

# **CHEMICAL HYGIENE PLAN**

University of North Florida

Reference 29 CFR 1910.1450

Occupational Exposure to  
Hazardous Chemicals in Laboratories

Revised April 2010

## **FOREWORD**

On January 31, 1990, the Occupational Safety and Health Administration (OSHA) promulgated a final rule for occupational exposure to hazardous chemicals in laboratories (The Lab Standard). Included in the standard, which became effective on May 1, 1990, is a requirement for all impacted employers to develop and carry out the provisions of a Chemical Hygiene Plan (CHP). The standard requires that the CHP be developed and implemented by January 31, 1991. A CHP is defined as a written program which sets forth procedures, equipment, personal protective items and work practices capable of protecting employees from the health hazards presented by chemicals used in the laboratory.

Components of the CHP must include standard operating procedures for safety and health, criteria for the implementation of control measures, procedures to ensure proper operation of engineering controls, provisions for training and information dissemination, permitting requirements, provisions for medical consultation, designation of responsible personnel including the Chemical Hygiene Officer (CHO), Lab Manager and Lab Supervisors and identification of particularly hazardous substances.

This plan is the CHP developed for the University of North Florida. This CHP is available to laboratory employees in all campus locations via the UNF web page. All laboratory personnel must know and follow the procedures outlined in this plan. All operations performed in the laboratory must be planned and executed in accordance with this document. In addition, each employee is expected to develop safe personal chemical hygiene habits aimed at the reduction of chemical exposures to themselves and others.

This document was developed to comply with the referenced OSHA 1910.1450 standard. The departments of Physical Facilities, Campus Planning and Environmental Health & Safety will assist the CHO and Lab Manager in maintaining the facilities and procedures employed in the laboratory compatible with current knowledge and regulations in laboratory safety. This CHP will be reviewed, evaluated, and updated at least annually and is readily available to employees, their representatives and any representative of the Florida Department of Labor and Employment Security.

## TABLE OF CONTENTS

### Section and Title Page

FOREWORD	i
TABLE OF CONTENTS	ii
1.0 Standard Operating Procedures for Laboratory Chemicals	1
1.1 Chemical Procurement	1
1.2 Chemical Storage	1
1.3 Chemical Handling	3
1.4 Laboratory Equipment and Glassware	4
1.5 Personal Protective Equipment	5
1.6 Personal Work Practices	6
1.7 Labeling	7
2.0 Criteria for Implementation of Control Measures	7
2.1 Air Sampling	7
2.2 Housekeeping	7
2.3 Safety and Emergency Equipment	8
3.0 Engineering Controls	9
3.1 Intent	9
3.2 Modification	10
3.3 Improper Function	10
3.4 Usage	10
3.5 General Lab Ventilation	10

## TABLE OF CONTENTS (continued)

### Section and Title Page

3.6	Local Exhaust Ventilation	11
3.6.1	Laboratory Hoods	11
3.7	Glove Boxes and Isolation Rooms	12
3.7.2	Cold Rooms and Warm Rooms	12
3.8	Storage Cabinets	12
3.9	Refrigerators	13
4.0	Employee Information and Training	13
4.1	Hazard Information	13
4.2	Training	13
5.0	Prior Approval for Laboratory Activities	14
5.1	Permit System	14
5.1.1	Off-Hours Work Practices	14
5.1.2	Sole Occupancy	14
5.1.3	Hazardous Work	15
5.1.4	Unattended Operations	15
6.0	Medical Consultations and Examinations	15
7.0	Chemical Hygiene Responsibilities	16
7.1	University President	16
7.2	Chemical Hygiene Officer (CHO)	16
7.3	Laboratory Employees	17

## TABLE OF CONTENTS (continued)

### Section and Title Page

8.0	Special Precautions	17
8.1	Working with Allergens and Embryotoxins	17
8.2	Working with Chemicals of Moderate Chronic or High Acute Toxicity	17
8.3	Working with Chemicals of High Chronic Toxicity	18
8.4	Working with Animals and Chemicals of High Chronic Toxicity	18
8.5	Working with Cryogenics and Supercooled Materials	19
8.6	Flammable Liquids	19
9.0	Recordkeeping	20
10.0	Chemical Spills, Releases, Fires and Accidents	20
11.0	Annual Chemical Hygiene Audit	23
12.0	Hurricane Plan	23
13.0	References and Recommended Reading	24

### **Additional UNF Reference Documents**

- A UNF Compressed Gas Rules
- B Laboratory Safety Survey Form
- C Resistance to Chemicals of Common Glove Materials
- D Chemical Hygiene Permit
- E UNF Chemical Waste Accumulation Point Requirements
- F Evacuation Maps
- G Accident Investigation Form

