MARCH, 2020

CHEMICAL HYGIENE PLAN

UNC CHARLOTTE
9201 UNIVERSITY CITY BLVD., CHARLOTTE, NC
28223

TABLE OF CONTENTS

List of Appendices

1.0 Purpose and Scope

The University Chemical Hygiene Plan sets forth procedures, work practices and equipment intended to protect laboratory workers from safety and health hazards presented by the laboratory use of hazardous chemicals. The basis for the Chemical Hygiene Plan is the Occupational Safety and Health Administration (OSHA) standard 1910.1450 - Occupational exposure to hazardous chemicals in laboratories, hereafter referred to as the "Lab Standard"). Definitions of key terms used in the Chemical Hygiene Plan can be found in the definitions section of the OSHA Lab Standard - 1910.1450 (b). A review of the definitions for "hazardous chemical," "laboratory," "laboratory scale," and "laboratory use of hazardous chemicals" confirms that the Lab Standard applies to most University laboratories.

The University Chemical Hygiene Plan includes:

1. The assignment of responsibilities under the plan, in addition to those set forth in the University Environmental Health and Safety (EHS) Policy (Policy Statement 703);
2. General principles for working with laboratory chemicals;
3. Guidelines for the development of laboratory facilities;
4. Standard Operating Procedures (SOPs) for the use of University laboratory facilities;
5. Basic rules and procedures for working with chemicals; and
6. Appendices that provide information useful in compliance with the Lab Standard and this document.

The University Chemical Hygiene Plan shall be reviewed at least annually by the EHS Chemical Hygiene Officer (CHO) and revised as needed.

2.0 Chemical Safety and Hygiene Responsibilities

In addition to those defined by the University Policy Statement 703, the following individuals assume responsibility for the implementation of this plan as described below.

1. Executive Leadership: The University of North Carolina at Charlotte has the responsibility to ensure compliance with the Occupational Safety and Health Administration (OSHA) compliance regulations.

2. The EHS Director is responsible for:

   a. Planning and recommending EHS programs which comply with all federal, state and local laws and regulations;
   b. Overseeing the activities of the CHO;

3. The CHO, under the direction of the EHS Director, has responsibility to:

   a. Develop the Chemical Hygiene Plan and program;
   b. Provide technical guidance to Department Heads, Supervisors, and Laboratory workers in the development and implementation of the provisions of the Chemical Hygiene Plan;
   c.. Annually review the chemical hygiene program and seek ways to improve it.

4. The Department Head (Chair, Director) has overall responsibility for chemical hygiene within their respective department, including the following:

a. Planning and developing budget requests that ensures that the necessary health and safety measures under the Chemical Hygiene Plan are implemented;
b. Developing and fostering proper attitudes towards Health and Safety;
c. Enforcing Environmental Health and Safety requirements by invoking disciplinary action or administrative sanction.

5. The Principal investigator (PI) / Lab Manager has overall responsibility for chemical hygiene in the laboratory, including responsibility to:

   a. Be familiar with the regulations and University policies and programs, which pertain to his or her laboratory;
   b. Provide regular, informal chemical hygiene and housekeeping inspections, including routine inspections of emergency equipment (in addition to, or in conjunction with, Laboratory reviews performed by EHS);
   c. Produce an annual chemical inventory list utilizing the UNCC Chemical Inventory Form, which includes all chemicals present in their laboratory spaces;
   d. Determine (with the assistance of EHS) the required levels of protective apparel and equipment, ensure its availability to laboratory personnel and enforce its use;
   e. Request assistance from EHS as needed;
   f. Ensure that employees are trained to know and follow the Chemical Hygiene Plan requirements;
   g.. Ensure that the laboratory is properly decommissioned, in conjunction with the EHS Office, after the completion of research activities and prior to departure from the University.

6. Laboratory workers are responsible for:

   a. Understanding and complying with University policies and programs, which pertain to his or her laboratory, work, including the planning and conducting of each operation in accordance with the University Chemical Hygiene Plan;
   b. Using appropriate personal protective equipment as required by the operation being conducted;
   c. Attending program training as required by their supervisor.

3.0 Laboratory Safety Plans

The PI or lab manager shall ensure that their laboratory has a laboratory specific safety plan. EHS has developed safety tools that can be used to develop a laboratory specific safety plan.

A **Laboratory Safety Plan** including Chemical Guidance Documents provided by EHS that is pertinent to the individual laboratory. Some examples of these guidance documents include

- Completed Lab Safety Plan template specific to the lab
- Chemical Standard Operating Procedures, including but not limited to:
  - Diethyl Ether
  - Ethidium Bromide
  - Hydrogen Peroxide (>30%)
  - Nitric Acid

- Chloroform
- Formalin and Paraformaldehyde
- Sulfuric Acid
- Acrylamide

- Experiment Standard Operating Procedures not provided on EHS website.

