

## MACALESTER COLLEGE CHEMICAL HYGIENE PLAN

The Macalester College Chemical Hygiene Plan is intended to promote a safe and healthful working and learning environment. The safety and health of faculty, students, staff and visitors is of major importance.

There are many safety and health laws, standards and reference materials, which regulate and guide office and laboratory activities.

OSHA (Occupational Safety and Health Act) was enacted by the federal government. This Act authorized the United States Department of Labor to establish safety and health standards and provided for their enforcement. The standards are either national "consensus standards" which are generally recognized by industry, professional societies and labor; or federal standards, which have been established by legislation or regulations. OSHA encouraged states to establish programs and standards at least as effective as those of the federal government.

The College wide program is particularly relevant for the Chemistry Department because of its focus on hazardous chemicals.

The Chemical Hygiene Plan is, in effect, a Hazard Communication Plan for the Departments of Chemistry, Biology, Physics, Geology, Psychology, Art, and Dramatic Arts. We provide Chemical Hygiene/Hazard Communication training for new Faculty/Staff/or other Employees which includes the viewing of the video "Laboratory Chemicals and Your Health: Principles".

The Chemical Hygiene Officer is the College representative to the Occupational Safety and Health Administration for this plan and reports to the Provost and the Director of Facilities. He/she develops departmental programs in conjunction with departmental representatives.

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## **SECTION A. INTRODUCTION**

The College strives to provide facilities free from recognized hazards likely to cause physical harm and to comply with federal, state, and local laws and regulations affecting the safety and health of Faculty/Staff/or other Employees. The Chemical Hygiene Plan addresses these objectives for the laboratory workplace by including the requirements of the OSHA Laboratory Standard, 29 CFR 1910, and Section 0.1450 of Subpart Z – “The Laboratory Standard Occupational Exposures to Hazardous Chemicals in the Laboratories”.

## **SECTION B. FACULTY, STAFF AND THEIR RESPONSIBILITIES**

### College Chemical Hygiene Officer

Ron Brisbois, Professor of Chemistry, or Terry Gorman, Director of Environmental Health, Safety and Security, have been designated by the College to serve as the College Chemical Hygiene Officers. They will:

- work with department Chemical Hygiene Officers to develop appropriate policies and practices within departments;
- in conjunction with the Human Resources Department, and the Environmental Health, Safety, and Security Office maintain records of Faculty/Staff/or other Employees exposure monitoring (including associated accident reports, if applicable) and medical consultations and examinations;
- keep the Laboratory Safety Committee informed of any related issues;
- coordinate Faculty/Staff/or other Employees chemical hygiene training; and monitor the legal requirements concerning hazardous substances.

### Department Chemical Hygiene Officer

Each department with laboratories or which otherwise use hazardous substances must designate a Departmental Chemical Hygiene Officer who will:

- provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan;

- encourage use of Standard Operating procedures for Laboratories;
- review the department Plan annually and update it as necessary in conjunction with the College Chemical Hygiene Officer, the Department Safety representative and/or other department members;
- conduct regular, formal chemical hygiene and housekeeping inspections, including annual inspections of laboratory and emergency equipment; seek ways to improve the Chemical Hygiene program in the department; and keep the College Chemical Hygiene Officer informed of issues relating to the department's Chemical Hygiene Plan.

### Laboratory Faculty and Staff

Department Faculty and Staff are responsible for planning and conducting each laboratory operation in accordance with the Chemical Hygiene Plan and the "Safety in the Academic Chemistry Laboratory" manual written by the American Chemical Society.

## **SECTION C. FACULTY/STAFF/OR OTHER EMPLOYEES EXPOSURE PROTECTION**

Laboratory operations will be conducted in a manner that prevents Faculty/Staff/or other Employees exposure to OSHA regulated substances in excess of the permissible exposure limits (PELs). A list of OSHA regulated chemicals and their PELs are available in the Chemistry Safety Library.

### 1. Respiratory Equipment

Proper respiratory equipment will be provided to Faculty/Staff/or other Employees where the use of respirators is necessary to maintain exposure below permissible exposure limits. Respirators will be selected and used in accordance with the OSHA Laboratory Standard.

### 2. Personal Protective Equipment

Personal protective equipment and instructions on the proper use of this equipment will be provided to Faculty/Staff/or other Employees, as appropriate, to minimize exposure to hazardous chemicals.

### Laboratory Facilities (Design Criteria)

Laboratory work and its scale must be appropriate to the physical facilities available

and to the quality of the ventilation system.

## 1. Laboratory Design

A laboratory facility should include, where appropriate:

- proper chemical storage for specific hazardous materials (e.g., flammables, corrosives, poisons, etc.);
- adequate laboratory hoods and sinks;
- emergency equipment including extinguishers;
- first aid equipment, eyewash fountains and drench showers;
- arrangements for proper waste disposal.

(In some cases laboratory facility features such as spill and first aid kits will be centrally maintained in the storeroom instead of each individual laboratory.)