## 1.0 **Standard Operating Procedures for Laboratory Chemicals**

### 1.1 Chemical Procurement

- 1.1.1 The decision to procure a chemical shall be a commitment to handle and use the chemical properly from initial receipt and storage to ultimate disposal. The responsibility for proper chemical hygiene procedures lies with the Lab Supervisor (instructor or teaching assistant), Principal Investigator and Lab Manager.
- 1.1.2 Purchase requisitions for the procurement of chemicals shall be routed through the office of Environmental Health & Safety (EH&S). The standard UNF Requisition Form shall be utilized for this purpose. Those requisitions without EH&S approval will be returned by the Purchasing Division. Orders shall be placed for the minimum quantity necessary to conduct business. Remember: in most cases the disposal of chemical waste now costs more than the purchase of raw materials.
- 1.1.3 Procedures for the proper handling, storage and disposal of lab chemicals shall be known by all personnel prior to use of the chemical. The primary resource for this information is the Material Safety Data Sheet (MSDS). Other references include the Merck Index, CRC Handbooks, Condensed Chemical Dictionary and the Office of EH&S. The MSDS is prepared by the manufacturer and comes with each shipment of regulated material. The Purchasing Division shall include the MSDS with each item delivered. Deliveries to the Natural Sciences Building should be made to room 2117.
- 1.1.4 All chemicals shall be received by the Purchasing Division. Personnel who receive chemical shipments shall be knowledgeable of the proper procedures for receipt. Spill control materials shall be available in the receiving area. All containers will be inspected for damage or leaking contents. Damaged chemical containers shall not be accepted. Chemicals received on a trial basis shall only be accepted pending an agreement with the vendor that the unused portion can be returned. Chemical containers shall not be accepted without accompanying labels, material safety data sheets (MSDS's), and packaging in accordance with appropriate regulations. All chemical shipments shall be dated when received and opened in the lab.

### 1.2 Chemical Storage

- 1.2.1 Once received, chemicals shall be immediately moved to designated

storage areas. Glass containers shall be kept in their original shipping containers or be placed in carrying containers for transport from Purchasing.

- 1.2.2 The storage area shall be well-illuminated, with all storage maintained at a reasonable level. Large bottles (> 4L) shall be stored no more than two feet from ground level.
- 1.2.3 Chemicals shall be segregated by hazard class (acids, bases, flammable liquids, solids and gasses, oxidizers, radioactive, metals, reactives, cryogens and infectious) and compatibility in a well identified area which is negatively pressurized and equipped with single-pass ventilation.
- 1.2.4 Compressed gas cylinders shall be transported only while secured on a hand-truck with the caps on. Storage should be by compatibility as above. Cylinders should be returned through the vendor. See Appendix A, UNF Compressed Gas Rules for more information. Copies of this rule shall be posted in all cylinder use and storage areas.
- 1.2.5 Mineral acids should be separated from flammable and combustible materials. Separation is storage within the same fire area but separated by as much space as practicable or by intervening storage from incompatible materials.
- 1.2.6 Acid-resistant trays or shelving shall be utilized for bottles of mineral acids.
- 1.2.7 Acid-sensitive materials such as cyanides and sulfides shall be separated from acids or protected from contact with acids.
- 1.2.8 Highly toxic, corrosive, reactive or flammable chemicals shall be stored in unbreakable secondary containers unless purchased in shatter-proof containers.
- 1.2.9 The immediate storage areas (shelving, stock area, etc.) shall not be used as a preparation or repackaging area.
- 1.2.10 The storage area is under the control of the Laboratory Manager.
- 1.2.11 When chemicals are taken from the storage area, they shall be placed in an outside container or otherwise transported in such a way as to prevent spillage.

1.2.12 Storage of chemicals at the lab bench or other work areas shall be as small as practical. Chemical storage in the work area shall be away from direct sunlight or heat.

1.2.13 Stored chemicals shall be examined at least annually by the CHO, Lab Manager or designee for labeling, replacement, deterioration, and container integrity. The inspection should determine whether any corrosion, deterioration or damage has occurred to the containers or storage facility as a result of leaking chemicals.

1.2.14 Inventories of chemicals in all storage areas shall be collected at least annually by the Lab Manager or designee. Unneeded items shall be disposed of through the Lab manager and CHO.

### 1.3 Chemical Handling

Each laboratory employee with the training, education and resources provided by supervision, shall develop and implement work habits consistent with this CHP to minimize exposure to the chemicals in the laboratory. Based on the realization that all chemicals inherently present hazards under certain conditions, exposure to all chemicals shall be minimized. General precautions which shall be followed for the handling and use of chemicals are:

1.3.1 Skin contact with all chemicals shall be avoided. Therefore, gloves should be donned prior to handling chemicals or their containers.

1.3.2 Employees should wash all areas of exposed skin prior to leaving the laboratory.

1.3.3 Mouth suction for pipetting or starting a siphon is prohibited.

1.3.4 Eating, drinking, smoking, gum chewing, or the application of cosmetics in areas where lab chemicals are present shall be avoided. Hands shall be thoroughly washed prior to performing these activities.

1.3.5 Storage, handling, and consumption of food or drink shall not occur in storage areas, refrigerators, glassware, or utensils also used for laboratory operations.

1.3.6 Risk determinations shall be conservative in nature. Any chemical mixture shall be assumed to be as toxic as its most toxic component. Substances of unknown toxicity shall be treated as toxic.

- 1.3.7 All experiments and research activities shall include planning and instruction of protective measures and waste disposal considerations.
- 1.3.8 Laboratory employees shall be familiar with the symptoms of exposure for the chemicals with which they work and the precautions necessary to prevent exposure. This information is made available during annual Right-To-Know training sessions and is found on Material Safety Data Sheets (MSDS's) and other references. Medical monitoring procedures are listed in Section 6.0.
- 1.3.9 In all cases, chemical exposures shall not exceed the Permissible Exposure Limits (PEL's) of OSHA or the Threshold Limit Values (TLV's) of the American Conference of Governmental Industrial Hygienists (ACGIH). These can be found on the MSDS for the material of concern.
- 1.3.10 Engineering controls, safety equipment, storage and procedures shall be inspected during the semiannual lab safety surveys. These surveys are conducted by trained laboratory staff utilizing the form found in Appendix B.
- 1.3.11 Specific precautions based on the toxicological characteristics of individual chemicals shall be implemented as deemed necessary by the Lab Manager or CHO. Common categories of materials requiring these special precautions are listed in Section 8.0.

