MINNESOTA STATE UNIVERSITY MOOHREAD
CHEMICAL HYGIENE PLAN

Introduction

A. Purpose

This Chemical Hygiene Plan (CHP) sets forth policies, procedures, equipment, and personal protective equipment and work practices that are capable of protecting employees from the health hazards presented by hazardous chemicals they use in laboratories. This plan is intended to meet the requirements of the Federal and State Occupational Safety and Health Administration (OSHA) standard, Occupational Exposure to Hazardous Chemicals in Laboratories and Minnesota Employee Right to Know Act (MERTKA).

This Chemical Hygiene Plan is intended to safely limit laboratory workers' exposure to OSHA regulated substances. Lab workers must not be exposed to substances in excess of the permissible exposure limits (PEL) specified in OSHA rule 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances.

B. Scope and Application

This standard applies where "laboratory use" of hazardous chemicals occurs. Laboratory use of hazardous chemicals means handling or use of such chemicals in which all of the following conditions are met: 1) the handling or use of chemicals occurs on a "laboratory scale", that is, the work involves containers which can easily and safely be manipulated by one person, 2) multiple chemical procedures or chemical substances are used, and 3) protective laboratory practices and equipment are available and in common use to minimize the potential for employee exposures to hazardous chemicals.

At a minimum, this definition covers employees (including student employees) who use chemicals in teaching and research laboratories at Minnesota State University Moorhead. Certain non-traditional laboratory settings may be included under this standard at the option of the individual departments within the University. Also, it is the policy of the University that laboratory students, while not legally covered under this standard, will be given training commensurate with the level of hazard associated with their laboratory work.

This standard does not apply to laboratories whose function is to produce commercial quantities of material. Also, where the use of hazardous chemicals provides no potential for employee exposure, such as in procedures using chemically impregnated test media and commercially prepared test kits, this standard will not apply. When laboratory work is limited to use of these commercially available kits, a Chemical Hygiene Plan is not required.

Many of the chemicals used in laboratories have OSHA-designated "permissible exposure limits" or "actions levels". Permissible exposure limits (PEL) refer to airborne concentrations of substances and are averaged over an eight-hour workday. Action levels are exposures below the permissible exposure limit which nevertheless require that certain actions such as medical surveillance and workplace monitoring take place.

An employee's workplace exposure to any regulated substance must be monitored if there is reason to believe that the exposure will exceed an action level or a PEL. If exposures to any regulated substance routinely exceed an action level or PEL there must also be employee medical exposure surveillance.

C. Coordination With Other University Standards and Guidelines

Although this standard deals only with use of hazardous chemicals, employees may also encounter potential physical or biological hazards in the laboratory. In the unlikely event that there is a conflict between provisions of various standards, the Director of Environmental Health & Safety (EHS) should be contacted to assist in resolving the discrepancy.

D. Responsibilities

1. University

Minnesota State University Moorhead is responsible for developing and supporting a broad-based chemical hygiene plan that will protect its laboratory employees from health effects associated with hazardous chemicals. Management is responsible for integrating safety into all of its activities, for promoting the same attitude among all levels of employment at the University, and for providing adequate time and recognition for employees who are given laboratory safety responsibilities.

2. EHS Department

The EHS Department is responsible for preparing and updating the University's Chemical Hygiene Plan, for distributing it to departments who will implement the Plan, and directing/monitoring the progress of departments toward achieving compliance. The EHS director will work with the University's Chemical Hygiene Officers in developing the CHP and update it annually.

3. Chemical Hygiene Officer

The Chemical Hygiene Officer (CHO) is responsible for implementing the Chemical Hygiene Plan and acting as a liaison between their College and EHS for laboratory safety issues. The CHO also assists in investigations of accidents and chemical exposures, makes laboratory safety training available to lab workers, and manages the purchase, storage, and disposal of all hazardous materials.

4. Supervisor

The immediate supervisor of a laboratory employee is responsible for scheduling time for the employee to attend designated training sessions and for assuring that potential hazards of specific projects have been identified and addressed before work is started. The supervisor is also responsible for enforcing safe work practices and for reporting hazardous conditions to EHS or the Chemical Hygiene Officers.

