CHEMICAL HYGIENE PLAN.....TABLE OF CONTENTS

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. Reviewing hazard assessments and engineering/process controls.

1.3.4. Assisting in the selection of protective equipment for laboratory workers.

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. Annually assessing 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. Providing necessary updates to the Chemical Hygiene Plan.

1.4.5. Promoting information exchange on the safe use and handling of chemicals.

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. Reviewing department or unit specific procedures to ensure they meet the goals and objectives of the University Chemical Hygiene Plan.

1.5.2. Providing resources to support program areas 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 regulatory and legislative matters related to hazardous materials.

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

The laboratory supervisor or PI:

1.6.1. Ensures implementation of the Chemical Hygiene Plan in compliance with the OSHA Lab Standard.

1.6.2. Maintains an inventory of chemicals or regulated substances in use in the laboratory, and provides lab workers ready access to Safety Data Sheets (SDS).

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 safe 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 sampling or monitoring in response to potential exposures as required.

1.6.8. Encourages and requires lab personnel to maintain cleanliness and minimize clutter in the lab.

1.6.9. Ensures that 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 in addition to laboratory supervisors and PI's ensure that students follow established procedures and maintain safety in the lab.

1.6.10. Ensures lab workers attend safety training provided by EH&S within 30 days of appointment (see section 1.7.1).

1.6.11. Provides chemical and procedure-specific training and procedures to supplement the Chemical Hygiene Plan.

1.6.12. Reviews and approves work with hazardous chemicals.

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 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 SDS and container warning label before handling chemicals.

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

1.7.7. Review Chemical Hygiene Plan and lab-specific procedures.

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 Department transfers any SDS and other hazardous chemical information to the purchaser and to EH&S.

1.8.3. Human Resources maintains demographic information on employees covered by the Plan and supports 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. Users must understand the potential hazards associated with all chemicals in their lab. Obtain and review Safety Data Sheets (SDS) and hazard labels 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 (412-624-2121) and basic emergency response procedures. 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, and fire alarms. In the event of skin or eye contact with chemicals, immediately remove affected clothing and flush the area of contact with cool water for 15 minutes. Get immediate medical assistance by calling 412-624-2121.

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 certified fume hoods) and 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 and other useful hazard information.

2.12. Store chemicals in compatible categories, not alphabetically.

2.13. DO NOT USE damaged containers or glassware in poor condition.

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 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 reactive?

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 actions 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 shut off all potential ignition sources).

3.4. Clean up the spilled material

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.
- 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) may be cleaned up by laboratory personnel using appropriate neutralizers/absorbents and proper personal protective equipment. If assistance is requested, contact EH&S (412-624-9505).

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 or toxic" due to possessing one (or more) of the following toxicological parameters:

a) Oral LD_{50} of 50 mg/Kg or less.

b) Dermal LD_{50} of 200 mg/Kg or less.

c) Inhalation LC_{50} 2 mg/L or 200 ppm or less.

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. Chemicals that 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. Dispose of grossly contaminated clothing or shoes as chemical waste.

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 EH&S, a determination on required medical surveillance can be made.

5. CARCINOGENIC AND REPRODUCTIVE HAZARDS

5.1. Carcinogens are substances capable of producing cancer in mammals and are regulated by OSHA, 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 EH&S. Carcinogens currently in common use at the University include acrylamide, chloroform, methylene chloride, 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. 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 basic solutions (e.g. triethylamine), and other organics (e.g., acetic anhydride, liquefied 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 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 slowly 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 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 FORMING CHEMICALS

Peroxide forming chemicals are chemicals which react with oxygen to form peroxides. Peroxides are compounds 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, reducing agents, 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 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 chemical 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 SDS and the Department of Environmental Health and Safety.

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 vendors approved by the University Purchasing Department in the smallest quantity consistent with the intended use. A University Procurement Card (P-Card) or Disbursement Request are not permitted to be used for the procurement of the following: chemicals classified as “Chemical of Interest by the US Department of Homeland Security, alcohol, controlled substances, drugs, prescriptions, gases, fuel or gasoline.

Any laboratory chemicals purchased via the P-card must be on the laboratory's Chemical Inventory List and the P-Card holder must have the authorization of the respective department chairperson. For P-card purchases of laboratory chemicals not on the laboratory's Chemical Inventory, an update to the Chemical Inventory must be made. For each P-card holder purchasing laboratory chemicals, a letter signed by the Department Chair authorizing chemical purchases on the P-card must be maintained by the department as described in University Policy 05-02 12. (http://cfo.pitt.edu/policies/documents/policy05-02-12.pdf) The letter shall validate that the P-card holder has a current Chemical Inventory on file with EH&S.

If chemicals are to be transferred to the University from another individual within the University or if chemicals are to be transferred to the University from another institution, prior approval must be obtained from EH&S.

Chemicals should not be transferred, donated, or sold from the University of Pittsburgh to individuals or other entities unless the transfer is approved by the Office of Research via a Materials Transfer Agreement.

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 (412-624-2728).

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. Gloves should not be worn on the elevator and are not necessary if the chemicals are prepared appropriately.

12.4. All chemical containers should be closed when not in use, especially during transport, to reduce the potential for spills and/or vapor releases.

12.5. 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 at all times (whether empty or full.