#### 1.4 Laboratory Equipment and Glassware

Each employee shall keep the work area clean and uncluttered. All chemicals and equipment shall be properly labeled in accordance with Section 1.7. At the completion of each work day or operation, the work area and equipment shall be thoroughly cleaned and properly stored.

In addition, the following procedures shall apply to the use of laboratory equipment:

- 1.4.1 All laboratory equipment shall be used only for its intended purpose.
- 1.4.2 All glassware will be handled and stored with care to minimize breakage; all broken glassware will be immediately disposed of in labeled receptacles that resist puncture.
- 1.4.3 Glassware that has come into contact with biohazardous materials shall be inactivated prior to disposal. Needles, scalpels and similar tools shall be placed in containers that are commercially designed for the disposal of

biohazardous sharps. The collection of biohazardous materials is conducted by Physical Facilities. Please refer to the UNF Biological Safety Manual for further discussion.

- 1.4.4 All pressurized and evacuated glass apparatus shall be shielded to contain chemicals and glass fragments should explosion or implosion occur.
- 1.4.5 Labels shall be attached to all chemical containers, identifying the contents, date and related hazards.
- 1.4.6 Waste receptacles and containers shall be segregated and labeled as to the material intended for disposal. Typical waste streams include municipal, biohazardous, chemical and recyclable. Further segregation of chemical waste shall be by compatibility. This includes heavy metals, halogenated and non-halogenated solvents, corrosives, etc.
- 1.4.7 All laboratory equipment shall be inspected on a periodic basis utilizing the forms in Appendix B and replaced or repaired as necessary.

## 1.5 Personal Protective Equipment

- 1.5.1 Safety glasses meeting ANSI Z87.1 are required for employees and visitors to the lab. Contact lenses are prohibited in the lab, except as approved by the supervisor, Lab Manager and CHO.
- 1.5.2 Chemical goggles and/or full face shields shall be worn during transfer and handling operations with the potential for splashing or contact with corrosive or irritating materials.
- 1.5.3 Sandals, perforated shoes, and bare feet are prohibited in the lab. Safety shoes are required where employees routinely lift heavy objects.
- 1.5.4 Lab coats and safety glasses must be worn while working with chemicals in the lab. Once contaminated, lab coats shall be laundered. Lab coats shall be removed immediately upon discovery of significant contamination.
- 1.5.5 Appropriate chemical-resistant gloves, based on the Table in Appendix C or similar references, shall be worn when there may be skin contact with materials that are corrosive, irritating, or otherwise dangerous. Gloves shall be washed and inspected prior to re-use. Damaged or deteriorated gloves shall be immediately replaced. Gloves should be washed prior to removal.

- 1.5.6 Thermal-resistant gloves shall be worn for operations involving the handling of heated materials and exothermic reaction vessels. Thermal-resistant gloves shall be non-asbestos and shall be replaced when damaged.
- 1.5.7 If utilized, respirators shall comply with OSHA Respiratory Protection Standard, 29 CFR 1910.134, and UNF's Respiratory Protection Program. It should be understood that respiratory protection is a temporary or last resort means of controlling employee exposure. Approval from the CHO shall be obtained prior to respirator use.

## 1.6 Personal Work Practices

- 1.6.1 Laboratory supervision must ensure that each employee knows and follows the rules and procedures established in this plan and other applicable UNF policies.
- 1.6.2 All employees shall remain vigilant to unsafe practices and conditions in the lab and shall immediately report such practices and/or conditions to the lab supervisor. The supervisor must correct unsafe practices and or conditions promptly.
- 1.6.3 Long hair and loose-fitting clothing shall be confined close to the body to avoid being caught in moving parts.
- 1.6.4 The practice of smelling or tasting chemicals as an aid in their identification is no longer appropriate and may result in illness.
- 1.6.5 Encourage safe work practices in others by setting the proper example. Horseplay is strictly forbidden.
- 1.6.6 All operations and experiments shall be planned with consideration of the equipment, protective gear, and waste disposal measures available.
- 1.6.7 Use engineering controls in accordance with Section 3.0.
- 1.6.8 Inspect personal protective equipment (PPE-safety glasses, gloves, lab coats, etc.) prior to use and wear appropriate protective equipment as procedures dictate and when necessary to avoid exposure. Injuries resulting from the failure to utilize appropriate PPE may not be compensable under State Worker's Compensation Law.
- 1.6.9 All accidents, spill and injuries shall be reported to the Lab Supervisor or

Lab Manager. Injuries requiring first aid treatment require completion of an injury report.

## 1.7 Labeling

- 1.7.1 All containers in the lab shall be labeled including temporary containers and waste containers. The label shall be informative, durable, and identify contents, source, date, and indication of hazard.
- 1.7.2 Portable containers shall be labeled by the individual using the container.
- 1.7.3 Exemptions for labeling requirements shall be made for chemical transfers from a labeled container into a container which is intended only for the immediate use of the employee who performed the transfer.
- 1.7.4 Hazard warning signs shall be posted at the entrances to all labs and chemical storage areas. These signs shall indicate the nature of chemical, physical and biological hazards (i.e. flammables, lasers, biohazard) presented by the materials or activities conducted in the lab. This information will be used by emergency response personnel prior to entry.
- 1.7.4 The labeling program shall be periodically reviewed by the Lab Manager or CHO to ensure that labels have not been defaced or removed.

