncontrolled situation shall promptly report to the UPMC Presbyterian Emergency Room. A Report of Incident shall be completed by the individual's supervisor.
  - 3.7 Consult EH&S with any questions regarding chemical spills and spill clean up.

#### **4. TOXIC MATERIALS**

- 4.1 Acutely toxic materials are characterized by prompt (or slightly delayed) health effects, such as burns, allergic reactions, respiratory irritation, and immediate damage to organs such as the skin and eyes.
  - 4.1.1 ANY chemical whose properties are unknown should be treated as though it is acutely toxic.
  - 4.1.2 Those materials defined as "poisons" due to possessing one (or more) of the following toxicological parameters:
    - a) Oral LD<sub>50</sub> of 50 mg/Kg or less.
    - b) Dermal LD<sub>50</sub> of 200 mg/Kg or less.
    - c) Inhalation LC<sub>50</sub> 2 mg/L or 200 ppm or less.

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- 4.2 The effects of exposures to chronically toxic materials occur over a longer period of time and are characterized by cumulative damage to organs or organ systems. (For the purpose of this discussion, carcinogenic and reproductive hazards are not included. See following sections) Chemicals which are defined here as chronic toxins include hepatotoxins (e.g., carbon tetrachloride, vinyl chloride), nephrotoxins (e.g., ethylene glycol), neurotoxins (e.g., acrylamide), agents which act on the hematopoietic system (e.g., benzene), and others affecting specific organs.
- 4.3 Precautions Specific to Toxic Material
- 4.3.1 Use and store toxic substances only in designated (or restricted) areas, preferably under a negative pressure with respect to the rest of the building, and in the smallest amounts possible. Post the room or area with appropriate warning signs to restrict entry, as necessary.
- 4.3.2 Use toxins in a certified chemical fume hood, glove box, or other containment device.
- 4.3.3 Store toxic chemicals in original containers only. Secondary containers should be avoided for toxic chemicals.
- 4.3.4 Store and transport toxic chemicals in secondary containment trays;
- 4.3.5 Thoroughly decontaminate or dispose of contaminated clothing or shoes as chemical waste. Contaminated washes and materials from experiments should be decontaminated chemically and stored in closed, suitable, labeled, impervious containers.
- 4.3.6 Protect vacuum pumps against contamination by using scrubbers or suitable filters. Decontaminate vacuum pumps, glassware or other equipment before removing it from the designated (or restricted) area.
- 4.3.7 Wet mop or HEPA-vacuum [High Efficiency Particulate Air Filter] to decontaminate surfaces; do not dry sweep.
- 4.3.8 If using toxicologically-significant quantities (amount depends on the substance) on a regular basis, contact your department's Chemical Hygiene Officer so that, in conjunction with the Department of Environmental Health and Safety, a determination on required medical surveillance can be made.

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## 5. CARCINOGENIC AND REPRODUCTIVE HAZARDS

- 5.1 Carcinogens are substances capable of producing cancer in mammals and are regulated by OSHA as a carcinogen, listed by the National Toxicology Program (NTP) as a carcinogen (or potential carcinogen) in its most recent Annual Report on Carcinogens, and/or listed by the International Agency for Research on Cancer (IARC) as a Group 1, 2A or 2B carcinogen. Updated lists are available from the Department of Environmental Health and Safety. Carcinogens currently in common use at the University include bromodeoxyuridine (BrDU), acrylamide, chemotherapy agents, and formaldehyde.
- 5.2 Reproductive toxins are substances that affect either male or female reproductive systems or capabilities and include agents which damage the genetic material (mutagens) or the developing fetus (teratogens). See the University SOP for Reproductive Hazards found in this Manual. Reproductive toxins currently in common use at the University include ethidium bromide and acrolein.

## 6. FLAMMABLES AND COMBUSTIBLES

Flammable and combustible materials are those chemicals which generate sufficient vapors to cause a fire when an ignition source is present. The minimum temperature at which a liquid gives off sufficient vapor to allow ignition is the "flashpoint." See the Fire Safety portion of this Manual for specific guidelines on flammable and combustible liquids, metals, and gases.