4.0 The Laboratory Facility

The laboratory facility should have adequate, well-ventilated stockrooms/storerooms, laboratory hoods, sinks and other safety equipment, including eyewash fountains and drench showers. There should be an alarm system to alert occupants to fires and other incidents in all parts of the facility, including isolation areas such as cold rooms.

4.1 Housekeeping

Floors should be cleaned regularly. Stairways and hallways should not be used as storage areas. Access to exits, emergency equipment, and utility controls should never be blocked. The work area should be kept clean, and chemicals and equipment should be properly stored. Lab workers should always keep their immediate work area uncluttered, and clean it up upon completion of an operation and at the end of each day.

4.2 Maintenance

Equipment should be maintained in serviceable condition. Preventive maintenance schedules should be established for equipment as required. Machine guards and shielding should remain in place, and be replaced if removed for maintenance or repairs.

4.3 Signage

The following signs should be posted conspicuously:

- Emergency telephone numbers of emergency personnel/facilities and supervisors should be posted on or near the entrance door. Warnings at areas or equipment where special or unusual hazards exist.

4.4 Safety Equipment

Safety and emergency equipment should be available. This includes (where applicable):

- Drench-type safety shower;
- Eyewash fountain;
- Fire extinguisher;
- Fire alarm and telephone for emergency use must be easily accessible to each lab;
- Chemical Spill Kits pertinent to the chemicals used in each area;
- First Aid Kits.

4.5 General Ventilation

The general ventilation system should have air intakes and exhausts located to avoid the intake of contaminated air. This system must provide a source of fresh air for occupants and for replacement of air exhausted by local ventilation devices (hoods), but it should not be relied on for protection from toxic substances released into the laboratory. Problems with the general ventilation of the laboratory should be reported to Facilities Management.

4.6 Local Exhaust Ventilation (Fume Hoods)

The chemical fume hood is an important engineering control in the reduction and prevention of exposure of laboratory workers to hazardous materials found in the laboratory. It is an effective means of capturing toxic, carcinogenic, offensive or flammable mists, vapors, fumes or dusts that would otherwise be released into the laboratory environment. Hoods can also provide a physical containment for laboratory operations.

Laboratory hoods should have a continuous monitoring device to allow convenient confirmation of adequate hood performance before use. Airflow into and within the hood should not be excessively turbulent; hood face velocity should be adequate (typically 80-100 linear feet per minute). Laboratory fume hoods will be inspected and certified by EHS. Fume hoods not meeting the required face velocity will be removed from service, as required by the Lab Standard.

Laboratory hoods should not be used for chemical storage. Excessive loading of the bench significantly detracts from hood performance. Ventilated storage cabinets, canopy hoods, snorkels, etc. should be provided as needed. Allowing volatile chemicals to evaporate within the hood is an unacceptable means of disposal.

When necessary, equipment in hoods should be fitted with traps, condensers or filters to remove hazardous gases, vapors or dusts and prevent their release to the environment. Operations should be performed at least six inches from the face of the hood to prevent interference from cross drafts (a stripe on the bench surface is a good reminder). Place large objects in the hood up on blocks to allow airflow under them. When the hood is in use, the sash should be lowered as far as practical. The sash should not be raised above the 100 feet per minute (fpm) mark when hazardous substances are being used in the hood. The sash can protect workers from chemical splashes and sprays, as well as fires and minor explosions.

When a hood is found to be out of order, all hazardous chemicals should be capped or removed. Laboratory personnel should contact Facilities Management as soon as possible for repair. The hood should be clearly labeled as “Out of Order” until repaired.

Do not use perchloric acid in an ordinary laboratory fume hood. When perchloric acid is heated above ambient temperature, vapors may condense within the exhaust system and form explosive perchlorates. To use perchloric acid, a special perchloric acid hood with a dedicated exhaust and wash down system is required. Identify perchloric hoods with appropriate signage, and do not use them as general-purpose fume hoods. Contact EHS

for additional considerations, procedures and precautions for the selection and use of perchloric acid fume hoods.

5.0 Chemical Receiving, Distribution and Storage

5.1 Receiving

Before a substance is received, the individual who requisitioned the material must obtain information on proper handling, storage, and disposal. They must be aware of all hazardous properties of the material and determine if the facilities where it will be used and the training of the personnel involved are adequate. Often the Safety Data Sheet (SDS) will provide the required information. An accessible copy of the SDS must be kept in the Laboratory/Department. Receiving personnel should be advised that the material has been ordered and should be familiar with the appropriate DOT shipping labels. No container will be accepted without an appropriate identifying label.

The label should contain the following information (as a minimum):

1. Name, address and telephone Number of the chemical manufacturer, importer or other responsible party;
2. Product Identifier;
3. Signal Word;
4. Hazard Statement(s);
5. Precautionary Statement(s);
6. Pictogram(s).