## 2.0 **Criteria for Implementation of Control Measures**

### 2.1 Air Sampling

- 2.1.1 Air sampling for the evaluation of employee exposure to chemical substances shall be conducted periodically or as specified by substance specific standards. Employee concerns of exposure and monitoring should be directed to the Lab Manager or CHO for follow up.
- 2.1.2 Upon addition of new chemicals or changes in control procedures, additional air sampling shall be considered to evaluate exposure potential. Air sampling shall be conducted where exposure levels for regulated substances may exceed the action level or PEL.
- 2.1.3 The results of air sampling studies performed in the lab shall be maintained for a period of 30 years plus the duration of employment. These data shall be part of the employee's permanent record as retained by the Human Resources Department.

### 2.2 Housekeeping

- 2.2.1 Each lab employee is directly responsible for the cleanliness of his/her work space and jointly responsible for common areas of the lab.
- 2.2.2 The following procedures apply to the housekeeping standards of the laboratory:
  - 2.2.2.1 All spills on lab benches or floors shall be immediately cleaned and properly disposed of. Each lab shall have access to clean-up materials such as absorbents, towels, brooms, scoops, trash liners, etc. Large spills involving acute toxins will necessitate implementation of the spill procedures in Section 10.
  - 2.2.2.2 Lab benches shall be kept clear of equipment and chemicals except those necessary for work currently being performed.
  - 2.2.2.3 The work area shall be cleaned at the end of each operation and each day.
  - 2.2.2.4 All apparatus shall be thoroughly cleaned and returned to storage following use.
  - 2.2.2.5 All floors, aisles, exits, fire extinguishing equipment, eyewashes, safety showers, electrical disconnects, and other emergency equipment shall remain unobstructed.
  - 2.2.2.6 All containers should be turned so that their labels are face front.
  - 2.2.2.7 Chemical containers shall be clean, properly labeled, and returned to storage following their use. Lids shall be tightly secured to all containers including waste containers when not in use.
  - 2.2.2.8 All chemical wastes shall be handled and disposed of in accordance with UNF Chemical Waste Accumulation Point Requirements (see Appendix E). Waste containers shall be periodically inspected for integrity, labeling, capping, etc. A record of these inspections shall be maintained in the accumulation area.

### 2.3 Safety and Emergency Equipment

- 2.3.1 Telephone numbers of emergency personnel, supervisors and other employees as deemed appropriate shall be posted at the entrance to each lab, telephone and other areas as deemed appropriate by the supervisor, Lab Manager or CHO.

- 2.3.2 Only those lab personnel trained in the proper use of fire extinguishers shall attempt to utilize this equipment. Those interested in attending such training courses should contact the Lab Manager or CHO. Prior to the procurement of new chemicals, the supervisor, Lab Manager or CHO shall verify that existing extinguishers and other emergency equipment are appropriate for such chemicals. This determination will also be made during the Lab Safety Survey.
- 2.3.3 All lab employees shall be instructed in the location and proper use of emergency showers and eyewashes. These units should be located within 100 feet or 10 seconds travel time from the lab or hazard. The units should be activated at least monthly by lab employees during the course of normal work activities. Biannual flow tests shall be conducted by the Lab Manager with assistance from the CHO in accordance with ANSI Z358.1 and manufacturer's specifications. Record of the biannual flow tests shall be maintained in the form of a tag on the device.
- 2.3.4 Signs to identify the location of safety and emergency equipment shall be posted in the lab. This includes fire extinguishers, emergency showers and eyewash units, spill kits and PPE locations.
- 2.3.5 First aid kits shall be located in a clearly visible area which is accessible to all lab personnel. This kit should include, but is not limited to the following items:

- |        |                           |
|--------|---------------------------|
| 1 Pak. | Merthiolate Swabs         |
| 1 Pak. | Wound Cleansing Scrubbers |
| 1 Pak. | Scissors and Forceps      |
| 3 ea   | Ammonia Inhalants         |
| 1 roll | Dermicel 1st Aid Tape     |

5 ea	4" X 4" Gauze Pads
10 ea	2" X 2" Gauze Pads
1 ea	Triangular Bandage
4 ea	5" X 9" Surgipad Dressing
10 ea	Band-Aids
2 ea	Compression Bandages
2 ea	2" X 6 yds. Gauze Rolls

### 3.0 **Engineering Controls**

#### 3.1 Intent

The engineering controls installed in the lab are intended to minimize employee exposure to chemical and physical hazards.

These controls follow other methods such as substitution of less hazardous materials, are preferred to PPE and must be maintained in order to function properly.

#### 3.2 Modification

No modification of engineering controls shall occur without approval of the Lab Manager or CHO and unless testing verifies that employee protection can be maintained.

#### 3.3 Improper Function

Improper function of engineering controls must be reported to the supervisor, Lab Manager, or CHO immediately. The device shall be taken out of service until proper repairs have been completed. In some cases, such as fume hood repair, it will be necessary to conduct follow-up testing to verify satisfactory completion of the repairs.

#### 3.4 Usage

All employees shall follow proper work practices when using engineering controls. The following sections provide guidance on such practices.

#### 3.5 General Lab Ventilation

3.5.1 Proper facility design dictates that lab ventilation be based upon degree of hazard. High hazard areas should be negatively pressurized with respect to low hazard areas. The lab building itself should be neutral or slightly negative with respect to the outdoors. This is facilitated by the use of single-pass air flow. No lab air shall be circulated to other areas due to the disadvantages and limitations of cleaning recirculated air. Labs and storage rooms shall be negative with respect to offices, hallways, and corridors (50-100 fpm).