## 7. CORROSIVES

- 7.1 Corrosive chemicals are those substances that, by direct chemical action, cause visible destruction or irreversible alterations of living tissue or deterioration of metal surfaces. Corrosive liquids and solids are responsible for many injuries in the lab. Corrosive gases are also serious hazards because they can be readily absorbed into the body by skin contact, inhalation, or eye contact.
- 7.2 Some categories of corrosive liquids include inorganic acids (e.g., hydrochloric [muriatic], nitric, sulfuric), organic acids (e.g., acetic, butyric, formic), inorganic basic solutions (e.g., ammonia, sodium hydroxide), other inorganics (e.g., bromine, phosphorous trichloride) organic basis solutions (e.g. triethylamine), and other organics (e.g., acetic anhydride, liquified phenol).
- 7.3 Precautions Specific to Corrosive Chemicals
- 7.3.1 Eye protection and gloves appropriate for the material to be handled should always be worn when handling corrosive materials. Depending on the type of operation, and quantity of chemicals(s) used, a faceshield and impervious apron/boots may also be appropriate.
- 7.3.2 An eyewash and/or safety shower must be readily accessible to areas

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where corrosives are used and stored.

- 7.3.3 Dehydrating agents such as sulfuric acid, phosphorous pentoxide, and calcium oxide should be mixed with water by adding the agent to water to avoid violent reaction and spattering.
- 7.3.4 Strong oxidizing agents such as chromic and perchloric acids should be clearly labeled, stored and used in glass or other inert containers. Corks and rubber stoppers should not be used.
- 7.3.5 Acids and bases must be stored separately.
- 7.3.6 To transport strong acids and bases from location to location, use safety rubber bottle carriers or non-breakable PVC-coated bottles.

## **8. PEROXIDE FORMERS**

Chemicals which react with oxygen to make peroxides form materials that can explode with impact, heat or friction. Peroxide-forming compounds can be divided into three hazard categories based on method of reaction and storage time. A partial list is presented in the Standard Operating Procedures for Peroxide Formers found in this Manual.

## **9. REACTIVE CHEMICALS**

Reactive chemicals are substances which may undergo a variety of violent reactions with the spontaneous liberation of heat and/or gases in such a rapid fashion that safe dissipation is not possible. This category includes explosives, oxidizers, reducers, water/acid/air sensitive and unstable chemicals. These substances are capable of producing toxic gases or explosive mixtures, being explosive themselves, reacting with water violently, or they may contain cyanide or sulfide. The reactivity of individual chemicals in specific chemical classes varies considerably and may be substantially modified by aging or contamination.

- 9.1 Class I Reactive Chemicals are normally unstable and may readily undergo violent change without a detonator.
  - 9.1.1 Pyrophoric chemicals (e.g., phosphorous, metal powders of magnesium, aluminum and zinc) will undergo spontaneous ignition in contact with air. Store in inert environments and prevent contact with air or water.
  - 9.1.2 Polymerizable chemicals (e.g., divinyl benzene and acrylonitrile) will undergo spontaneous polymerization in contact with air. Such materials should be kept cool, and be stored or utilized away from moisture and water.
  - 9.1.3 Chemicals classified as oxidizers (e.g., perchloric and chromic acids) will undergo violent reactions when in contact with organic materials or

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strong reducing agents. Hazards can be minimized by using and storing minimal amounts, emphasizing proper storage away from organic and flammable materials, and reducing chemicals.

- 9.2 Class II Reactive Chemicals react violently with water. Examples include chlorosulfonic acid, acetyl halides, phosphorous trioxide and titanium tetrachloride. Obviously, these chemicals should be kept away from water, and handled in laboratory fume hoods. Most of these materials are corrosive, as are their decomposition products, so appropriate personal protective equipment must be worn.
- 9.3 Class III Reactive Chemicals decompose violently in water with evolution of heat and flammable gases. Examples include alkali metals, alkaline earth metals, metal hydrides and metal nitrides. While avoiding contact with water, ensure that ventilation is adequate to disperse any evolved flammable gases. As water may accelerate the fire, dry sand should be used to smother the chemicals.
- 9.4 Class IV Reactive Chemicals react rapidly with water, generating acutely toxic gases or vapors. Typical chemicals in this class include alkaline metal phosphides and isocyanates. Use these materials with adequate ventilation and prevent contact with water.
- 9.5 Class V Reactive Chemicals such as metal cyanide salts, organic cyanide compounds, metal sulfide salts, and organic sulfides/mercaptans are acid-sensitive and may produce extremely toxic hydrogen cyanide and hydrogen sulfide gases on contact with acids. The same effect may occur with materials which form acids in the presence of moisture or liquid water. Provide adequate ventilation to minimize the severe inhalation hazard of hydrogen cyanide and hydrogen sulfide. Do not store in cabinets with acids, oxidizers and other reactive chemicals.
- 9.6 Class VI Reactive Chemicals can detonate or explode if heated above ambient temperature or if exposed to an ignition source. Examples include sodium amide, metal azides, brominated organic compounds, organic perchlorates and ammonium nitrate and chlorate.
- 9.7 Class VII Reactive Chemicals such as organic azides, some metal azides, benzoyl peroxide and peroxidized ethers may detonate or decompose explosively under ambient temperature and pressure, without any external ignition source. Materials in this class should only be handled by experienced and trained individuals, after consulting the MSDS and the Department of Environmental Health and Safety.

