



NORTHLAND
COMMUNITY & TECHNICAL COLLEGE

<u>SECTION</u>	<u>PAGE</u>
Introduction.....	3
Responsibilities of a Program Administrator.....	4
Standard Operational Procedures	5
Implementation of Control Measures	13
Fume Hood Management.....	14
Employee Information and Training.....	14
Required Approvals.....	16
Medical Consultation and Examination	16
Additional Protection.....	18
Emergency Response	19
Review and Update	21
Chemical Storage.....	22
Additional Storage	24
Appendix A - Forms.....	25

1.0 PURPOSE

This Chemical Hygiene Plan (CHP) sets forth policies, procedures, equipment, personal protective equipment and work practices that are capable of protecting employees and students from the health hazards presented by hazardous chemicals used in laboratories. This plan is intended to meet the requirements of 29 CFR 910.1450, Occupational Exposure to Hazardous Chemicals in Laboratories.

2.0 SCOPE

This CHP applies to our Science Laboratories where employees work with substances in which the containers used for reactions; one person easily and safely manipulates transfers and other handling of substances. The objective of this program is to provide guidance to all laboratory personnel who use chemicals, so that they can perform their work safely.

Laboratory Employees – Each individual working in a laboratory should be informed about hazards associated with that laboratory and the specific work going on there. This includes all staff, students and assistants.

Support Personnel – Storeroom, janitorial, maintenance and delivery personnel may be exposed to potential physical and chemical hazards from work carried out in the laboratory. They must be informed about the risks involved and trained how to avoid potential hazards.

3.0 RESPONSIBILITIES

A. Safety Officer

The Safety Officer has the ultimate responsibility for chemical hygiene throughout the College and, with assistance of other program administrators, will provide continued manpower and fiscal support for chemical hygiene.

B. Chemical Hygiene Officer – Is responsible for the program Kristel Kizer-Cole – TRF and EGF campuses

The Chemical Hygiene Officer (CHO) is responsible for the Chemical Hygiene Program throughout the College and will provide continued direction for the Chemical Hygiene Program. The Chemical Hygiene Officer shall:

- work with administrators and other faculty to develop and implement acceptable, appropriate chemical hygiene policies and practices,
- monitor procurement and use of chemicals in the lab; determining that laboratory facilities and training levels are adequate for chemicals in use,
- perform regular, formal chemical hygiene and housekeeping inspections that include inspections of emergency equipment,

- maintain a current chemical inventory of science chemicals present within the Northland college property,
- review and improve the Chemical Hygiene Plan on, at a minimum, an annual basis,
- maintain overall responsibility for the safe operation of the Chemistry, Biology and Physics Laboratories,
- ensure that workers / students know and follow the chemical hygiene rules,
- determine the proper level of personal protective equipment; ensure that such protective equipment is available and in working order,
- ensure that appropriate training has been provided to employees,
- monitor the waste disposal program.

C. **Instructors** – Directly responsible for chemical hygiene in the laboratory. The Instructor is required to ensure that provisions of the CHP are being followed.

LABORATORY

INSTRUCTOR(S)

Chemistry:

Kristel Kizer - TRF

Biology:

Tim Gabor - TRF
Jeffrey Bell - EGF

D. **Students** – Responsible for planning and conducting each operation in accordance with prescribed chemical hygiene procedures.

4.0 STANDARD OPERATING PROCEDURES FOR LABORATORY CHEMICALS

A. Chemical Procurement

The decision to procure a chemical shall be completed by the Chemical Hygiene Officer, with assistance from Administration. A commitment of safe handling and use of the chemical from initial receipt to ultimate disposal will always be adhered to.

Northland Community and Technical College policy is to aggressively and continually evaluate current inventory and properly dispose of unnecessary materials.

Requests for procurement of new chemicals should involve the Safety Officer for the college to be notified of any changes.

A chemical request form shall be used for this purpose.

The Safety Officer and the Chemical Hygiene Officer shall identify information on proper handling, storage and disposal prior to procurement of a chemical. If, upon investigation, the chemical is either extremely hazardous (e.g., mutagenic, carcinogenic, teratogenic), or difficult to dispose of, they shall not approve procurement.

In addition, chemicals used in the laboratory shall be those which are appropriate for the ventilation system.

All chemicals must be received in a central location. Administrative personnel who receive chemical shipments shall be knowledgeable of the proper procedures for received.

When chemicals are received in the college receiving area, the pertinent science instructor will be notified of pick-up.

Science instructors or a designated-trained person will transport the materials to the Chemical Storage area.

Chemical containers shall not be accepted without accompanying labels, material safety data sheets and packaging in accordance with Northland's policy. All chemical shipments should be dated when received and opened.

B. Chemical Storage

Received chemicals shall be immediately moved to the designated Chemical Storage area by one of the Science Instructors. Large glass containers shall either remain in their original shipping container or be placed in carrying containers (e.g., rubber "boots") during transportation.

The storage area shall be well illuminated, with storage maintained at or below eye level. Large bottles (e.g., gallon) shall be stored in the designated flammable storage cabinet in Chemical Storage area.

Hazard classification and compatibility in an well-identified area, with good general exhaust ventilation must segregate chemicals.

Mineral acids should be segregated from flammable and combustible materials. Separation is defined by NFPA 49 as storage within the same fire area but separated by as much space as practicable or by intervening storage from incompatible materials.