- 3.5.2 The air delivered to the labs shall be of a quality and quantity so as to satisfy current ANSI/ASHRAE 62 standards. Therefore, careful consideration must be given to the location of building exhaust and intake fixtures.
- 3.5.3 Delivery shall be uniform, prevent stagnation, and not interfere with fume hood performance.

### 3.6 Local Exhaust Ventilation

- 3.6.1 All materials with pronounced odor, irritating properties or hazardous emissions shall be utilized under local exhaust ventilation. A common example of such is the chemical fume hood.
  - 3.6.1.1 Such materials shall be placed well within the hood, approximately 4-6" behind the sash.
  - 3.6.1.2 Hoods shall be affixed with a device to warn the user of unsafe operating conditions and shall remain on at all times when materials are stored within.
- 3.6.2 The ventilation system shall be inspected periodically and following repair. Records of these inspections shall be maintained by Physical Facilities.
- 3.6.3 Fume hood ductwork shall be constructed of non-flammable materials that are resistant to the chemicals utilized in the hood. Ductwork shall be maintained under negative pressure to prevent contamination from damage or leakage. Duct velocities should be maintained around 2,000-3,000 fpm unless particles of large diameter or high concentration are exhausted.
- 3.6.4 Prior to a change in chemicals or procedures, the adequacy of the ventilation system shall be determined by the CHO and Physical Facilities Department.
- 3.6.5 Confirm adequate hood performance prior to each use by observing the performance monitoring device.
- 3.6.6 Keep the sash of the hood closed at all times except when work within the hood is conducted. At these times, maintain sash height as low as possible.
- 3.6.7 Storage of chemicals and equipment inside the hood shall be kept to a

minimum.

- 3.6.8 Minimize interference with the inward flow of air into the hood by storing materials up off the floor of the hood.
- 3.6.9 Fume hood exhaust should be placed at 8-10 feet above the roofline and 50 feet from air intakes to protect personnel working on the roof and the integrity of building supply air.
- 3.6.10 Discharge velocities shall be in the range of 2,000-3,000 fpm through an open stack that does not utilize down-turning rain caps.
- 3.6.11 Fume hood performance shall be evaluated at least every six months during the Lab Safety Survey. The hood face velocity shall be maintained between 90 and 110 fpm. A record of each inspection shall be maintained by the CHO and be posted on the hood itself. See Appendix B for an example of the hood profile record.
- 3.6.12 The hood shall not be used as a means of disposal for volatile chemicals. No alteration affecting hood structure, performance or integrity shall occur without prior approval from the Lab Manager, CHO and Physical Facilities Department.
- 3.6.13 Malfunctioning fume hoods shall be immediately reported to the supervisor or Lab Manager and taken out of service. A work order shall be given to Physical Facilities for repair as an urgent service request. Once repairs are completed, the hood shall be profiled to ensure that minimum performance criteria are met.

### 3.7 Glove Boxes and Isolation Rooms

- 3.7.1 Specially designed glove boxes, ductless hoods, table top hoods, etc. shall be approved by the Lab Manager or CHO prior to use.

- 3.7.1.1 The exhaust air from glove boxes, table top hoods, or isolation rooms will be exhausted outdoors and not through filters or other removal mechanisms unless these devices are used as a means of controlling nontoxic emissions.

### 3.7.2 Cold Rooms and Warm Rooms

- 3.7.2.1 In the event of mechanical or electrical failure, all temperature sensitive items shall be secured or stored to prevent damage, exposure, explosion, etc. Once these items are secured, a work order

shall be sent to Physical Facilities for an urgent repair request.

### 3.8 Storage Cabinets

3.8.1 Storage cabinets for flammable and hazardous chemicals can be ventilated as needed. However, such ventilation must be approved by the Lab Manager and CHO.

3.8.1.1 Only those cabinets rated for the storage of flammables, acids, etc., shall be used for such.

### 3.9 Refrigerators

3.9.1 Three types of refrigerators are commonly used in the lab:

3.9.1.1 The household type of refrigerator is not suitable for the storage of flammable liquids since it does not have explosion safe controls or door switches.

3.9.1.2 The explosion-safe refrigerator is constructed with the controls sealed or mounted on the outside of the unit. This type of unit is specifically designed for the storage of flammable liquids.

3.9.1.3 The explosion-proof refrigerator has the controls mounted on the outside of the unit in an explosion-proof enclosure. This type of unit is called intrinsically safe and is designed for the storage of flammable liquids in a flammable environment.

3.9.2 Every refrigerator shall be clearly labeled so as to indicate the suitability of flammable liquid storage.

3.9.3 Regardless of the type, lab refrigerators shall not be used for food storage

## 4.0 **Employee Information and Training**

### 4.1 Hazard Information

All employees will be informed of the hazards presented by the chemicals used in the lab. Each employee shall receive training at the time of initial assignment, prior to assignments involving new exposure situations and at least annually as required in the OSHA Hazard Communication Standard (Employee Right-to-Know).