## 2. Laboratory Ventilation

a. The general laboratory ventilation system should:

- provide a source of air for breathing and for input to local ventilation input devices,
- ensure that laboratory air is continually circulated, and
- direct airflow into the laboratory from non-laboratory areas and out to the exterior of the building.

b. Airflow into and within laboratory hoods should not be excessively turbulent and hood face velocity should be adequate for particular fume hood use.

## Faculty/Staff/or other Employees Exposure Determination and Monitoring

If there is reason to believe that exposure levels for a regulated substance routinely exceed the action level (or in the absence of an action level, the PEL). The College Chemical Hygiene Officer will facilitate measurement of Faculty/Staff/or other Employees exposure to that substance. Department Chemical Hygiene Officers should notify the College Chemical Hygiene Officer regarding such measurement needs.

### 1. Initial Exposure Determination

Factors, which might raise the possibility of overexposure and therefore warrant an initial measurement of Faculty/Staff/or other Employees

exposure includes:

- the manner in which the chemical procedures or operations involving the particular substance are conducted (e.g., use of an open vessel instead of a closed system);
- the existence of historical monitoring data, which shows elevated exposures to the particular substance for similar operations;
- the use of a procedure which involves significant quantities or is performed over an extended period of time; or
- signs or symptoms of exposure (e.g., skin or eye irritation, shortness of breath, nausea, headache, etc.) which are experienced by Faculty/Staff/ or other Employees.

## 2. Exposure Monitoring

If the initial exposure determination described above discloses Faculty/Staff or other Employees exposure over the action level for a particular substance (or in the absence of an action level, the PEL), the College will immediately comply with the appropriate exposure monitoring.

Monitoring airborne concentrations of individual hazardous chemicals should be conducted in the following circumstances:

- a. when a specific substance that is highly toxic is regularly and continuously used; and
- b. when requested by laboratory Faculty/Staff/or other Employees because of a documented health concern or suspicion that a PEL may be exceeded.

## 3. Recordkeeping

Exposure testing, procedures and results will be maintained by the College Chemical Hygiene Officer, the Human Resources Department, and the Environmental Health, Safety and Security Office,

Faculty/Staff/or other Employees will be notified in writing of monitoring results within 15 working days after receipt of the results.

An accurate record of any measurements taken to monitor Faculty/Staff/or other Employees exposures must be kept, transferred, and made available for each Faculty/Staff/or other Employees.

## Medical Consultations and Medical Exams

1. Employees who work with hazardous chemicals will receive medical attention, including follow-up examinations that the examining physician determines to be necessary under the following circumstances:
  - Whenever Faculty/Staff/or other Employees develop signs or symptoms of exposure to a hazardous chemical to which they may have been exposed in the laboratory;
  - When exposure monitoring reveals an exposure level routinely above the action level (or PEL) for a regulated substance for which there are exposure monitoring and medical surveillance requirements. Medical surveillance will be conducted as required by the particular standard; and
  - Whenever an event takes place in the laboratory such as a spill, leak, or explosion which results in the likelihood of a hazardous exposure, affected Faculty/Staff/or other Employees will be provided with the opportunity for medical consultation to determine the need for a medical exam.

2. Type of Medical Attention

All medical examinations and consultations will be performed under the direct supervision of a licensed physician and will be provided without cost to Faculty/Staff/or other Employees, without loss of pay and at a reasonable time and place. All questions regarding medical consultations and examinations should be directed to the College Chemical Hygiene Officer.

3. Information for the Physician

The following information will be provided to a physician conducting medical consultations and exams:

- the identity of hazardous chemicals to which Faculty/Staff/or other Employees may have been exposed;
- a description of the conditions under which the exposure occurred, including quantitative exposure data if available;
- a description of the signs and symptoms of exposure that Faculty/Staff/or other Employees are experiencing, if any.

4. Physician Report

A written opinion from the examining physician for any consultations or exams performed under this Operating Procedure must include:

- any recommendation for further medical follow-up;
- the results of the medical examination and any associated tests;
- any medical condition revealed during the course of the exam which might place Faculty/Staff/or other Employees at increased risk as a result of exposure to hazardous chemicals found in the workplace; and
- a statement that Faculty/Staff/or other Employees have been informed by the physician of the results of the consultation or medical exam and any medical condition that may require further examination or treatment.

The written opinion should not reveal specific diagnoses unrelated to occupational exposure.

#### 5. Recordkeeping

An accurate record of any measurement taken to monitor employee exposures and any medical consultations and examination information, including tests or written opinions, will be maintained for each employee. Such information will be recorded and made available in accordance with existing law.

### **SECTION D. STANDARD OPERATING PROCEDURES**

Standard operating procedures are intended to protect Faculty, Staff and Students working in the laboratory, others who may be exposed, and the environment from injury due to hazardous chemicals.