5. Employee

Each laboratory employee is responsible for attending safety training sessions, following safety guidelines applicable to the procedures being carried out, assuring that required safety precautions are in place before work is started, and reporting hazardous conditions as they are discovered. Employees who have significant responsibility for directing their own laboratory work are responsible for assuring that potential hazards of specific projects have been identified and addressed before work is started.

Standard Operating Procedures

A. Laboratory Operating Procedures

The laboratory operating procedures found in Prudent Practices in the Laboratory: Handling and Disposal of Chemicals (National Research Council, 1995) and supplemental materials found in the American Chemical Society's Safety in Academic Chemistry Laboratories are adopted for general use at Minnesota State University Moorhead. The following topics are covered:

General Recommendations for Safe Practices in Laboratories

General Principles	Flammability Hazards
Health and Hygiene	Cold Traps and Cryogenic Hazards
Food Handling	Systems Under Pressure
Housekeeping	Waste Disposal Procedures
Equipment Maintenance	Warning Signs and Labels
Guarding for Safety	Unattended Operations
Shielding for Safety	Working Alone
Glassware	Accident Reporting

Protective Apparel, Safety Equipment, Emergency Procedures and First Aid

Glasses and Face Shields	Emergency Procedures
Gloves	First Aid
Other Clothing and Footwear	Chemical Ingestion or Contamination
Safety Equipment	

Design Requirements for and Use of Electrically Powered Laboratory Apparatus

General Principles	Stirring and Mixing Devices
Vacuum Pumps	Heating Devices
Drying Ovens	Electronic Instruments
Refrigerators	

Laboratory Ventilation

General Laboratory Ventilation	Special Ventilation Areas
Use of Laboratory Hoods	Maintenance of Ventilation Systems
Other Local Exhaust Systems	

B. Chemical Spill Emergency Procedures – Quick Reference

Evacuate

- Leave the spill area; alert others in the area and direct/assist them in leaving.
- Without endangering yourself: remove victims to fresh air, remove contaminated clothing and flush contaminated skin and eyes with water for 15 minutes. If anyone has been injured or exposed to toxic chemicals or chemical vapors, call 911 and seek medical attention immediately.

Confine

- Close doors and isolate the area. Prevent people from entering spill area.

Report

- From a safe place, call Public Safety (477-2449).
- Report you have an emergency and give your name, phone, and location; location of the spill; the name and amount of material spilled; extent of injuries; safest route to spill.
- Stay on the phone and Public Safety will advise you as soon as possible on actions taken.
- EHS or Fire Department will clean up or stabilize spills. In the case of a small spill and low hazard situation, EHS will advise you on what precautions and protective equipment to use.

Secure

- Until emergency response personnel arrive: block off the area leading to the spill, lock doors, post signs and warning tape, and alert others of the spill.
- Post staff by commonly used entrances to the area to direct people to use other routes.

Criteria for Implementing of Control Measures

Engineering controls, personal protective equipment, hygiene practices, and administrative controls each play a role in a comprehensive laboratory safety program. Implementation of specific measures must be carried out on a case-by-case basis, using the following criteria for guidance in making a decision. Assistance is available from EHS.

A. When to Use Fume Hoods

The laboratory fume hood is the major protective device available to laboratory workers. It is designed to capture chemicals that escape from their containers or apparatus and to remove them from the laboratory environment before they can be inhaled. Characteristics to be considered in requiring fume hood use are physical state, volatility, toxicity, flammability, eye and skin irritation, odor, and the potential for producing aerosols. A fume hood should be used if a proposed chemical procedure exhibits and one of these characteristics to a degree that

1) airborne concentrations might approach the action level or PEL,
2) flammable vapors might approach one tenth of the lower explosion limit,
3) materials of unknown toxicity are used or generated, or
4) odor produced is annoying to laboratory occupants or adjacent units.

Procedures that can generally be carried out safely outside the fume hood include those involving

1) water-based solutions of salts, dilute acids, bases, or other reagents,
2) very low volatility liquids or solids,
3) closed systems that do not allow significant escape to the laboratory environment, and
4) extremely small quantities of otherwise problematic chemicals. The procedure itself must be evaluated for its potential to increase volatility or produce aerosols.