## 4.2 Training

Training shall include methods of detecting the presence of a hazardous chemical, physical and health hazards of chemicals in the lab and measures employees can take to protect themselves from these hazards. Training shall present the details of the CHP and shall include:

- 4.2.1 The contents and location of the OSHA Laboratory Standard and this CHP;
- 4.2.2 The permissible exposure limits for OSHA regulated substances or recommended exposure values for other hazardous chemicals in the lab;
- 4.2.3 Signs and symptoms associated with exposure to chemicals present in the laboratory;
- 4.2.4 Location and availability of reference materials on chemical hygiene;
- 4.2.5 Proper use of chemical fume hoods, eye wash, safety showers, first aid measures and other safety related items and equipment in the lab;
- 4.2.6 Training in the proper use of apparatus and techniques necessary to conduct procedures, experiments, assignments, etc.;
- 4.2.7 Training shall be conducted by departmental supervisors, Lab Supervisors, Lab Manager, CHO or a designee who has the appropriate level of experience and technical knowledge. The following materials may be used during training:

## 5.0 **Prior Approval of Laboratory Activities**

### 5.1 Permit System

A permit system shall be used for laboratory activities which present specific, foreseeable hazards to employees. These activities include off-hours work, sole occupancy of building, hazardous operations and unattended operations. The permit entitled "Chemical Hygiene Permit" is included in Appendix D and shall be executed prior to the performance of these activities.

#### 5.1.1 Off-Hours Work Procedures

Laboratory personnel are not permitted to work after hours in the lab,

except with the explicit knowledge of the Lab Supervisor or Lab Manager.

#### 5.1.2 Sole Occupancy

Work performed in the lab when the only person in the building is the person performing the work shall be performed under the permit system. Periodic UPD checks, telephone conversation or other measures should also be taken to maintain communications with the sole occupant.

#### 5.1.3 Hazardous Work

All hazardous operations are to be performed during a time when at least two personnel are present in the laboratory. At no time shall a laboratory person, while working alone in the laboratory, perform work which is considered hazardous. The determination of hazardous operations shall be made by the Lab Supervisor and Lab Manager.

#### 5.1.4 Unattended Operations

When laboratory operations are performed which will be unattended by lab personnel (continuous operations, overnight reactions, etc.), the following procedures will be employed:

5.1.4.1 The permit system shall be utilized.

5.1.4.2 The laboratory supervisor will review work procedures to ensure the safe completion of the operation.

5.1.4.3 An appropriate sign will be posted at all entrances to the laboratory.

5.1.4.4 The overhead lights in the lab shall remain on.

5.1.4.5 Precautions shall be made for the interruption of utility service during the unattended operation (loss of water pressure, electricity, etc.).

5.1.4.6 The person responsible for the operation will return to the laboratory at the conclusion of the operation to assist in the dismantling of the apparatus.

## **6.0 Medical Consultations and Examinations**

- 6.1 An opportunity to receive medical attention is available to all employees who work in the laboratory. The opportunity for medical attention will be made available to employees under the following circumstances:
  - 6.1.1 Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory.
  - 6.1.2 Where air monitoring reveals an exposure level above the action level for an OSHA regulated substance.
  - 6.1.3 Whenever 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 employee will be provided an opportunity for medical consultation to evaluate the severity of exposure and determine the need for medical treatment.
- 6.2 These medical consultations and examinations shall be provided without cost to employees, without loss of pay, and at a reasonable time and place.
- 6.3 These medical consultations and examinations shall be administered by or under the direct supervision of a licensed physician. A list of authorized medical providers is available through the office of Human Resources or EH&S.

## **7.0 Chemical Hygiene Responsibilities**

- 7.1 The University President has the ultimate responsibility for chemical hygiene throughout the University of North Florida and with the assistance of other program administrators, will provide continued support for chemical hygiene.
- 7.2 The CHO and Lab Manager shall jointly:
  - 7.2.1 Work with administrators and other employees to develop and implement appropriate chemical hygiene policies and practices;
  - 7.2.2 Monitor procurement and use of chemicals in the lab, including determining that facilities and training levels are adequate for the chemicals in use;
  - 7.2.3 Perform regular, formal chemical hygiene and housekeeping inspections including inspections of emergency equipment;

- 7.2.4 Assist Facilities Planning and project managers in developing precautions and adequate facilities;
  - 7.2.5 Maintain current knowledge concerning the legal requirements of regulated substances in the lab;
  - 7.2.6 Review and update this CHP on an annual basis;
  - 7.2.7 Maintain overall responsibility for the lab safety program;
  - 7.2.8 Ensure that Lab Supervisors know and implement chemical hygiene rules and that this information is passed along to individual employees;
  - 7.2.9 Determine the proper level of personal protective equipment and ensure that labs provide and maintain protective equipment;
  - 7.2.10 Ensure that appropriate training has been provided to employees; and
  - 7.2.11 Monitor the waste disposal program.
- 7.3 Laboratory Employees
- 7.3.1 Laboratory employees are individually responsible for planning and conducting each laboratory operation in accordance with this CHP and other applicable UNF policies; and
  - 7.3.2 Developing good personal chemical hygiene habits.

## 8.0 **Special Precautions**

When laboratory procedures require the use of certain allergens, embryotoxins, acute and chronic toxins, cryogens, flammable liquids, corrosives and reactives special precautions shall be implemented as described below and deemed necessary by the CHO and Lab Manager. Information identifying these materials is available on the MSDS or other reference materials. The permit system shall be utilized for all special activities. Any questions regarding the use of the permit system should be addressed to the Lab Manager or CHO.

- 8.1 Working with Allergens and Embryotoxins: (formaldehyde, glutaraldehyde, isocyanates, nickel, chromium, lead and mercury compounds, etc.)
  - 8.1.1 Chemical resistant gloves shall be worn when allergens or substances of unknown allergen activity are handled.