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- 9.8 Class VIII Reactive Chemicals are explosive materials that should be handled by experienced and properly equipped personnel. Class A explosives include TNT, mercury fulminate and diazo-dinitrophenol. Class B explosives (49 CFR 173.88) include stabilized nitrocellulose and nitroglycerin. Forbidden reactive chemicals include diethylene glycol dinitrate, unstabilized nitroglycerin and unstabilized nitrocellulose.

## **10. PROCUREMENT OF CHEMICALS**

All chemicals will be procured through the University Purchasing Department in the smallest quantity consistent with the intended use. If chemicals are to be transferred to the University from another individual or institution, prior approval must be obtained from the Department of Environmental Health and Safety.

## **11. PROCUREMENT AND USE OF RADIOISOTOPES**

The Laboratory Supervisor must submit all proposed uses of radioisotopes to the Radiation Safety Committee for approval. The Radiation Safety Office must approve all purchases and transfers of radioactive materials. Contact the Radiation Safety Office (624-2728) for details.

## **12. DISTRIBUTION AND TRANSPORT OF CHEMICALS**

- 12.1 Always transport chemicals in carry buckets or on a wheeled cart with raised edges to serve as secondary containment.
- 12.2 If no freight elevator is available, chemicals may be transported on a passenger elevator with extreme caution. When possible, isolate the elevator from public use while transporting chemicals.
- 12.3 Transport all chemical containers "closed" so that no vapors are released to the atmosphere.
- 12.4 Transport compressed gas cylinders using a hand truck specifically designed for that purpose and use a suitable strap, chain or other restraint during transportation. Compressed gas cylinders must be restrained with suitable racks, straps, chains or stands immediately upon delivery.
- 12.5 Any chemicals shipped from the University must be:
- a) Appropriately packaged labeled per Department of Transportation requirements.
  - b) All personnel preparing shipments containing chemicals (e.g. dry ice or formalin) must be certified. Certification is available through EH&S training.
  - c) Any chemical shipped from the University must be accompanied by a signed

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and completed Material Transfer Agreement.

### 13. CHEMICAL STORAGE

- 13.1 Before storing any hazardous material, read the label and MSDS for more specific instructions on storage and handling.
- 13.2 Each laboratory must maintain a current inventory of chemicals.
- 13.3 Chemical storage rooms and areas must be posted with signage that indicates the significant hazards of stored chemicals.
- 13.4 Store chemical containers "closed" at all times so that no vapors are released to the atmosphere exemptions must be made for vessels whose contents place the vessel under pressure. Vessels with pressure-relief caps should be utilized in these instances for storage.
- 13.5 As a general rule, avoid storing chemicals on the floor or above eye level.
- 13.6 Chemicals must only be stored in compatible groups. Only segregated chemicals can be stored alphabetically. Incompatible groups of chemicals must not be stored in close proximity to one another.

#### 13.6.1 Compatibility Families of Inorganic Chemicals

- 1. Metals, hydrides.
- 2. Halides, sulfates, sulfites, thiosulfates, phosphates, halogens.
- 3. Amides, nitrates<sup>\*</sup>, nitrites<sup>\*</sup>, azides<sup>\*</sup>, nitric acid.
- 4. Hydroxides, oxides, silicates, carbonates.
- 5. Sulfides, selenides, phosphides, carbides, nitrides.
- 6. Chlorates, perchlorates<sup>\*</sup>, perchloric acid<sup>\*</sup>, hypochlorites, peroxides<sup>\*</sup>, hydrogen peroxide.
- 7. Arsenates, cyanides, cyanates.
- 8. Borates, chromates, (per) manganates.
- 9. Acids (except nitric).
- 10. Sulfur, phosphorous, arsenic, phosphorous pentoxide<sup>\*</sup>.