In addition to following Chemical Hygiene Plan operating procedures, Faculty/Staff/or other Employees should use the manual, "Safety in the Academic Chemistry Laboratory," by the American Chemical Society. The College provides this manual to new Faculty/Staff/or other Employees of affected departments. Another reference available in the Safety Library is the "Prudent Practices in the Laboratory - Handling and Disposal of Chemicals" (National Research Council - National Academy Press, 1955).

#### Chemical Procurement

##### 1. Inventory

Each Department will maintain a centralized listing of all chemical items, in consultation with the Chemical Stores Supervisor, in its stockrooms, laboratories or other work areas along with a master inventory maintained by

the Chemical Stores Supervisor. A Material Safety Data Sheet will be maintained within the Department on each such chemical item in its inventory and in the Science Division storeroom.

2. Purchase Approval

The Department Chemical Hygiene Officers and the Chemical Stores Supervisor will review purchase requests for new hazardous chemicals. They will discuss and resolve special concerns with Faculty/Staff/or other Employees who place orders through the Chemical Stores Supervisor. All orders for chemicals in the Science Division will be placed through the Chemical Stores Supervisor. The Chair and/or College Chemical Hygiene Officer may assist in resolving significant concerns.

### 3. Receiving Shipments

All chemicals will be received in the Science Division storeroom or other designated area. No container will be accepted without an adequate identifying label and a Material Safety Data Sheet. The Chemical Stores Supervisor and Department Chemical Hygiene Officer should inspect each shipment to ensure proper labeling and place in central inventory. Information on proper handling, storage, and disposal of substances will be made available to individuals receiving shipments. Whenever possible, such information will be made available to those individuals prior to receipt of shipments.

### 4. Degree of Toxicity of Substances

Additional laboratory procedures must be developed by each department and included in the Plan where appropriate to protect Faculty/Staff/or other Employees who are working with particularly hazardous chemicals including select carcinogens, reproductive toxins and substances with a high degree of acute toxicity.

**Select Carcinogens** are substances meeting one of the following criteria:

- a. It is regulated by OSHA as a carcinogen; or
- b. It is listed under the category "known to be carcinogens" in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or
- c. It is listed under Group 1 ("carcinogenic to humans") by the International Agency for Research on Cancer Monographs (IARC) (latest edition); or
- d. It is listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens: by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:

- 1) after inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m<sup>3</sup>;
- 2) after repeated skin application of less than 300 (mg/kg of body weight) per week; or
- 3) after oral dosages of less than 50 mg/kg of body weight per day.

Listings of IARC Group 1, 2A and 2B chemicals as well as the NTP carcinogens are included in the appendix.

**Reproductive Toxins** which are chemicals affecting the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis). In addition, certain reproductive toxins may cause infertility in females or males.

**High Acute Toxicity Substances, which** may be fatal or cause damage to target organs as a result of a single exposure. Examples include hydrogen cyanide, hydrogen sulfide, and nitrogen dioxide.

#### Hazard Identification

Laboratory chemicals and facilities should be properly labeled to identify any hazards\* associated with them for Faculty, Staff and Student information and protection.

##### 1. Container Labels

Labels on incoming containers of hazardous chemicals must not be removed or defaced. Unlabeled bottles of chemicals should not be opened; such materials should be disposed of as outlined in Chemical Hygiene Plan Waste Disposal Procedures. A designation should be made if the compound requires special use facilities (such as usage of only in a hood) via a color code sticker.

When dispensing chemicals from one container to another, make sure that the new container is properly labeled with the chemical name and hazards. All secondary containers including waste containers should be labeled in this manner unless they are intended for the immediate use of the person who dispensed the chemicals.

Containers with mixed wastes must identify the constituents by volume or percentage.

## 2. Material Safety Data Sheets

Material Safety Data Sheets received with incoming shipments of hazardous chemicals will be maintained in the Science Division Chemical storeroom and the department and will be \*OSHA Hazards Communications Standard 1910.1200 made available on request to laboratory Faculty/Staff/or other Employees.

## 3. Chemicals Developed in the Laboratory

The following provisions will apply to chemical substances developed in the laboratory:

- If the composition of the chemical substance which is produced exclusively for the laboratory's use is known, the user shall determine if it is a hazardous chemical as defined in OSHA Hazards Communications Standard 1910.1200. If the chemical is determined to be hazardous, the user will notify the Department Chemical Hygiene Officer who will coordinate appropriate training.
- If the chemical produced is a byproduct whose composition is not known, the user shall assume the substance is hazardous and shall implement the Chemical Hygiene Plan.
- If the chemical substance is produced for another user outside of the laboratory, the employer shall comply with the hazard communication standard including the requirements for preparation of material safety data sheets and labeling.

## 4. Degree of Toxicity of Substances (p. 7)

## 5. Laboratory Signs

Laboratory areas that have special or unusual hazards (e.g., radiation areas, designated areas) should be posted with warning signs.