5.2 Chemical Distribution

The method of transport of chemicals should reflect both the potential danger and the potential for facility disruption posed by a specific substance. For example, for highly toxic or caustic materials, particular attention must be paid to the personal protection of the transporter.

When chemicals are hand carried, the container should be placed in an outside container or bucket. Freight-only elevators should be used when possible. Carts should be sturdy and have adequately sized wheels. Flammable liquids should only be transported in proper containers.

Compressed gas cylinders must be handled carefully. The valve cover must always be in place for transport. Cylinders should never be rolled or dragged. A handcart should be utilized with the cylinder strapped in place, even for short distances.

5.3 Chemical Storage

Due to the huge array of chemicals that are found in the academic laboratory, chemical storage at a university is a complex subject. Below are some general guidelines. Information on the storage of a specific chemical can be obtained from the Laboratory Chemical Storage Scheme Table, the container label, the SDS, or by contacting EHS.

Chemicals that are highly toxic should be stored in unbreakable secondary containers. Stored chemicals should be examined periodically for deterioration and container integrity. It is recommended that chemicals that are more hazardous be stored below eye level. Chemicals should not be stored on the floor. Chemicals should be stored on shelves containing a lip to avoid accidental spillage.

Pyrophoric materials must be stored in tightly closed containers under an inert atmosphere or liquid. Pyrophoric materials are those that are capable of spontaneous combustion in the presence of air (see Appendix H). All transfers and manipulations of pyrophoric materials must also be carried out under an inert atmosphere or liquid.

Compressed gas cylinders must be stored in an upright position and securely restrained. Full cylinders not in use should have the valve cover in place. Full cylinders must be kept separate from empty cylinders. Cylinders with flammable contents should be separated from oxygen containing cylinders by at least 20 feet when not in use.

Amounts of chemicals stored within the laboratory itself should be as small as practical. Storage on bench tops and in hoods is inadvisable. Exposure to heat or direct sunlight should be avoided. Periodic inventories should be conducted, with unneeded items being discarded or returned to the storeroom/stockroom.

Chemicals should be grouped according to the following (many have special storage requirements):

1. Flammable liquids (see Appendix A) should be stored in flammable-liquid cabinets or specially designed "explosion-proof" refrigerators. If the laboratory contains ten or more gallons of flammable liquids, the use of a flammable-liquid cabinet is mandatory. Generally includes peroxide forming chemicals (also see Appendix A), which have the potential for explosion, and shall be stored in a cool, dark, dry location, with appropriate labels which include the date opened. These chemicals should be disposed of as hazardous waste upon the date of manufacturer's expiration. As an alternative to disposal, the laboratory may conduct documented monthly tests for the presence of peroxides.

2. Volatile toxics and poisons (see Appendix B) – Can be stored with flammables in a flammable storage cabinet if there are no other incompatible considerations. Alternative is any enclosed cabinet or shelf to protect from breakage below bench level. These are not to be stored with bases.

3. Oxidizing and non-oxidizing inorganic acids (see Appendix C) - should be stored in corrosives cabinets, separate from non-oxidizing inorganic acids, flammables, and each other by containment trays.

4. Organic Acids (See Appendix D) – should be stored in a vented cabinet under a fume hood. Do not store with bases. Acetic Acid is best stored in a flammable cabinet with other flammables.

5. Concentrated inorganic bases (Appendix E) should be stored separately from inorganic acids and halogenated organics (volatile toxics).

6. Oxidizing Liquids and Reactives, excluding oxidizing acids – (Appendix F) should be stored separately from all other chemicals as they are highly reactive. Never store these with flammables.

7. Non-volatile Toxics – (Appendix G) - may be stored in any storage area, according to its chemical properties. However, they should bear the appropriate warning label (when required).

8. Pyrophorics and Water Reactives – (Appendix H) – these products should always be isolated from other liquid chemicals and in double containment. They can be stored with dry chemicals if necessary.

9. Dry Solids (Appendix I) – This general grouping of chemicals should always be kept dry. Cabinets are the suggested means of storage. Always store above liquid chemicals, and keep the more toxic dry solids separate from non-toxics.

5.4 Chemical Labeling

Chemical containers stored in the laboratory must meet minimum labeling requirements.

Manufacturer original chemical container labels must contain:

- Name, address and telephone number of manufacturer;
- Product Identifier;
- Signal Word;
- Hazard Statement(s);
- Precautionary Statement(s);
- Pictogram(s).

Secondary chemical container labels must contain:

- Product Identifier(s) as listed on the Safety Data Sheet or the manufacturer's primary container. Refer to the SDS of that chemical for acceptable product identifier synonyms; as a general rule, the use of molecular formulas as product identifiers is prohibited.

Note: Pictogram(s) or other symbol system can be added as a best practice for labeling.