12.6. Any chemicals shipped from the University must be:

a) Appropriately packaged, labeled, marked, and documented per Department of Transportation (DOT) or International Air Transport Association (IATA) requirements.

b) All personnel preparing shipments containing chemicals regulated as Dangerous Goods (e.g. dry ice or formalin) must be trained and certified. Contact EH&S for additional information related to training and certification.

c) Any chemical shipped from the University must be accompanied by a signed and completed Material Transfer Agreement

13. **CHEMICAL STORAGE**

13.1. Before storing any hazardous material, read the label and SDS 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. All chemical containers should be closed during storage to ensure 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 be stored in compatible groups. Chemicals should only be stored alphabetically when stored within compatible groups.

13.6.1. Compatibility Families of Inorganic Chemicals

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

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

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 fume hood's efficacy is its face velocity, measured in linear feet per minute (lfpm) through the open sash. Most fume hoods at the University are designed to operate at 100 lfpm with an 18" sash opening. Fume hoods designed to operate safely at lower face velocities may be installed with permission of EH&S.

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.

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 fume hood. Do not use fume hoods for extended chemical storage.

15.1.5. The work or apparatus inside the fume 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 fume hood sashes, and replace cracked or damaged fume hood sashes promptly.

15.1.7. All new fume hoods must be commissioned after installation and before initial use according to ASHRAE 110 testing that verifies all of the fume hood's control features are functioning properly and the fume hood is capable of containing hazardous chemical emissions.

15.1.8. In the event of power failure or other failure of fume hood function, stop work, cover or close all chemicals, close the sash, and notify a supervisor.

15.1.9. All chemical fume hoods must be certified annually for proper operational air flow by EH&S or its designee. PI's or supervisors are responsible to assure that only certified chemical fume hoods are used.

15.2. Chemical Use Areas

The potential for employee exposure to 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.

15.4. Emergency Showers and Eye Wash Stations

15.4.1. Eye wash stations, drench hoses or 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 the eye wash station, drench hose or emergency shower 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. If emergency medical attention is needed, call 412-624-2121. 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. 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 at no cost to the employee is to be performed at Employee Health Services, Room 500.59 Medical Arts Building, 3708 Fifth Avenue, or at the UPMC Presbyterian Hospital Emergency Department.

17. **LABELS**

17.1. Labels are required on all containers in the lab.

17.2. A proper label must identify the material per the Globally Harmonized System (GHS) requirements. Use a common name in English, the international hazard warning and designated signal word. Avoid formulas and abbreviations known only to the user.

17.3. Unlabeled chemicals should be handled as chemical waste. All containers of chemical waste must be labeled with a completed orange "WASTE CHEMICALS" label 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.

18. **SIGNS**

18.1. Each laboratory entrance must be posted with a room number and emergency notification sign that contains contact names and emergency phone numbers. This sign 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. Signs warning of severe or unusual hazards such as unstable chemicals, lasers, radioactive and biohazard agents must be posted at lab entrances and on specific equipment or areas housing such hazards.

19. SAFETY DATA SHEETS

Safety data sheets should be obtained and reviewed for each chemical **before** use in the laboratory. Electronic SDS are available through the chemical manufacturer website or the Department of Environmental Health and Safety website (www.ehs.pitt.eduu). If chemicals developed in University laboratories are to be provided to another user outside of the lab, a safety data sheet and label must be prepared. Consult EH&S prior to transfer of such material

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 and may be completed on-line. Faculty may complete the initial Chemical Hygiene training on-line. Online training can be accessed at www.ehs.pitt.edu.

21. CHEMICAL WASTE

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

21.1. The Environmental Protection Agency (EPA) regulates hazardous waste 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.

21.1.1. Ignitability (EPA Code D001) describes:

- Liquids with a flashpoint below 60^{O}C (140^{O}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 gases (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 flammable and/or 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 Codes D004-D043) 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 chemical 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. Chemical Waste Collection

21.4.1. Chemical waste should be collected in a container that is compatible with the waste type. Specific container selection should be as follows:

- Flammable liquids: glass bottles, steel cans, high density plastic.
- Concentrated acids and bases: 2.5 liter "acid" bottles, no metal containers.
- 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.

21.4.2. Chemical waste containers should not be overfilled and must have sufficient headspace for expansion during temperature changes (1.5 inches for flat-top containers; 3 inches for tapered containers).

21.4.3. Chemical waste containers must be sealed with a screw-type cap and should only be opened when actively adding chemical waste. A funnel is not an acceptable means of closing a container.

21.4.4. Once chemical waste has been added to the container, the container must be labeled with a completed orange "WASTE CHEMICALS" label.

21.5. Collecting and Commingling Chemical 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 chemical wastes separately from each other (examples included);

1. Halogenated -- e.g. chloroform, methylene chloride.
2. Hydrocarbon -- e.g. xylene, ether, hexane, acetone.
3. Nitrogeneous -- e.g. triethylamine, diisopropylamine.
4. Sulfurous -- e.g. dimethylsulfoxide, dimethylsulfate.
5. Corrosive (acid) -- e.g. sulfuric acid, hydrochloric acid
6. Corrosive (basic) -- e.g. sodium hydroxide. potassium hydroxide
7. Aqueous solutions -- e.g. diaminobenzidine, ethidium bromide, heavy metals.
8. Oils -- e.g. motor oil, pump oil.
9. 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 chemical waste 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 be labeled with a completed "WASTE CHEMICALS" label once waste is first placed in the container.

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

21.6.4. Include name, room number, phone number, department and date.

21.6.5. List **all** components of commingled waste. Do not use formulas, abbreviations, or nomenclature, if feasible. Do not use generic names such as "solvent waste", "halogenated waste", "non-halogenated waste", "aqueous waste", etc.

21.6.6. Record pH of aqueous wastes (if applicable).

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 chemical waste generated. Benefits of waste reduction include increased safety of personnel, reduced environmental contamination, and decreases in expenditures.