- 8.1.2 Women of child-bearing age should handle embryotoxins only in a hood complying with UNF policy and while using protective equipment to prevent skin contact as prescribed by the Lab Supervisor, Lab Manager and CHO.
- 8.1.3 Embryotoxins will be stored in well ventilated areas in unbreakable secondary containers.
- 8.1.4 The Lab Supervisor, Lab Manager, and CHO will be notified of spills and other exposure incidents. A physician will be consulted when appropriate.
- 8.2 Working with Chemicals of Moderate Chronic or High Acute Toxicity (DFP, HF, HCN, unknowns, etc.) Implement the procedures in 8.1 and:
  - 8.2.1 Areas where these chemicals are stored and used shall have restricted access and appropriate hazard signage.
  - 8.2.2 A fume hood with a minimum face velocity of 100 fpm or similar containment device will be used.
  - 8.2.3 Gloves and long sleeves will be used. Hands and arms will be washed immediately after working with these chemicals.
  - 8.2.4 Two people will always be present during work with these chemicals.
- 8.3 Working with Chemicals of High Chronic Toxicity: (dimethyl mercury, nickel carbonyl, benzo-a-pyrene, nitrosamines, nitrosamides, bischloromethyl ether, etc.) Implement the procedures in 8.2 and:
  - 8.3.1 All transfer and work with these substances shall be in a designated area such as a restricted access hood, glove box, or portion of a lab.
  - 8.3.2 Use of the material shall follow approval of the supervisor through the permit system.
  - 8.3.3 Vacuum pumps must be equipped with scrubbers or high efficiency particulate absolute (HEPA) filters.
  - 8.3.4 Any contaminated equipment or glassware will be decontaminated in the hood before removal from the designated area.
  - 8.3.5 Spills of powders shall be cleaned up with a wet mop or HEPA vacuum. The mop shall be decontaminated or disposed of as hazardous waste.

- 8.3.6 The designated area will be marked to control access.
- 8.3.7 Containers will be stored in a ventilated, limited access area in labeled, unbreakable, chemically resistant, secondary containers.
- 8.4 Working with Animals and Chemicals of High Chronic Toxicity: Implement the procedures in 8.3 and:
  - 8.4.1 For large scale studies, special facilities with restricted access will be provided.
  - 8.4.2 The substance will be administered by injection or gavage when possible rather than by diet or inhalation. When diet is used, a negative pressure caging system directed toward HEPA filters will be used.
  - 8.4.3 Procedures will be used to minimize the generation of aerosol from food, urine, and feces. Including the use of HEPA filtered vacuum equipment for cleaning. Moisten contaminated bedding before removal from cage. Diets shall be mixed in closed containers in the hood.
  - 8.4.4 Plastic or rubber gloves and fully buttoned lab coats will be worn in the animal room (rooms where animal rearing, housing, feeding, etc., is the sole purpose).
- 8.5 Working with Cryogenics and Supercooled Materials: (liquid N, He, Air, CO<sub>2</sub>)
  - 8.5.1 The principal hazards of cryogenic materials are freeze-burn, pressure
  - 8.5.2 Eye protection shall be worn whenever cryogenics are handled. Where clothing should be worn that covers the legs, ankles and feet as most cryogenics are heavier than air. Contact warrants flooding the exposed area with water.
  - 8.5.3 Avoid wearing watches, rings, bracelets or other jewelry that will conduct
  - 8.5.4 Most cryogenic gases are not toxic; however they can be asphyxiants
  - 8.5.5 Container venting should be provided to avoid quick and violent pressure
  - 8.5.6 Combustible cryogenics such as liquid hydrogen and natural gas should be handled as all flammable gases are: provide ventilation, keep away from sources of ignition, and vent gases to a safe location.
  - 8.5.7 Glass containers should be avoided however, if some portion of a

container is made of glass, tape should be used to minimize flying shards upon implosion or breakage.

## 8.6 Flammable Liquids

- 8.6.1 Flammable substances are some of the most common materials used in the lab. Therefore, the potential for accident is greater and the resultant need for safety should be more apparent. Flammable liquids are those having a flash point less than 100°F. Those flammable liquids having flash points at or near room temperature are especially dangerous. This information is available on the MSDS and other technical references.
- 8.6.2 Flammable liquids should only be handled, used and stored in areas free of ignition sources. Heating should never be conducted using an open flame.
- 8.6.3 Transferring flammable liquids to and from large or metal containers should be conducted utilizing grounding and bonding. Grounding dissipates static charge and bonding connects two containers to prevent a spark during discharge. Questions regarding these procedures should be directed to the Lab Manger or CHO.

## 9.0 Recordkeeping

- 9.1 Accident investigations will be conducted by the immediate supervisor with assistance of other personnel, as necessary.
- 9.2 Accident/injury reports will be completed with copies forwarded to the offices of Human Resources and EH&S.
- 9.3 Exposure records (air monitoring and medical monitoring data) for hazardous chemicals and harmful physical agents will be maintained for the duration of employment plus 30 years per 29 CFR 1910.20. These records shall be maintained in the employee's personnel files by the Department of Human Resources.
- 9.4 Medical records for employees exposed to hazardous chemicals and harmful physical agents will be maintained for the duration of employment plus 30 years per 29 CFR 1910.20.
- 9.5 Records of employee training will be maintained for a period of three years from the date of the training session.
- 9.6 Inventory and control records pertaining to substances regulated by the Food and Drug Administration and Drug Enforcement Agency shall be maintained for the

duration of use.