6.0 Principles and Procedures for Working with Laboratory Chemicals

6.1 General

It is prudent to minimize all chemical exposures. Because few laboratory chemicals are without hazards, general precautions for handling all laboratory chemicals should be adopted, in addition to specific guidelines for particular types of chemicals. Potential skin contact with chemicals should be avoided.

Avoid underestimation of risk. Even for substances of no known significant hazard, exposure should be minimized; for work with substances that present special hazards, special precautions should be taken. One should assume that any mixture would be more toxic than its most toxic components and that all substances of unknown toxicity are toxic. Care must be taken to avoid chemical incompatibilities when planning experiments and operations. Check the chemical Safety Data Sheets or contact EHS for guidance.

Provide adequate ventilation. The best way to prevent personnel exposure to airborne substances is to prevent their escape into the working atmosphere, by use of hoods and other ventilation devices.

Two recognized exposure guidelines include OSHA Permissible Exposure Limits (PELs) and American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs). Contact EHS for assistance in identifying and measuring chemical exposure.

The Chemical Hygiene Plan requires that laboratory workers know and follow Plan rules and procedures. In addition to the general principles mentioned above, the following procedures and rules should be used for essentially all laboratory work with chemicals:

6.2 Avoidance of "routine" exposure

1. Develop and encourage safe habits.
2. Avoid unnecessary exposure to chemicals by any route.
3. Do not smell or taste chemicals.
4. Vent apparatus, which may discharge toxic chemicals (vacuum pumps, distillation columns, etc.) into fume hoods.
6. Do not allow release of toxic substances in cold rooms and warm rooms, since these often have contained, recirculated atmospheres.
7. Use only those chemicals for which the available ventilation system is appropriate.

6.3 Equipment and glassware

1. Handle and store laboratory glassware with care to avoid damage; do not use glassware that is cracked, scratched, or showing other signs of wear or damage.
2. Use extra care with evacuated glass apparatus; shield or wrap to contain chemicals and fragments should implosion occur.
3. Use equipment only for its designed purpose.
4. In the event of breakage, clean broken glassware with a brush and dustpan. Always wear hand protection if it is necessary to handle broken glassware.
5. Never dispose of broken glass in the laboratory's general trash container. Place all broken glassware in separate, dedicated puncture-proof box with a clear plastic liner.

6.4 Personal habits

1. Wash areas of exposed skin well before leaving the laboratory.
2. Avoid practical jokes or other behavior that might confuse, startle or distract another worker.
4. Be alert to unsafe conditions and see that they are corrected when detected.
5. Do not eat, drink, smoke, chew gum, or apply cosmetics in laboratories or areas where laboratory chemicals are present.

6. Avoid storage of food or beverages in refrigerators which are also used for laboratory operations.

6.5 Personal and protective apparel

1. Long hair should be confined.
2. Lab workers should not wear loose fitting or dangling clothing.
3. Clothing should cover as much of the worker's skin as possible.
4. Lab workers must wear close-toed shoes at all times in the laboratory..
5. Protective apparel (lab coats, safety eyewear, aprons, shoe covers etc.) with the required degree of protection for substances being handled should be available for each lab worker and visitor as appropriate.

6.6 Personal protective equipment

1. It is recommended that all persons, including visitors, where chemicals are stored or handled, wear appropriate eye protection. Wear appropriate gloves when the potential for contact with toxic materials exists; inspect the gloves before each use, wash them before removal, and replace them periodically.
2. Contact EHS for selection and use of respiratory protection, including filtering facepieces (N-95). Refer to the UNC-Charlotte Respiratory Protection Program.
3. Use any other protective and emergency apparel and equipment as appropriate.
4. If contact lenses are worn in the laboratory, inform supervisor so special precautions can be taken.
5. Remove laboratory coats immediately when they become significantly contaminated.

6.7 Planning

1. Seek information and advice about hazards.
2. Plan appropriate protective procedures.
3. Plan the positioning of equipment before beginning any new operation.
4. Identify locations of safety equipment such as eyewash/shower stations, spill control equipment, and first-aid supplies.

6.8 Unattended operations

1. Leave the lights in the laboratory on.
2. Place an appropriate sign on the door.
3. Provide for containment of toxic substances in the event of failure of a utility service (such as cooling water).

6.9 Use of fume hood(s)

1. Use the hood per manufacturer's instructions for operations that might result in release of chemical vapors or dust.
3. Confirm hood is performing adequately before using it by checking the EHS inspection sticker date and flow gauge reading (where applicable).
4. Do not use Perchloric Acid, Hydrofluoric Acid, or Radiation in a hood. Please contact EHS for approval.
5. Keep hood sash closed at all times, except when adjustments within the hood are being made.
6. Work at least 6 inches inside fume hood sash while wearing appropriate PPE. The general PPE requirement is lab coat, protective chemical resistant gloves, safety glasses and closed toed shoes.