Signs should be posted to show the location of safety showers, eyewash stations, exits, first aid kits, fire extinguishers, etc. Extinguishers should be labeled to show the type of fire for which they are intended.

### Material Handling

The storage, distribution, and methods of handling hazardous chemicals will be conducted in a manner which minimizes the potential for accidents and Faculty, Staff or Student exposure.

a. Stockrooms/Storerooms

Hazardous chemicals should be segregated in a well-identified, ventilated area. The department storerooms are under the control of the Departmental Chemical Hygiene Officer who is responsible for their safety and inventory control. Stored chemicals are examined annually for replacement, deterioration, and container integrity and are disposed of as necessary. The Science Division Chemical storeroom is under the control of the Chemical Stores Supervisor, with the College Chemical Hygiene Officer having oversight responsibility.

b. Distribution

Faculty/Staff/or other Employees receiving chemicals are responsible for proper use, storage and disposal until chemicals are returned to the appropriate storeroom. Faculty/Staff/or other Employees are responsible in conjunction with the Department Chemical Hygiene Officer for documenting that safety aspects of chemicals have been reviewed before usage.

When chemicals are hand carried, they should be placed in an outside container or acid-carrying bucket to protect against breakage and spillage.

Compressed gas cylinders should never be rolled or dragged. Cylinders should be transported with a suitable handcart and the cylinder strapped in place.

c. Laboratory Storage

Quantities of chemicals stored in the laboratory should be kept to a minimum. Chemicals should be stored away from heat sources and direct sunlight. Periodic inventories will be conducted by the Chemical Hygiene Officer and the Chemical Stores Supervisor and items, which are

unnecessary, will be returned to the Divisional Storeroom for disposal. Empty containers will be returned to the Storeroom.

Incompatible materials should be segregated for storage. Refer to Safety Library Incompatibility Charts.

d. Use of a Hood

A hood should be used for operations, which might result in release of toxic chemical vapors or dust. The hood velocity will be checked annually and the hood velocity posted on the hood. In general, the hood should be used when working with any appreciably volatile substance with a TLV of less than 50 ppm. If high toxicity materials such as carcinogens or reproductive toxins are used, the hood velocity should have a minimum average face velocity of 100-125 fmp. Each Department will maintain a list of these hoods, with a copy being sent to the Chemical Hygiene Officer. The hoods designated as high hazard hoods will have the face velocity checked monthly.

Storage of chemicals in the hood should not be allowed to block vents or airflow and should be kept to a minimum. The hood should be operating if chemicals are stored there. Hoods/sashes should be closed, or when operations are being carried out in the hoods, be positioned at the recommended height.

e. Working Alone

Experiments, which are hazardous, should not be conducted by Faculty/Staff/or other Employees who are not in shouting distance of others. Under normal working conditions, arrangements should be made between individuals working in separate laboratories or work areas to crosscheck periodically.

f. Dispensing Chemicals

When chemicals are transferred from one container to another, Faculty/Staff/or other Employees should be sure that the new container is compatible with the chemical and is labeled with the identity of the chemical. Empty chemical containers should be sent to the Science Division storeroom.

## Laboratory Operations/Activities Requiring Approval

Faculty/Staff/or other Employees should be informed of those procedures and operations, which require prior review, by the Department Chemical Hygiene Officer to ensure that these activities are carefully monitored for adherence to the Chemical Hygiene Plan and regulatory requirements.

### a. Laboratory Operations Requiring Prior Approval

- disposal of non-routine chemical wastes
- work with high toxicity chemicals
- work with substances demonstrating high carcinogenic potency in animals or human carcinogens

### b. Department-Specific Prior Approval Activities

The Department Chemical Hygiene Officer will determine if there are additional, department-specific laboratory activities, which require his or her review.

## **SECTION E. GENERAL LABORATORY SAFETY GUIDELINES**

Safety guidelines are intended to protect the health and safety of laboratory Faculty/Staff/or other Employees who work with hazardous chemicals through training and careful attention to safe operating practices.

Faculty/Staff/or other Employees in the affected departments will use standard operating procedures outlined in the "Safety in the Academic Chemistry Laboratory" manual.

## **SECTION F. SPECIFIC EXPOSURE CONTROL MEASURES**

### Goal

Specific Exposure Control Measures address the criteria that would invoke the use of specific exposure control measures, above and beyond Standard Operating Procedures and General Laboratory Safety Guidelines, which reduce

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Faculty/Staff/or other Employees exposure to hazardous chemicals.

### Criteria

Criteria for determining when and what types of specific exposure control measures should be implemented may be based on (1) the degree of toxicity of a substance to be used, (2) the exposure potential of the procedures to be performed, or (3) the capacity of the engineering controls, administrative practices or personal protective equipment to control Faculty/Staff/or other Employees exposures.

General procedures for handling these types of chemicals are included in this guidance. Faculty/Staff/or other Employees in conjunction with Department Chemical Hygiene Officers should review these general procedures and adapt them as appropriate to their specific laboratory chemicals and operations.