\* These chemicals deserve special attention due to their potential instability.

#### 13.6.2 Compatibility Families of Organic Chemicals

- 1. Acids, anhydrides, peracids.
- 2. Alcohols, glycols, amines, amides, imines, imides.
- 3. Hydrocarbons, esters, aldehydes.

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4. Ethers<sup>\*</sup>, ketones, ketenes, halogenated hydrocarbons, ethylene oxide.
5. Epoxy compounds, isocyanates.
6. Peroxides<sup>\*</sup>, hydroperoxides<sup>\*</sup>, azides<sup>\*</sup>.
7. Sulfides, nitriles.
8. Phenols, cresols.

<sup>\*</sup>These chemicals deserve special attention due to their potential instability.

#### **14. ELIMINATION, MINIMIZATION, OR SUBSTITUTION**

When evaluating or re-evaluating an experiment, process or operation, investigate the possibility of eliminating the use of hazardous materials, substituting a less hazardous chemical, or minimizing the volume of hazardous chemicals used. For example, one may be able to wash glassware with an aqueous-based detergent instead of an organic solvent or chromic acid-based material. One can replace known highly toxic materials (e.g., benzene, n-hexane, chlorinated hydrocarbons) with analogous materials which are less toxic (e.g., xylene, isohexane, n-methyl pyrrolidone). Also, microscale techniques should be used whenever possible. Closed vessels should always be used in lieu of open vessels, when feasible.

#### **15. CONTROL MEASURES AND EQUIPMENT**

The preferred method of minimizing employee exposure to hazardous materials is through the use of engineering controls. Principal investigators, laboratory supervisors and chemical users should maintain a continual awareness of the specific hazards associated with the chemicals being used. Once engineering controls are implemented, users must follow established procedures and utilize the engineering controls. Users must promptly report to building management any malfunctions or local alarm conditions associated with installed engineering controls.

##### **15.1 Laboratory Fume Hoods**

Laboratory fume hoods (aka chemical fume hoods) are engineering controls designed to protect lab personnel from release of airborne chemical contaminants. A secondary purpose is to protect people and property against small fires and explosions.

- 15.1.1 The primary measure of a hood's efficacy is its face velocity, measured in linear feet per minute (lfpm) through the open sash. Most chemical fume hoods at the University are designed to operate at 100 lfpm with an 18" sash opening.
- 15.1.2 All chemical fume hoods should be equipped with a manometer or other hood monitor at the time of new installation, or at the time of renovation for existing chemical fume hoods. This monitor should be used continually to check proper hood function. In the event of monitor

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malfunction, contact EH&S.

- 15.1.3 Chemical fume hoods are safety backup devices for condensers, traps and other devices that collect vapors and fumes. Never use a fume hood to "dispose" of chemicals by evaporation.
- 15.1.4 Only apparatus and chemicals essential to the specific procedure or process should be placed in the hood. Do not use hoods for extended chemical storage.
- 15.1.5 The work or apparatus inside the hood should be placed at least six inches inside the hood. Also, air baffles inside fume hoods must remain clear of obstructions for proper air flow and protection.
- 15.1.6 Never remove hood sashes.
- 15.1.7 Replace cracked or damaged hood sashes promptly.
- 15.1.8 In the event of power failure or other hood failure, stop work, cover or close all chemicals, close the sash on the hood, and notify a supervisor.
- 15.1.9 All chemical fume hoods must be certified annually for proper operational air flow by the Department of Environmental Health and Safety or designee. PI's or supervisors are responsible to report hoods that are delinquent for annual certification to EH&S.

## 15.2 Chemical Use Areas

The potential for employee exposure to hazardous chemicals is greatly reduced by restricting the use of chemicals to a designated area equipped with the proper control devices. This designated area can be a glove box, fume hood, bench or an entire laboratory depending on the manipulations required.

## 15.3 Fire Safety Equipment

- 15.3.1 Each laboratory must have access to fire extinguishers capable of extinguishing the type of fire that may be generated by the materials used in the lab.
- 15.3.2 The Department of Environmental Health and Safety arranges annual fire extinguisher inspections by a qualified professional.

NOTE: See the Fire Safety and General Lab Safety sections of this manual for more information.