7. Minimize traffic near the hood, especially when conducting hazardous work.
8. Keep materials stored in hoods to a minimum and do not allow them to block vents or airflow. Keep the work area and bottom baffles clear from clutter.
9. Remove any electrical units or spark sources from hood when using flammable liquids and/or gases.
10. Do not raise the hood above the arrow indicator when working with hazardous chemicals inside the hood.
12. Do not modify the hood by adding unauthorized manufacture shelving, removing side panels, blocking air foil or any other manufacture unapproved modification.
13. Only use the fume hood for it is intended purpose. Do not use the fume hood for virology or bacteriology work. This work should be completed in a biosafety cabinet.

6.10 Working alone

1. Avoid working alone in a building.
2. Do not work alone in a laboratory if the procedures being conducted are hazardous.

6.11 Working with Particularly Hazardous Substances

One goal of the Chemical Hygiene Plan and program is to minimize exposure to particularly hazardous substances, which include select carcinogens, reproductive toxins and substances which have a high degree of acute toxicity. Conduct all transfers and work with these substances in a designated area (e.g., a restricted access hood, glove box, or portion of a lab designated for their use; for which all people with access are aware of the substances being used and necessary precautions). Assure that the designated area is conspicuously marked and that all containers of these substances are appropriately labeled with identity and warning labels.

Environmental Health and Safety has developed Standard Operating Procedures for many of the common Particularly Hazardous Substances utilized in campus research labs.

.

7.0 Spills and Accidents

A written emergency plan should be established and should include pertinent emergency procedures. Accidents or near accidents should be carefully analyzed with the results distributed to all who might benefit.

7.1 Incidental spills with human contamination

1. Be prepared, know where the nearest eyewash and safety shower are located.
2. Eye Contact: Promptly flush eyes with water for a prolonged period (15 minutes) while holding the eyes open (manually if necessary) and rotating the eyeballs; then seek medical attention.
3. Ingestion: Encourage the victim to drink large amounts of water. Do not induce vomiting, unless instructed to do so by the SDS or other credible source.
4. Skin Contact: Promptly flush the affected area with water (15 minutes) and remove any contaminated clothing or jewelry. When removing pullover shirts and sweaters, take care not to contaminate the eyes. Wash affected areas with mild soap. If symptoms persist after washing, seek medical attention.
5. Consult the SDS for first-aid recommendations. Keep the SDS with the victim.

6. Promptly clean up spills, using appropriate protective apparel, equipment, and dispose of all contaminated materials in accordance with the University Hazardous Waste Management Program.
7. For minor spills, contact Laboratory Safety Manager / EHS CHO at 704-687-1111.

7.2 Incidental spills with no human contamination

1. Warn all nearby people of the spill and potential danger.
2. If the material is flammable (see Appendix A), turn off all possible sources of ignition such as Bunsen burners (DO NOT TURN OFF or ON electrical switches).
3. Evaluate the hazardous properties and size of the spill to determine if evacuation of the building or additional assistance are needed.
4. Contain the spill (keep doors closed, close the fume hood sash if spill in hood, etc.)
5. Absorb liquid spills using commercially available spill absorption materials while wearing appropriate personal protective equipment.
6. Dispose of all contaminated materials in accordance with the University Hazardous Waste Management program.

7.3 Major spills

On the UNC Charlotte campus, "large" spills of volatile hazardous materials must be referred to the Campus Police by calling 911 from a campus phone or 704-687-2200 from any phone. Campus Police will make contact with Charlotte Fire Department (CFD) and EHS Office. Hazardous Materials Response Team will respond if conditions warrant. For major spills, it is important to immediately leave the area and inform building occupants of the situation. The following are criteria that clearly indicate a "major" spill:

- The need to evacuate employees;
- The need for a response from outside the immediate release area;
- The release has potential to:
    - Be immediately dangerous to life and health;
    - Pose a serious threat of fire and/or explosion;
    - Cause high levels of exposure to toxic substances.
- Uncertainty by lab members that the spill can be contained / cleaned;
- Unclear situations.

8.0 Personal and Environmental Monitoring

Regular measurement of airborne concentrations of hazardous chemicals is not usually justified or practical in laboratories, but may be appropriate when testing or redesigning fume hoods or other ventilation devices, or when a highly toxic substance is stored or used regularly. It is sometimes necessary to perform personal air sampling on an individual lab worker. EHS must be contacted if a lab worker believes they have received a significant chemical exposure or exhibits signs or symptoms of an overexposure to a chemical used in the lab. In addition, if there is any reason to believe that an employee's exposure approaches the OSHA action level or OSHA permissible exposure level EHS must be contacted.

EHS will evaluate exposure potential, perform personal or environmental sampling as appropriate or required, and make recommendations for reducing exposure. Lab workers will be notified in writing with the results of air monitoring.