### Exposure Potential

The routes of exposure to chemicals may occur by inhalation, ingestion, contact with skin or eyes, or injection.

**Inhalation** of chemical vapors, mists, gases or dusts can produce poisoning through the mucous membrane of the mouth, throat, and lungs and can seriously damage these tissues. The degree of injury resulting from exposure to toxic vapors, mists, gases or dusts depends on the toxicity of the material and its solubility in tissue fluids, its concentration and the duration of exposure.

**Ingestion** of many chemicals can be extremely dangerous. The relative acute toxicity of a chemical can be evaluated by determining its LD<sub>50</sub>, which is defined as the quantity of chemical that will cause the death of 50% of the test animals when ingested in a single dose. In addition, many chemicals will directly damage the tissue of the mouth, throat, nose, lungs, and gastrointestinal tract.

**Contact with skin and eyes** can lead to significant chemical injury. A common result of skin contact is local irritation, but many chemicals can be absorbed through the skin and cause systemic poisoning. Most chemicals are damaging to the eyes, which are very sensitive organs. Alkaline materials, phenols, and strong acids can

cause permanent loss of vision.

**Injection** of chemicals is not a very common route of exposure but may occur through mechanical injury from glass or other materials contaminated with chemicals, or when chemicals are handled in syringes.

**Other factors** to consider in evaluating the degree of exposure potential from the use of a particular chemical or activity involving the chemical include the:

- chemical's volatility, flammability, and reactivity;
- potential for unplanned chemical reactions;
- high heat of reaction;
- amount of time that a worker will be exposed;
- sensitivity of the laboratory worker (e.g., asthma, allergies, pregnancy);
- potential for generating aerosols; and
- potential for an uncontrollable release.

#### Capacity of Engineering Controls, Administrative Practices, and PPE

Evaluating the need for specific exposure control measures when Faculty/Staff/or other Employees are handling certain chemicals or using certain procedures should include a review of existing engineering controls, administrative practices and personal protective equipment (PPE).

The capacity of general ventilation and local exhaust systems should be evaluated against the required level of Faculty/Staff/or other Employees exposure protection. For example, work with a highly acute toxin such as hydrogen cyanide should be conducted under a hood with a face velocity of at least 100 fpm (or other containment device) if the procedure could result in the generation of aerosols or vapors.

Administrative practices, such as recordkeeping, training and medical surveillance, may need to be revised for particular laboratory activities to ensure Faculty/Staff/or other Employees are adequately protected from overexposure to hazardous chemicals. It may be appropriate to maintain inventory and usage records for select carcinogens and provide routine medical surveillance for individuals who will be handling these substances in toxicologically significant quantities.

The compatibility of available PPE and substances and/or procedures to be used is another area to consider in deciding whether to implement certain exposure control measures. Laboratory Faculty/Staff/or other Employees should be trained on the

proper use and type of PPE to use and should seek guidance from their Department Chemical Hygiene Officer if they are uncertain about its adequacy for a specific operation.

### Faculty/Staff/or other Employees Exposure Control Measures

The Laboratory Standard requires that each laboratory evaluate the need for specific exposure control measures when Faculty/Staff/or other Employees are working with select carcinogens, reproductive toxins, or substances with a high degree of acute toxicity. These measures include the establishment of designated areas, use of containment devices, decontamination procedures and safe removal of contaminated waste.

#### Designated Areas

OSHA recommends that the use of select carcinogens, reproductive toxins, or substances of high acute toxicity be restricted to “designated areas,” especially when other less toxic chemicals are being used in the same area. A designated area may be an entire laboratory, an area within a lab, or a device such as a lab hood. The goal is to limit exposures and alert all Faculty/Staff/or other Employees in the vicinity to the potential hazard.

#### Containment Devices

Circumstances involving select carcinogens, reproductive toxins, or substances of high acute toxicity that may warrant the use of containment devices (such as a fume hood) include:

- the use of volatile substances;
- manipulations that may generate an aerosol; and
- any handling or reaction that may result in an uncontrollable release.

Critical hoods should have airflow evaluated prior to use under such circumstances.

If this is not possible, work with substances of high or unknown toxicity should be avoided unless other types of ventilation devices are available.

## Decontamination Procedures

It may be appropriate to establish decontamination procedures to adequately address the decontamination required for certain designated areas in the laboratory.

Vacuum pumps and other contaminated equipment including glassware should be decontaminated in the hood before removing them from the designated area. The controlled area should be decontaminated periodically and always before normal work is resumed there.

## Safe Removal of Contaminated Waste

Safe disposal of contaminated wastes should be part of the planning process for any laboratory experiment or procedure. If practical, very hazardous substances should be converted to less hazardous substances in the laboratory rather than being directly placed in containers for disposal. The Department Chemical Hygiene Officer and the Chemistry Laboratory Supervisor will be in charge of picking up hazardous waste containers and proper disposal.