B. When to Use Safety Shields or Other Containment Devices

Safety shields, such as the sliding sash of a fume hood, are appropriate when working with highly concentrated acids, bases, oxidizers or reducing agents, all of which have the potential for causing sudden spattering or even explosive release of material. Reactions carried out at non-ambient pressures (vacuum or high pressure) also require safety shields, as do reaction that are carried out for the first time or are significantly scaled up from normal operating conditions.

Other containment devices, such as glove boxes or vented gas cabinets, may be required when it is necessary to provide an inert atmosphere for the chemical procedure taking place, when capture of any chemical emission is desirable, or when the standard laboratory fume hood does not provide adequate assurance that overexposure to a hazardous chemical will not occur. The presence of biological or radioactive materials may also mandate certain special containment devices.

High strength barriers coupled with remote handling devices may be necessary for safe use of extremely shock sensitive of reactive chemicals.

Highly localized exhaust ventilation, such as is usually installed over atomic absorption and gas chromatography instruments, may be required for instrumentation that exhausts toxic or irritating materials to the laboratory environment.

Ventilated chemical storage cabinets or rooms should be used when the chemicals in storage may generate toxic, flammable or irritating levels of airborne contamination.

C. When to Use Protective Equipment

Eye protection is required for all personnel and any visitors whose eyes may be exposed to chemical or physical hazards. Side shields on safety eyewear provide some protection against

splashed chemicals or flying particles, but goggles or face shields are necessary when there is a greater than average danger of eye contact. A higher than average risk exists when working with highly reactive chemicals, concentrated corrosives, or with vacuum or with pressurized glassware systems. Contact lenses should not be worn in the laboratory. Chemicals can be concentrated under contact lenses and contact lenses will interfere with eye flushing in case of emergency. Minnesota State statute 126.20 requires the use of ANSI Z87.1-1989 compliance goggles in all instructional laboratories where chemical splash potential exists.
Lab coats or other similar clothing protectors are strongly encouraged for all laboratory personnel. Lab coats are required when working with select carcinogens, reproductive toxins, substances which have a high degree of acute toxicity, strong acids and bases, and any substances on the OSHA PEL list carrying a "skin" notation.

Gloves made of appropriate material are required to protect the hands and arms from thermal burns, cuts, or chemical exposure that may result in absorption through the skin or reactions on the surface of the skin. Gloves are also required when working with particularly hazardous substances where possible transfer from hand to mouth must be avoided. Thus gloves are required for work involving pure or concentrated solutions of select carcinogens, reproductive toxins, substances which have a high degree of acute toxicity, strong acids and bases, and any substances on the OSHA PEL list carrying a "skin" notation.

Workers and students should be made aware that there is no single all-purpose glove. Each chemical situation needs to be carefully evaluated. Gloves should be carefully selected using guides from the manufactures. General selection guides are available; however, glove resistance to various chemical materials will vary with the manufacturer, model, and thickness. Therefore, review a glove-resistance chart from the manufacturer you intend to buy from before purchasing gloves.

Bare feet are not permitted in any laboratory. Sandals and open-toed shoes are strongly discouraged in all laboratories and are not permitted in any situation where lab coats and gloves are required.

Respiratory protection is generally not necessary in the laboratory setting and must not be used as a substitute for adequate engineering controls. Availability of respiratory protection for emergency situations may be required when working with chemicals that are highly toxic and highly volatile or gaseous. If an experimental protocol requires exposure above the action level of PEL that cannot be reduced, respiratory protection will be required. Rarely, an experimental situation may potentially involve IDLH (Immediately Dangerous to Life or Health) concentrations of chemicals, which will require use of respiratory protection. All use of respiratory protective equipment is covered under MSUM's Respiratory Protection Program.

Supervisors must designate areas, activities, and tasks that require specific types of personal protective equipment as described above. Prior pulmonary function tests will be made for each employee requiring personal respiratory device use. The EHS director should be contacted if pulmonary tests are to be performed.