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#### 15.4 Emergency Showers and Eye Wash Stations

- 15.4.1 Eye wash stations and emergency showers must be accessible to work areas where the potential for eye or skin exposure to corrosive materials exists.
- 15.4.2 All lab personnel must be instructed by their supervisor on the location and use of this equipment.
- 15.4.3 Lab personnel should ensure that access to eye wash stations and emergency showers is not restricted or blocked. No electrical appliance should be permitted within the spray area of an eyewash/safety station.
- 15.4.4 Eye wash stations should be flushed at least weekly by lab personnel. Malfunctioning eye wash stations should be reported immediately to building management. This weekly flushing must be documented by lab personnel.

### 16. CHEMICAL EXPOSURE

If an overexposure to chemicals is suspected, report immediately to your supervisor. An exposure assessment must be performed by the supervisor. The Department of Environmental Health and Safety can be consulted by the Laboratory Supervisor or Chemical Hygiene Officer in any instance where overexposure is suspected. If assessment indicates that an employee could have been exposed to a hazardous chemical in a manner that may have caused harm, a medical consultation (and possibly a subsequent examination) at no cost to the employee is to be performed at Employee Health Services, Room 500.59 Medical Arts Building, 3708 Fifth Avenue.

### 17. LABELS

- 17.1 Labels are required on all containers in the lab.
- 17.2 A proper label must identify the material in the container. When possible, use a common name in English and avoid formulas and abbreviations.
- 17.3 Unlabeled chemicals should be handled as hazardous waste. All containers of chemical waste must be labeled in accordance with University of Pittsburgh guidelines.
- 17.4 Chemicals synthesized or developed in the laboratory must be assumed to be toxic if no data are available. Suitable handling procedures must be prepared and implemented. All containers of chemicals prepared in the laboratory must be marked with the chemical name, primary hazard(s) [if known], the responsible person(s) and the date.

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## 18. SIGNS

- 18.1 Each laboratory entrance must be posted with a room number and emergency notification signs that contain contact names and emergency phone numbers. These signs must also list the significant hazards found in that lab. Laboratory supervisors are required to request the necessary signage from the Department of Environmental Health and Safety, and ensure these signs are conspicuously posted at each lab entrance. See the laboratory signage section of this Manual.
- 18.2 Hazard signs warning of severe or unusual hazards such as unstable chemicals, lasers, radioactive and biohazard agents must also be posted at lab entrances and/or on specific equipment or areas housing such hazards.

## 19. MATERIAL SAFETY DATA SHEETS

Material safety data sheets should be obtained and reviewed for each chemical **before** use in the laboratory. Electronic MSDS are available through the Department of Environmental Health and Safety. If chemicals developed in University laboratories are to be provided to another user outside of the lab, a material safety data sheet and label must be prepared. Consult EH&S for proper format of MSDS.

## 20. CHEMICAL HYGIENE TRAINING

- 20.1 The University requires that employees be informed of the presence of hazardous chemicals when assigned to a work area and prior to new exposure situations (i.e., those situations involving new hazardous chemicals and/or new work procedures). Such training is to be provided by the department in conjunction with laboratory supervisors.
- 20.2 All individuals working in University labs must attend Chemical Hygiene Training within 30 days of employment. Refresher training is required every three years. This training can be completed on-line at [www.ehs.pitt.edu](http://www.ehs.pitt.edu). Only faculty may complete the initial Chemical Hygiene training on-line.

## 21. CHEMICAL WASTE

When a material has no further use and has been declared excess or a waste by the user, it must be clearly labeled as a waste. The responsibility for the identification and handling of hazardous waste within the University rests with the individuals who have created the waste. The Department of Environmental Health and Safety is available to provide technical guidance, assistance and information.

- 21.1 The Environmental Protection Agency (EPA) regulates hazardous waste management with statutes found in 40 CFR 260-270. A material can be defined as a hazardous waste either because of its general characteristics or because of a specific listing.

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21.1.1 Ignitability (EPA Code D001) describes:

- Liquids with a flashpoint below 60<sup>0</sup>C (140<sup>0</sup>F)--e.g., most organic solvents such as methanol, ethanol, isopropanol, and xylene.
- Solids capable of causing fire by friction, absorption of moisture, or spontaneous chemical change and when ignited burn vigorously and persistently to create a hazard (e.g., picric acid).
- Flammable, compressed gasses (e.g., hydrogen, methane).
- Oxidizers (e.g., potassium permanganate).