Solid chemical wastes should be placed in suitable containers. It is important to ensure that all waste containers are properly labeled to identify the associated contents and hazards. Laboratory Faculty/Staff/or other Employees involved in disposing of wastes should be aware of waste hazards, the importance of segregating incompatible materials and the applicable regulatory requirements.

### Procedures for Handling Chemicals with High Acute Toxicity

Examples: Hydrofluoric Acid, Hydrogen Cyanide

1. Use and store these substances in areas of restricted access with special warning signs.
2. Always use a hood or other containment device for procedures, which may result in the generation of aerosols or vapors containing the substance. The released vapors should be trapped to prevent their discharge with the hood exhaust.
3. Avoid skin contact by using gloves and wearing long sleeves and other protective apparel as appropriate.
4. Always wash hands and arms immediately after working with these materials.

5. Keep records of the amounts of these materials on hand, amounts used, and the names of participating Faculty/Staff/or other Employees.
6. Faculty/Staff/or other Employees should be familiar with the emergency procedures for accidents or spills involving these substances by consulting the appropriate Material Safety Data Sheets and the Department Chemical Hygiene Officer. If a major spill occurs outside of the hood, emergency responders should wear appropriate personal protective equipment and all other persons should evacuate the area.
7. Be sure that at least two people are present at all times when a highly toxic compound, or compound of unknown toxicity, is being used.
8. Breakable containers of these substances should be stored in resistant trays and work and storage surfaces should be covered with removable, absorbent plastic-backed paper.
9. Contaminated clothing should be chemically decontaminated, if possible, or destroyed. Contaminated waste should be stored in suitably labeled impervious containers. Liquids can be stored in glass or plastic bottles containing vermiculite.

#### Procedures for Handling Select Carcinogens

Examples: Benzene, Nickel, and Vinyl Chloride

1. All work with these substances should be conducted in a “designated area” such as a restricted access hood, glove box, or portion of a lab designated for use of chronically toxic substances. People with access to this area should be aware of the substances used and the necessary precautions to take. The designated area should be clearly marked with warning and restricted access signs.
2. The use and disposal of these substances should be approved by the Department Chemical Hygiene Officer prior to this activity. If appropriate, the Department Chemical Hygiene Officer will consult with the College Chemical Hygiene Officer and/or Department Chair.
3. Always use a hood or other containment device for procedures, which may result in the generation of aerosols or vapors containing the substance. The released vapors should be trapped to prevent their discharge with the hood exhaust.

4. Vacuum pumps should be protected against contamination by scrubbers or other devices and vented into the hood. Vacuum pumps and other contaminated equipment should be decontaminated in the hood prior to removing them from the designated area. The designated area should also be decontaminated before resuming work there.
5. Avoid skin contact by using gloves and wearing long sleeves and other protective apparel as appropriate.
6. Remove any protective clothing before leaving a designated area and place it in an appropriate, labeled container.
7. Always wash hands, arms, face and neck immediately after working with these materials.
8. Keep records of the amounts of these materials on hand, amounts and dates used, and the names of the Faculty/Staff/or other Employees involved.
9. Faculty/Staff/or other Employees should be familiar with the emergency procedures for accidents or spills involving these substances. If a major spill occurs outside of the hood, emergency responders should wear appropriate personal protective equipment and all other persons should evacuate the area.
10. Be sure that at least two people are present at all times when a highly toxic compound, or compound of unknown toxicity, is being used.
11. These substances should be stored in unbreakable containers in a ventilated area with limited access. Work and storage surfaces should be covered with removable, absorbent plastic-backed paper. All containers should be labeled with the identity and hazards of the substance.
12. Contaminated clothing should be chemically decontaminated, if possible, or destroyed. Contaminated waste should be stored in suitably labeled impervious containers. Liquids can be stored in glass or plastic bottles containing vermiculite. Containers of contaminated wastes should be transferred from the designated area in a secondary container.
13. Determine the appropriateness of medical surveillance for Faculty/Staff/or other Employees if they are working with toxicologically significant quantities of these substances on a regular basis.

14. Positive pressure glove boxes should be checked for leaks before each use. Negative pressure glove boxes should have a ventilation rate of at least 2 volumes per hour and a pressure of at least 0.5 inches of water. Exit gases should be trapped or filtered and then released through the hood.

## **SECTION G. EMERGENCY PREVENTION AND RESPONSE**

Laboratory Faculty/Staff/or other Employees should be familiar with College emergency procedures in order to prevent and reduce the impact of laboratory accidents.

All injury and health risk exposure accidents should be immediately reported to the Safety Office. An accident report must be filed within 24 hours on the designated form with copies going to the Security Office, the Human Resources Office, the Department Chair, and the Chemical Hygiene Officer. Near accidents should be reported in the same fashion. The Department Chair will circulate reports within the department to help minimize future reoccurrences.

## **SECTION H. INFORMATION AND TRAINING**

The College and/or Department Chemical Hygiene Officer will provide laboratory Faculty/Staff/or other Employees with information and training on the hazards of chemicals present in their work area and what to do if an accident occurs.