9.0 Medical Program

If a laboratory worker develops signs or symptoms associated with a hazardous chemical to which the lab worker may have been exposed, they shall be provided the opportunity to receive an appropriate medical examination. If exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the PEL) for an OSHA regulated substance for which there are medical surveillance requirements, medical surveillance shall be established for the lab worker as prescribed by the particular standard. If an event takes place in the lab such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure, the affected lab workers shall be provided with the opportunity for a medical examination.

Anyone who believes they are exposed to, or whose work involves regular and frequent handling of, toxicologically significant quantities of a chemical should contact EHS for referral to a qualified physician to determine on an individual basis whether a regular schedule of medical surveillance is desirable.

10.0 Training Program

The goal of information dissemination and training is to assure that individuals at risk are adequately informed about the nature of work in the laboratory, its risks, and what to do if an accident occurs. Literature and consulting advice concerning chemical hygiene is readily available to laboratory personnel through EHS.

The PI, instructor or lab manager shall ensure that lab workers receive the required training. EHS has developed laboratory safety training courses that will assist PI's with meeting basic safety training requirements. Training shall be at the time of initial assignment to the laboratory and periodically thereafter as needed. Training must be documented and at a minimum cover the following requirements:

1. The contents of the OSHA Lab Standard and its appendices
2. The location, availability and applicable contents of the University Chemical Hygiene Plan
3. The permissible exposure limits for OSHA regulated substances used in the lab; or, if the OSHA does not regulate substance; the NIOSH recommended exposure limit or ACGIH threshold limit value
4. Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory
5. The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to SDSs received from the chemical supplier
6. Methods and observations that may be used to detect the presence or release of a hazardous chemical (such as monitoring conducted by EHS, continuous monitoring devices, visual appearance or odor of hazardous chemicals being released, etc.)
7. The physical and health hazards of chemicals in the laboratory and the measures lab workers can take to protect themselves from these hazards, including specific procedures the University

has implemented to protect lab workers from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used

11.0 Inspections

As described in Section 3.0 of the Chemical Hygiene Plan, it is the responsibility of the PI or Lab Manager to conduct regular, informal Chemical Hygiene and Housekeeping inspections of their laboratory. EHS has developed an easy to use Laboratory Safety Checklist that can be utilized by the PI / Lab Manager for this important responsibility. Please contact EHS for a copy of the Laboratory Safety Checklist.

Additionally, the EHS office is charged with conducting or overseeing formal Chemical Hygiene Plan inspections for laboratories. These may come in the form of announced or unannounced visits, with the scope of these inspections falling within the realm of the Chemical Hygiene Plan and/or General safety measures.

12.0 Waste Disposal Program

The goal of proper waste disposal is to assure that minimal harm to people, other organisms, and the environment will result from the disposal of laboratory chemicals. Hazardous waste disposal shall be in accordance with the University Hazardous Waste Management Program. Unlabeled containers of chemicals and solutions should undergo prompt disposal; if partially used, they should not be opened except by highly trained personnel using appropriate personal protective equipment.

Before a worker's employment in the laboratory ends, chemicals for which that person was responsible should be discarded or returned to storage. Indiscriminate disposal by pouring waste chemicals down the drain or adding them to mixed refuse for landfill burial is unacceptable. Hoods should not be used as a means of disposal for volatile chemicals. Disposal by recycling or chemical decontamination should be used when possible.

13.0 Records

This section reviews the requirements for documenting the University's compliance with the Chemical Hygiene Laboratory Standard. The Laboratory Standard requires the following records be maintained for at least 30 years and that they be accessible to the laboratory workers or their representative.

- Air concentration monitoring results
- Exposure assessments
- Medical evaluations
- Medical examination

In additional to the above, training, complaint, equipment repair, inspection and incident records should be retained.

Appendix A Flammables/Combustibles and

Peroxide Formers

FLAMMABLES AND COMBUSTIBLES

2-MERCAPTOETHANOL
2-NITROPROPANE
ACETIC ACID, GLACIAL
ACETONE
BENZALDEHYDE
BENZENE
BENZYL ALCOHOLS
BROMOBENZENE
CARBON DISULFIDE
CAPROIC ACID
CHLOROBENZENE
COLLODION
CYCLOHEXANOL
DIMETHYL SULFIDE
EPICHLOROHYDRIN
ETHYL ACETATE
ETHYL ALCOHOL
ETHYLENE GLYCOL
ETHYLENE OXIDE
FORMIC ACID
GASOLINE
METHACRYLIC ACID
METHYL ALCOHOL
METHYL ETHYL KETONE
MORPHOLINE
N-HEXANE
NITROBENZENE
N-BUTANOL
PENTANE
PHENYL ETHER
PROPANE
PYRIDINE
STEARIC ACID
STODDARD SOLVENT
TEMED
TERT BUTYL ISOCYANATE
TOLUENE TRIETHYLAMINE
TURPENTINE
TERT BUTYL ISOCYANATE
XYLENE

Reference:
Safety data sheets (SDS)
National Fire Protection Agency document NFPA 321: *Classification of Flammable and Combustible Liquids*, 1991 Edition.