Management of Fume Hoods and Other Protective Equipment

A. Frequency and Type Monitoring

Fume hoods must be monitored daily by the user to ensure that air is moving into the hood. Any malfunctions must be reported immediately to the Physical Plant. The hood should have a continuous reading device, such as a pressure gauge, to indicate that air is moving correctly. Users of the older hoods without continuous reading devices should attach a strip of tissue or yarn to the bottom of the vertical sliding sash. The user must ensure the hood and baffles are not blocked by equipment and bottles, as air velocity through the face may be decreased. The

average face velocity of each fume hood should be measured annually with a velometer or a thermoanemometer. A record of monitoring results will be made.

Eyewashes must be flushed weekly by the user. This will ensure that the eyewash is working and the water is clean, should emergency use become necessary. The user should coordinate with the Physical Plant to ensure that emergency showers and eyewashes are checked annually. Fire extinguishers will be checked annually by University contractor. Public Safety is responsible for checking regularly to ensure that other protective equipment is functioning properly. EHS can assist with these evaluations, should assistance be necessary.

B. Acceptable Operating Range

The acceptable operating range for fume hoods is 80 to 150 linear feet per minute, at the designate sash opening (usually 18 inches). If, during the annual check, a hood is operating outside of this range one check to ensure the baffles are adjusted properly, and that the exhaust slots are not blocked by bottles and equipment. If these adjustments do not help, report the deficiency to the Physical Plant for servicing.

C. Maintenance

During maintenance of fume hoods, laboratories must clean out and, if necessary, decontaminate the fume hood and restrict use of chemicals to insure the safety of maintenance personnel. Maintenance personnel will post a warning sign indicating the hood is inoperable during all repairs.

D. Training

Training in the appropriate use and care of fume hoods systems, showers, eyewashes and other safety equipment will be included in the initial and update training.

E. New Systems

When new ventilation systems, such as variable air volume exhaust, are installed in University facilities, specific policies for their use will be developed by EHS and employees will be promptly trained on the use of the new equipment.

Employee Information and Training

A. Information

Accessibility of information on the hazards of chemicals and procedures for working safely are essential for the laboratory employee. Supervisors should ensure that lab employees are informed about and have access to the following sources:

1. This Chemical Hygiene Plan, which is based on information contained in the OSHA standard, Occupational Exposure to Hazardous Chemicals in Laboratories, and its appendices (29 CFR 1910.1450).

2. *Safety in Academic Chemistry Laboratories*, published by the American Chemical Society.

3. Signs and symptoms associated with exposure to hazardous chemicals, as well as information on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory are found in Prudent Practices in the Laboratory: Handling and Disposal of Chemicals. The following topics are covered:

Procedures for Working with Substances that Pose Hazards Because of Acute Toxicity

Chronic Toxicity, or Corrosiveness Procedures for Working with Substances that Pose Hazards Because of Flammability or Explosion

Procedures for Working with Compressed Gases and for Working at Pressures Above or Below Atmospheric

Known Hazards of and Specific Precautions for a Selected Group of Laboratory Chemicals

4. Safety Data Sheets (SDS) for laboratory chemicals are available from EHS, department offices, in many individual laboratories, and may be retrieved from the Internet via MSDSonline.com. Departments that receive SDS directly with chemical shipments will make such information available to the employees and students using the chemicals, and will also send a copy of the SDS to the EHS Director. Safety Data Sheets (SDS) are to be posted in designated laboratories and also filed in departments using the chemical. A SDS must be on file before a chemical may be used by an employee or student.

5. Information on chemical waste disposal and spill response is available by contacting the EHS office. Departments should also have posted disposal and spill response guidelines.

B. Training

Each laboratory supervisor is responsible for ensuring that laboratory employees are provided training about the hazards of chemicals present in their laboratory work area and methods to control exposure to such chemicals. Such training will be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new potential exposure situations.

Colleges and non-academic departments that engage in the laboratory use of hazardous chemicals are responsible for identifying employees who require training and for developing and delivering training programs for such employees.