## 10.0 **Chemical Spills, Releases, and Accidents:**

10.1 In the event of a chemical spill, release, fire or other accident, the following set of procedures will be implemented:

10.1.1 Chemical spills shall be reported to the Lab Supervisor, Lab Manager,

10.1.2 The immediate spill area shall be evacuated while the identity and quantity of the material is evaluated. If possible, ensure that the fume hood remains on and the lab door is closed during evacuation.

10.1.2.1 If the spill threatens the health of building occupants, activate the fire alarms at the hallway exits to evacuate the building. Personnel should then meet at a predetermined area for a head count.

10.1.2.2 A decision must be made by the Lab Manager, CHO and

10.1.2.2.1 At a minimum, decision criteria must include the following:

10.1.2.2.2 Quantity of the material lost;

10.1.2.2.3 The physical state of the material and the resultant exposure route;

10.1.2.2.4 The toxicity and effects of exposure; and

10.1.2.2.5 The ability to provide adequate protection and clean up supplies.

10.2 If ANY doubt surrounds this decision, call JFR for assistance by utilizing the red emergency phones in the hallways of the first and second floors or by dialing "0" for UPD directly. The call should include the following:

10.2.1 Location, identity and quantity of the material lost;

10.2.2 Nature and extent of any injuries, exposures or fire; and

10.2.3 Identity of the caller and a phone number to call back for further information.

10.3 If an in-house clean-up is agreed to, the following procedures shall be utilized:

10.3.1 Review the MSDS and other references to determine the recommended procedures for personal protection, clean-up and disposal;

10.3.2 Personal protective equipment needs may include skin protection in the form of chemical resistant gloves, coveralls or apron and shoe covers. Other items include respiratory protection in the form of air purifying and air supplying devices. However, no person should attempt to utilize this equipment unless previously trained, fit tested and medically qualified.

10.3.3 Clean-up supplies may include absorbent materials in the form of oil dry, kitty litter, vermiculite, spill pillows, socks, booms, etc. Additional items include brooms, shovels or scoops, mops, buckets and towels.

10.3.4 The absorbent should be spread around a liquid spill to contain it and then placed on top of the spill to soak it up. The saturated absorbent should be carefully collected with the tools above and placed into sealed containers such as spill drums, plastic liners, etc.

10.3.4.1 Spills of dry materials such as powders should be cleaned up with a damp mop, pillow or similar material to control

10.3.4.2 Mercury spills should be cleaned up using the trapped

10.3.5 All contaminated items such as gloves, towels, brooms, etc. should be

10.4 Decontamination occurs by physical removal or chemical interaction. However, in most cases detergent and warm water are the best materials. Personnel involved in the clean-up should immediately wash or shower to remove potential contamination, dust, etc.

10.5 Procedures in the event of a lab fire include:

to 10.5.1 No attempt should be made to fight the fire unless it is sufficiently small allow a quick dousing or unless previous training has been provided in fire extinguisher use.

10.5.2 If the fire is beyond control, evacuate the lab immediately. If possible, ensure the fume hood remains on and the lab door is closed. Activate the emergency alarms at the hallway exits to evacuate the building. Notify the Lab Manager, CHO and UPD.

## 11.0 **Annual Chemical Hygiene Plan Audit**

11.1 The Lab Manager shall conduct an audit of all phases of the CHP each year. Results will be provided to the CHO. Supervisors are responsible for taking corrective actions in the lab and the CHO is responsible for coordinating facility improvements, revising this CHP and other applicable safety procedures.

## 12.0 **Hurricane Plan**

### 12.1 Condition 4: Hurricane Season

Review this plan and revise as necessary. New equipment procedures and personnel will warrant change of this plan. Ensure that there is adequate supply of plastic garbage bags, duct tape, flashlights, batteries, etc.

### Condition 3: 48 Hour Warning

A hurricane is imminent. Collect portable electronic equipment in the building such as pH meters, spectrophotometers, electrophoresis apparatus, etc. Store these items in rooms without outside doors or windows. Return compressed gas cylinders to the appropriate storage room. Collect microscopes and store them in rooms without outside doors or windows.

### Condition 2: 24 Hour Warning

This will be the last opportunity to access the lab or campus. Turn off natural gas supply valve to the building. Where possible, move all chemicals and equipment from rooms with outside doors and windows to rooms without. Store remaining items as far as possible from outside windows and doors and remove from wall mounted shelving.

Shut off all electronics. Disconnect and store all computer equipment, analytical instruments, electronic devices, telescopes, microscopes, etc., in plastic bags and as far away from outside doors and windows as possible. Treat records and files in a similar fashion. Turn off all circuit breakers in each room and evacuate the campus.

### 13.0 **References and Recommended Reading**

National Research Council, Prudent Practices for Handling Hazardous Chemicals in Laboratories, National Academy Press, Washington, D.C., 1981.

National Research Council, Prudent Practices for Disposal of Chemicals from Laboratories, National Academy Press, Washington, D.C., 1983.

Freeman, N.T., Introduction to Safety in the Chemical Laboratory, Academy Press, 1982.

Manufacturing Chemists' Association, Inc., Guide For Safety In The Chemical Laboratory, D. Van Nostrand Company, Inc., 1954.

Green, Michael E., Safety In Working With Chemicals, MacMillan Publishing Co., Inc., 1978.

Pipitone, David A., Safe Storage of Laboratory Chemicals, Wiley & Sons, Inc., 1984.

Code of Federal Regulations, 29 CFR, Part 1910, Subpart Z, Section 1910.1450, Occupational Exposure to Hazardous Chemicals in Laboratories, 1990.