21.1.2 Corrosivity (EPA Code D002) describes:

- Aqueous solutions with pH less than 2 or greater than 12.5.
- Liquids capable of corroding steel at a specific rate.

21.1.3 Reactivity (EPA Code D003) describes:

- Substances that react with water violently and may produce toxic gases (e.g., potassium, sodium).
- Substances that are normally unstable.
- Chemicals containing cyanide or sulfide that generate toxic gases.
- Capable of detonation when exposed to an initiating source or to heat under confinement.

21.1.4 Toxicity (EPA Code D Series) describes:

- Wastes which contain one or more certain heavy metals (e.g. silver, cadmium, mercury), and/or one or more of 23 organics and 8 pesticides as determined by the Toxicity Characteristic Leaching Procedure (e.g. benzene, DDT).

21.1.5 Some 500+ materials are specifically listed by EPA as hazardous waste on the EPA "D", "F", "P" and "U" lists. Contact EH&S with any questions regarding chemical waste..

21.2 In order to comply with federal regulations and personnel safety requirements, it is important that "unknowns" not be generated. The generation of such materials can be avoided by labeling **all** containers of chemicals or reaction mixtures.

21.3 Mixed wastes are biological and/or radioactive wastes that are also chemical wastes. Biological and radioactive wastes have disposal procedures which differ dramatically from those associated with hazardous wastes, and the disposal of mixed wastes typically presents unusual problems. Every effort should be made to avoid the generation of mixed wastes. If mixed wastes are generated, EH&S must be contacted to determine appropriate disposal procedures.

21.4 Hazardous waste should be collected in a container that is in sound condition and appropriate for the waste type. Containers should not be overfilled and must be capped with a screw-type cap. All containers must be labeled to characterize the contents, provide the date of first use, name of generator, and contain the word

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“waste” on the label.

#### 21.4.1 Specific Container Selection

- Flammable liquids: glass bottles, steel cans, high density plastic containers.
- Concentrated acids and bases: 2.5 liter "acid" bottles, no metal.
- Aqueous solutions: glass/sturdy plastic bottles, plastic cans.
- Trace contaminated solid wastes: double 4-6 mil polyethylene bags.
- Hydrofluoric acid: plastic container with plastic screw-type cap.

#### 21.5 Collecting and Commingling Hazardous Waste

21.5.1 If different chemical wastes are mixed together in a single container for disposal (commingling), then the same type of chemicals must be mixed together to make a common segregation group (see below). Only compatible chemicals may be mixed together within segregation groups.

21.5.2 Collect these types of hazardous wastes separately from each other (examples included);

1. Halogenated -- e.g. chloroform, methylene chloride.
2. Hydrocarbon -- e.g. xylene, ether, hexane, acetone.
3. Nitrogenous -- e.g. triethylamine, diisopropylamine.
4. Sulfurous -- e.g. dimethylsulfoxide, dimethylsulfate.
5. Corrosive -- e.g. sulfuric acid.
6. Aqueous solutions -- e.g. diaminobenzidine, ethidium bromide, heavy metals.
7. Oils -- e.g. motor oil, pump oil.
8. Solid lab wastes such as gels containing acrylamide and ethidium bromide.

21.5.3 Care should be taken not to mix wastes which will react with each other, even if they are within the same compatibility group (e.g. although acids and bases are both corrosives, they should not be mixed in the same container except under controlled conditions by experienced personnel).

21.6 The following labeling procedures should always be adhered to:

21.6.1 Only labels supplied by the Department of Environmental Health and Safety are acceptable for containers of excess chemicals.

21.6.2 Each container must have a label once waste is first placed in the container.

21.6.3 Fill out the label in pencil (due to chemical resistance).

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- 21.6.4 Include name, room number, building, department and date of first entry.
- 21.6.5 List **all** components of commingled waste. Do not use formulas, abbreviations, or nomenclature, if feasible.
- 21.6.6 Record pH of aqueous wastes.
- 21.6.7 Do not cover original container labels with University chemical waste label, if possible.
- 21.7 Laboratories must not accumulate chemical wastes for more than 30 days before placing it in a designated University hazardous waste pick-up area.
- 21.8 One of the University's high priority goals is to reduce the amount of hazardous waste generated. Benefits of waste reduction include increased safety of personnel, reduced environmental contamination, and decreases in expenditures.