Employee training programs will include, at a minimum, the following subjects:

1. Methods of detecting the presence of hazardous chemicals (i.e. observation, odor, real-time monitoring, air sampling, etc.);
2. Basic toxicological principles, including toxicity, hazard, exposure, routes of entry, acute and chronic effects, dose-response relationship, threshold limit values, and permissible exposure limits, exposure time, and health hazards related to classes of chemicals;
3. Good laboratory practice, including general techniques designed to reduce personal exposure and to control physical hazards, as well as specific protective mechanisms and warning systems used in individual laboratories. Appropriate use of fume hoods is to be specifically addressed;
4. Description of information available, including Safety Data Sheets;
5. Emergency response actions appropriate to individual laboratories;
6. Applicable details of the Chemical Hygiene Plan, including general and laboratory-specific Standard Operating Procedures.
7. An introduction to hazardous chemical waste management.

Medical Consultation and Examination

A. All employees who work with hazardous chemicals will have an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances:

1. Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory, the employee will be provided an opportunity to receive an appropriate medical examination.

2. Where exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the PEL) for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements, medical surveillance will be established for the affected employee as prescribed by the particular standard.

3. Whenever an event takes place in the work area such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure, the affected employee will be provided an opportunity for a medical consultation. Such consultation will be for the purpose of determining the need for a medical examination.

B. All medical examinations and consultations will be performed by or under the direct supervision of a licensed physician and will be provided without cost to the employee, without loss of pay, and at a reasonable time and place.

C. Minnesota State University Moorhead will provide the examining physician with the following information:

1. The identity of the hazardous chemical(s) to which the employee may have been exposed;

2. A description of the conditions under which the exposure occurred including quantitative exposure data, if available; and

3. A description of the signs and symptoms of exposure that the employee is experiencing, if any.

The above information will be collected and submitted by the employee's supervisor or department to the Minnesota State University Moorhead Human Resource Office as well as to the examining physician.

D. The examining physician will provide to the Minnesota State University Moorhead Human Resource Office a written report including the following:

1. Any recommendation for further medical follow-up;

2. The results of the medical examination and any associated tests;

3. Any medical conditions which may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous chemical found in the workplace; and

4. A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment. The Human Resource Office will notify the employee's department of the results of the medical consultation or examination. The written opinion will not reveal specific findings of diagnoses unrelated to occupational exposure.

Additional Employee Protection for Work with Particularly Hazardous Substances

Additional employee protection will be considered for work with particularly hazardous substances. These include select carcinogens, reproductive toxins and substances that have a high degree of acute toxicity. Prudent Practices in the Laboratory: Handling and Disposal of Chemicals provides detailed recommendations for work with particularly hazardous substances. Laboratory supervisors and principle investigators are responsible for assuring that laboratory procedures involving particularly hazardous chemicals have been evaluated for the level of employee protection required. Specific considerations will be given to the need for inclusion of the following provisions:

A. Planning
B. Establishment of a designated area
C. Access control
D. Special precautions such as:
    - Use of containment devices such as fume hoods or glove boxes;
    - Use of personal protective equipment;
    - Isolation of contaminated equipment;
    - Practicing good laboratory hygiene; and
    - Prudent transportation of very toxic chemicals.
E. Planning for accidents and spills
F. Special storage and waste disposal practices

Record Keeping, Review and Update of Chemical Hygiene Plan

A. Record keeping

1. Exposure evaluation

Any records of exposure evaluation carried out by individual departments (including continuous monitoring systems) should be kept within the department and also sent to EHS. Results of exposure evaluations carried out by designated consultants or university personnel will be kept by EHS and the Human Resource Offices and sent to the chairperson of the affected department. Raw data should be kept for one year and summary data for personnel will be retained for the term of employment plus 30 years.

2. Medical consultation and examination

Results of medical consultations and examinations will be kept by the Human Resource Office for a length of time specified by the appropriate medical records standard. This time will be at least the term of employment plus 30 years as required by OSHA.

3. Training

Individual employee training should be recorded and should be kept in the individual's department for 5 years.

4. Fume hood monitoring

Data on annual fume hood monitoring will be kept in the individual departments. Fume hood monitoring data are considered maintenance records and as such the raw data will be kept for one year and summary data for 5 years.

B. Review and Update of Chemical Hygiene Plan

On an annual basis, this Chemical Hygiene Plan will be reviewed and evaluated for effectiveness by the EHS Director & Chemical Hygiene Officers and updated as necessary. Any changes in the Chemical Hygiene Plan will be transmitted to academic and non-academic departments.