### **1. Training Program**

Training will consist of at least the following subjects:

- a. methods that may be used, and observations to detect, the release or presence of a hazardous chemical (such as continuous monitoring devices and the visual appearance or odor of hazardous chemicals when being released);
- b. the physical and health hazards of chemicals in the work area; and
- c. the measures Faculty/Staff/or other Employees can take to protect themselves from these hazards, including specific procedures that the College has implemented to protect Faculty/Staff/or other Employees from exposure to hazardous chemicals (e.g., emergency procedures

and protective equipment to be used).

## 2. Information for Faculty/Staff/or other Employees

Faculty/Staff/or other Employees will be provided with the following information:

- a. the Chemical Hygiene Plan standards and Permissible Exposure Limits (PEL's) (located in Chemistry Stores);
- b. the Chemical Hygiene Plan;
- c. the signs and symptoms associated with exposure to hazardous chemicals used in the laboratory (references located in Chemical Stores);
- d. the location and availability of reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including Material Safety Data Sheets (located in the Chemical Store or on line at;  
<http://www.macalester.edu/security/msds/msdslinks.html>);
- e. a copy of "Safety in Academic Chemical Laboratories" (copy provided for Faculty/Staff/or other Employees); and
- f. a copy of the College Written Hazard Communication Program (Section 2 of this manual).

## 3. When to Provide Training and Information

Information and training will be provided at the time of Faculty/Staff/or other Employees initial assignment to the work area where hazardous chemicals are present and prior to assignments involving new exposure situations. Refresher information and training will be provided as determined by College and Department Chemical Hygiene Officers, but at a minimum, will occur once per year.

Each Department will have an initial training program conducted by the College Chemical Hygiene Officer. The items to be covered are seeing the videotape Laboratory Chemicals and Your Health: Principles and a review of the Chemical Hygiene Plan. A copy of "Safety in Academic Chemical Laboratories" will be distributed to each employee. A signature of attendance will be required of each employee to certify that he/she has received such initial training. A copy of this list will be maintained in the Human Resources Office and by the College Chemical Hygiene Officer. An annual update of training by each employee will also be required.

## **SECTION I. INSPECTIONS AND CHEMICAL HYGIENE PLAN REVIEW**

The Plan will be reviewed annually in an effort to minimize safety and health risks and periodic inspections of laboratories will be made.

### **1. Inspecting Laboratory Safety Equipment**

Laboratory safety equipment will be inspected annually by the Chemical Hygiene Officer to assess fitness for use. Equipment includes:

- fume hoods and other protective equipment (environmental controls);
- personal protective equipment (gloves, respirators);
- emergency equipment (fire extinguishers, spill kits); and
- first aid equipment (showers, eyewash stations).

### **2. Review of the Chemical Hygiene Plan**

The Chemical Hygiene Plan will be annually reviewed by the Laboratory Safety Committee and Chemical Hygiene Officers and the Environmental Health, Safety, and Security Office for compliance with appropriate regulations and for adequacy in protecting Faculty/Staff/or other Employees from the health and physical hazards associated with laboratory chemicals.

The results of this review should be recorded, including notes on needed changes, when those changes were made, etc.

## **SECTION 2**

## WRITTEN HAZARD COMMUNICATION PROGRAM

### GENERAL INFORMATION

The Hazard Communication Standard requires chemical manufacturers or importers to assess the hazards of all chemicals they produce or import and transmit that information to affected employers and employees. The standard requires the College to provide Faculty/Staff/or other Employees with information about the potential of hazardous chemical exposure under normal use conditions or in a foreseeable emergency. This information is transmitted through a Hazard Communication Program, which includes container labeling and other forms of warning, Material Safety Data Sheets, and employee training.

The Hazard Communication program is an extension of the College Chemical Hygiene Plan. It is intended to promote a safe and healthful work environment.

The general written program will be maintained by the College Chemical Hygiene Officer and by departments where Faculty/Staff/or other Employees are more likely to be exposed to hazardous chemicals. Written Departmental programs will be established to expand or modify the general college program where appropriate. Written programs will be available for review by an interested Faculty/Staff/or other Employees.

Primary responsibility for compliance with the Hazard Communication Program lies with each department. Each Director, Department Chair and Supervisor\* is responsible for safe work performance and hazard communication within their department. The Chemical Hygiene Officer is responsible for development, coordination and monitoring of College-wide hazard communication policies and procedures.

## CONTAINER LABELING

The container-labeling portion of the Hazard Communication Standard requires manufacturers, distributors and importers to label, tag or mark hazardous chemical containers with the identity of hazardous chemicals, the appropriate hazard warnings, and the name and address of the manufacturer, importer or other responsible party. The purpose of the labeling requirements is to provide employees with an immediate warning of hazard in the workplace and to direct the handler of the chemical to the appropriate Material Safety Data Sheet (MSDS). Labels should act as visual reminders of information presented during training and of information found in more detailed form on the MSDS.