PEROXIDE FORMERS

1-PENTENE
1,3,5,7-CYCLOOCTATETRAENE
2-BUTANOL
2-PENTANOL
2-PROPANOL
4-METHYL-2-PENTANONE
ACETAL
ACETALDEHYDE BENZYL
ALCOHOL BUTADIENE
BUTYL ETHER
CROTONALDEHYDE
CUMENE
CYCLOHEXANE
CYCLOPENTENE
DECALIN(DECAHYDRONAPHTHALENE)
DIBUTYL ETHER
DIETHYLENEGLYCOL
DIMETHYL ETHER
DIETHYL ETHER
DIETHYLENE OXIDE
DIISOPROPYL ETHER
DIOXANE
DIVINYL ACETATE
DIVINYL ETHER
ETHER
ETHOXY ACETATE
ETHYL ETHER
ETHYLENE GLYCOL MONO ETHER
ETHYLENE GLYCOL DIMETHYL ETHER
FURAN
HEXONE
ISOPROPYL ETHER
METHYL ISOBUTYL KETONE
PERFLUOR ETHENE
POTASSIUM AMIDE
SODIUM AMIDE
STYRENE
TETRAFLUOROETHYLENE
TETRAHYDROFURAN
TETRAHYDRO NAPHTHALINE
VINYL ACETATE
VINYL ACETYLENE
VINYL CHLORIDE
VINYL ETHERS
VINYLIDENE CHLORIDE

Appendix B

Volatile Toxins (Halogenated Solvents, Carcinogens,.Toxins)

ACETONITRILE
CARBON TETRACHLORIDE
CHLROFORM
DICHLOROMETHANE
DIMETHYL SULFATE
DIMETHYL SULFOXIDE
HALOGENATED ORGANICS
HALOMETHANE
HALOTHANE
MERCAPTOETHANOL
METHYLENE CHLORIDE
PERFLUOROHEXANE
PHENOL
TRITON X100

KNOWN CARCINOGENS

ACETALDEHYDE
AMINOBIPHENYL
ARSENIC
ASBESTOS
AZATHIOPRINE
BENZENE
BENZIDINE
BERYLLIUM COMPOUNDS
BIS(CHLOROMETHYL) ETHER
1,4-BUTANEDIOL DIMETHYL-SULFONATE
1,4-BUTANEDIOL DIMETHYL-SULFONATE
CHROMIUM / CHROMIUM COMPOUNDS
CYCLOPHOSPHAMIDE
ETHYLENE OXIDE
FORMALDEHYDE
SILICA DUST (AS QUARTZ/CRISTOBALITE)
VINYL CHLORIDE

Reference: National Toxicological Report KNOWN CARCINOGENS, 7th ANNUAL REPORT ON CARCINOGENS 199

Appendix C

Inorganic Acids

OXIDIZING

CHLORIC ACID
CHLOROSULFONIC ACID
CHROMIC ACID
FLOUROSULFONIC ACID
NITRIC ACID
NITROSULFONIC ACID
PERCHLORIC ACID
SELENIC ACID
SULFURIC ACID

NON-OXIDIZING

BORIC ACID
HYDROBROMIC ACID
HYDRIOTIC ACID
HYDROCHLORIC ACID
HYDROFLUORIC ACID
PHOSPHORIC ACID
SULFURYL ACID

Appendix D

Organic Acids

ACETIC ACID
ACRYLIC ACID
ACETIC ANHYDRIDE
BENZOYL BROMIDE
BENZOYL CHLORIDE
BENZYL BROMIDE
BENZYL CHLORIDE
BUTYRIC ACID
CHLOROACETIC ACID
DIMETHYL SULFATE
FORMIC ACID
GLACIAL ACETIC ACID
ISOBUTYRIC ACID
LACTIC ACID METHYL
CHLOROFORMATE PHENOL
PICRIC ACID
PROPIONIC ACID
PROPIONYL BROMIDE
PROPIONYL CHLORIDE
SALICYLIC ACID
TRICHLOROACETIC ANHYDRIDE
TRIFLUOROACETIC ACID

Appendix E Inorganic

Bases / Alkaline

AMMONIUM HYDROXIDE
AMMONIUM SULFIDE
BARIUM HYDROXIDE
CALCIUM HYDRIDE
CALCIUM HYDROXIDE
CALCIUM OXIDE
HYDRAZINE
POTASSIUM HYDROXIDE
SODIUM CARBONATE
SODIUM HYDROXIDE
SODIUM HYDRIDE
STRONTIUM CARBONATE