Some exemptions from the labeling portion of this standard by chemical manufacturers exist as follows:

- Pesticides covered by the Federal Insecticide, Fungicide and Rodenticide Act under the jurisdiction of the Environmental Protection Agency.

\*Supervisors include all Faculty/Staff/or other Employees who supervise the work or study activities of one or more Faculty/Staff/or other Employees, even on a short-term basis.

- Foods, drugs and cosmetics under the jurisdiction of the Food and Drug Administration.
- Distilled spirits not intended for industrial use and under the jurisdiction of the Bureau of Alcohol, Tobacco and Firearms.
- Consumer products under the jurisdiction of the Consumer Product Safety Commission.

Supervisors in each College department shall verify that all hazardous material containers received for use:

- Are clearly labeled as to the contents.
- Carry the appropriate hazard warning.
- List the name and address of the manufacturer.

Manufacturers, distributors and importers are required to provide this information on their container labels. For containers not properly labeled, containers with obscure/defaced labels, or unlabeled secondary containers where a chemical is transferred, the supervisor shall ensure that an extra copy of the original manufacturer's label or a generic self-adhesive label is completed with the appropriate information and affixed to the container immediately. Information for completing the generic label may be obtained from the original label or an MSDS.

### HAZARDOUS CHEMICAL INVENTORY

The Science Division Chemical Storeroom will maintain a master list of all chemicals and their location. Each department will maintain a current list (inventory) of hazardous chemicals used by its Faculty/Staff/or other Employees. This list will be stored with departmental MSDS and will use an identity, which can be referenced to MSDS.

Departments will inform the Chemical Stores Supervisor regarding the location of their hazardous chemical inventory.

### MATERIAL SAFETY DATA SHEETS (MSDS)

The Material Safety Data Sheet (MSDS) or equivalent is the primary written means to convey information concerning the hazards of chemicals to employers and employees. In most cases the manufacturer, importer or formulator who introduces the product into commerce or the workplace will prepare and send the MSDS or equivalent. The contents of the MSDS will be based upon a chemical hazard determination made by them.

Each Department will be responsible for obtaining and maintaining MSDS for hazardous chemicals used by its Faculty/Staff/or other Employees in a designated location known to all Department members. Incoming MSDS will be reviewed for new and significant health/safety information to be passed on to affected Faculty/Staff/or other Employees. Departments may use "hard copies", the Science Division Storeroom, or the on-line web sites at [www.macalester.edu/security/msds/msdslinks.html](http://www.macalester.edu/security/msds/msdslinks.html) or other department resources to help meet the intent of MSDS requirements.

The inventory of hazardous chemicals, MSDS and Chemical Stores or on-line at [www.macalester.edu/security/msds/msdslinks.html](http://www.macalester.edu/security/msds/msdslinks.html) will be readily accessible to Faculty/Staff/or other Employees in their work areas.

## EMPLOYEE TRAINING AND INFORMATION

Faculty/Staff/or other Employees will be made aware of hazardous chemicals used in their work areas and the requirements of the Hazard Communication Standard. They will be informed of the availability and location of the Written Program, Material Safety Data Sheets (MSDS), and the List of Hazardous Chemicals.

Faculty/Staff/or other Employees will be trained in the methods and observations for detecting the presence or release of hazardous chemicals, the physical and health hazards of these chemicals, the measures for protection from hazards, and the specific details of the Hazard Communication Program which include labeling and MSDS information systems.

With assistance from the College Chemical Hygiene Officer, Department Chairs and Supervisors will be responsible for training and providing information to their Faculty/Staff/or other Employees which includes:

- Chemicals present in the workplace,
- Physical and health effects of the hazardous chemicals,
- Methods and observation techniques used to determine the presence or release of hazardous chemicals in the work area,
- How to lessen or prevent exposure to hazardous chemicals through use of control/work practices and personal protective equipment,
- Steps the College has taken to lessen or prevent exposure to hazardous chemicals,
- Emergency procedures for responding to a chemical incident,
- How to read labels and review MSDS to obtain appropriate hazard information.

After conducting hazardous chemical training or information sessions, trainers will document and keep on record the date of training, who attended and what was done. Before a new hazardous chemical is introduced into a Department, Faculty/Staff/or other Employees in the affected work area will be given information as outlined above.

## HAZARDOUS NON-ROUTINE TASKS

Periodically, some Faculty/Staff/or other Employees will perform hazardous non-routine tasks or projects such as confined space entry or repair/maintenance operations. Prior to starting such work, Departments will develop and/or provide documented procedures and information to Faculty/Staff/or other Employees before they start the task or project.

Information will cover specific chemical hazards, protective/safety measures and the steps, which have been taken to lessen hazard potential.

## INFORMING CONTRACTORS

Departments will inform contractors or their employee(s) of hazardous chemicals, which may result in exposures while on a College, "job-site".