Appendix F

Common Laboratory Oxidizers (Excluding Acids)

THE FOLLOWING CLASSES OF CHEMICALS ARE USUALLY CLASSIFIED AS OXIDIZERS:

BROMATES	CHLORATES	PERCHLORATES	CHLORITES
CHROMATES	HYPOCHLORITES	DICHROMATES	PEROXIDES
SUPEROXIDES	NITRATES	NITRITES	PERMANGANATES
PERSULFATES			

SOME SPECIFIC EXAMPLES:

AMMONIUM PERCHLORATE	AMMONIUM PERMANGANATE
BARIUM PEROXIDE	BROMINE
CALCIUM CHLORATE	CALCIUM HYPOCHLORITE
CHLORINE TRIFLUORIDE	CHROMIUM ANHYDRIDE
CHROMIC ACID	DIBENZOYL PEROXIDE
FLUORINE	HYDROGEN PEROXIDE (>30%)
LEAD DIOXIDE	MANGANESE DIOXIDE
MAGNESIUM PEROXIDE	NITROGEN TRIOXIDE
PERCHLORIC ACID	POTASSIUM BROMATE
POTASSIUM CHLORATE	POTASSIUM PEROXIDE
PROPYL NITRATE	SODIUM CHLORATE
SODIUM CHLORITE	SODIUM PERCHLORATE

References: CRC Handbook of Laboratory Safety, 3rd edition.

Appendix G

Non-Volatile Toxins

ACRYLAMIDE
BROMOPHENOL BLUE
ETHIDIUM BROMIDE
FORMAMIDE
IGEPAL
SODIUM DODECYL SULFATE
TRIETHANOLAMINE TRIZMA
BASE

Appendix H

PYROPHORIC AND WATER REACTIVE CHEMICALS

Pyrophoric Materials

Class of Pyrophoric Compounds	Examples
Finely divided metals	calcium, zirconium
Alkali metals	sodium, potassium
Metal hydrides or nonmetal hydrides	germane, diborane, sodium hydride, lithium aluminum hydride
Partially or fully alkylated derivatives of metal and nonmetal hydrides	diethylaluminum hydride, trimethylphosphine
Alkylated metal alkoxides or nonmetal halides	diethylethoxyaluminum, dichloromethylsilane
Metal carbonyls	pentacarbonyliron, octacarbonyldicobalt, nickel carbonyl
Used hydrogenation catalysts	Especially hazardous because of the adsorbed hydrogen
Phosphorus (white)	Grignard reagents

Water Reactive Materials

Aluminum Alkyl Halides	Ferrosilicon
Aluminum Alkyl Hydrides	Lithium
Aluminum Borohydride	Lithium Borohydride
Aluminum Carbide	Lithium Hydride
Aluminum Ferrosilicon	Lithium Nitride
Aluminum Hydride	Lithium Silicon
Aluminum Phosphide	Magnesium Alkyls
Barium	Magnesium Hydride
Calcium	Magnesium Phosphide
Calcium Carbide	Methyl Magnesium Bromide, in ethyl ether
Calcium Hydride	Potassium Alloys
Calcium Phosphide	Rubidium
Calcium Silicide	Sodium
Cesium	Sodium hydride
Diethyl, Demethyl Zinc	Trichlorsilane
Ethyldichlorisilane	Zinc powder

Reference: *Bretherick's Handbook of Reactive Chemical Hazards*.

Appendix I – Dry Solids

Common Dry Solids

The following are some common dry solids found at University of North Carolina-Charlotte

AGAROSE
ALBUMIN, FROM BOVINE SERUM
ALUMINA ALUMINUM CHLORIDE ALUMINUM OXIDE AMMONIUM ACETATE AMMONIUM CARBONATE
AMMONIUM PERSULFATE AMMONIUM SULFATE BORIC ACID
BOVINE SERUM ALBUMIN BROMOPHENOL BLUE CALCIUM CARBONATE CITRIC ACID
CUPRIC SULFATE DODECYL SULFATE
EDTA
EGTA
ETHYLENE OXIDE
GLYCINE
HYDRAZINE HYDRATE
HYDROXYLAMINE
HYDROCHLORIDE
IMIDAZOLE
L-ASCORBIC ACID
MAGNESIUM SULFATE
METALS, VARIOUS
METHYL CELLULOSE
OXALIC ACID
PARAFORMALDEHYDE
PONCEAU S
POTASSIUM CARBONATE
POTASSIUM CHLORIDE
POTASSIUM HYDROXIDE
POTASSIUM PHOSPHATE
SALICYLIC ACID
SODIUM ACETATE
SODIUM AZIDE
SODIUM BICARBONATE
SODIUM CHLORIDE
SODIUM HYDROXIDE
SODIUM THIOCYANATE
SUCCINIC ACID
SUCROSE
SULFANILAMIDE
TRIS BASE
UREA