Nitric acid will be stored in a separate acid cabinet.

Acid resistant trays shall be stored in a separate acid cabinet.

Acid sensitive materials, such as cyanides and sulfides shall be separated from acids or protected from contact with acids and water.

Highly toxic chemicals or other chemicals whose containers have been compromised shall be stored in unbreakable secondary containers.

The storage area shall NOT be used as a preparation or repackaging area.

The storage area shall be accessible during normal working hours. The storage area is under control of the Science Department and Science Instructors.

Storage of chemicals at the lab bench or other work areas shall be limited to those amounts necessary for one operation or shift. The amount of chemicals at the lab bench shall be as small as practical.

The Chemical Hygiene Officer shall examine stored chemicals for container integrity and/or deterioration at least annually. The inspection should determine whether any corrosion, deterioration or damage has occurred to the storage facility as a result of leaking chemicals.

The Chemical Hygiene Officer shall conduct periodic inventories of chemicals outside the storage area. Unneeded items shall be properly discarded or returned to the storage area.

C. Chemical Handling

Each laboratory employee / student (with the training, education and resources provided by supervision) shall develop work habits consistent with requirements of Northland College CHP to minimize potential personal and co-worker exposure to chemicals. Based on the realization that all chemicals inherently present hazards in certain conditions, exposure to all chemicals shall be minimized.

General precautions, which shall be followed for the handling and use of all chemicals, are:

1. Skin contact with chemicals shall be avoided at all times.
2. Employees shall wash all areas of exposed skin prior to leaving the laboratory. Hand soap is provided at each sink.
3. Mouth suction for pipetting or starting a siphon is prohibited.
4. Eating, drinking, smoking, chewing gum or application of cosmetics in the laboratory is prohibited.
5. Storage of food or beverages is not allowed in the storage areas or refrigerators used for laboratory operations.

6. Determination of risks shall be conservative in nature.
7. Any chemical mixture shall be assumed to be as toxic as its most toxic component.
8. Substances of unknown toxicity shall be assumed to be toxic.
9. Laboratory employees/students shall be familiar with the symptoms of exposure for the chemicals, which they work with, and the precautions necessary to prevent exposure.
10. The intent and procedures of this CHP shall be continually adhered to.
11. In all cases of chemical exposure, neither the Permissible Exposure Limits (PEL's) of OSHA or the Threshold Limit Values (TLV's) of the American Conference of Governmental Industrial Hygienists (ACGIH) shall be expected.
12. Engineering controls and safety equipment in the laboratory shall be utilized and inspected in accordance with guidelines established in the CHP.
13. Each laboratory Instructor will maintain an inspection log, which documents eyewash/shower function.
14. Specific precautions based on the toxicological characteristics of individual chemicals shall be implemented as deemed necessary by the Administration and Chemical Hygiene Officer.

D. Laboratory Equipment and Glassware

Each employee / student shall keep the work area clean and uncluttered. All chemicals and equipment shall be properly labeled, in accordance with the Northland College CHP guidelines.

At the completion of each workday or operation, the work area shall be thoroughly cleaned and all equipment properly cleaned and stowed.

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

1. All laboratory equipment shall be used only for its intended purpose.
2. All glassware will be handled and stored with care to minimize breakage; all broken glassware will be immediately disposed of in the broken glass container.
3. All evacuated glass apparatus shall be shielded to contain chemicals and glass fragments should implosion occur.
4. Labels shall be attached to all chemical containers, identifying the contents and related hazards.

5. Waste receptacles shall be labeled as such.
6. All laboratory equipment shall be inspected on a periodic basis and replaced or repaired as necessary.

E. Personal Protective Equipment

Safety glasses meeting ANSI Z87.1 are required for employees and visitors to the laboratory and will be worn at all times when chemicals are being used or manipulated in the laboratory.

The wearing of contact lenses in the laboratory is strongly discouraged. The Employer will develop its own specific policy regarding the use of contact lenses in its laboratories.

Chemical goggles and/or a full-face shield shall be worn during chemical transfer and handling operations as procedures dictate.

Chemical resistant aprons should be worn in the laboratory. Aprons shall be removed immediately upon discovery of significant contamination.

Appropriate chemical-resistant gloves (based on information from the included glove selection table) shall be worn at all times when there exists the potential for skin contact with chemicals.

Used gloves shall be inspected and decontaminated prior to use. Damaged or deteriorated gloves will be immediately replaced. Gloves should be rinsed/washed prior to removal from hands.

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 or deteriorated.

Respirator usage shall comply with OSHA Respiratory Protection Standard, 29 CFR 1910.134, and the NCTC Respiratory Protection Program.

F. Personal Work Practices

Laboratory supervision must ensure that each student knows and follows laboratory-specific rules and procedures established by this plan. For example, safety rules in Biology may differ from those in Chemistry.

All employees/students shall remain vigilant to unsafe practices and conditions in the laboratory and shall immediately report such practices and/or conditions to the laboratory Instructor. The Instructor must PROMPTLY correct unsafe practices or conditions.

Long hair or loose-fitting clothing shall be confined close to the body to avoid contact with chemicals or being caught in moving machine/equipment parts.

Use only those chemicals appropriate for the ventilation system.

Avoid unnecessary exposure to all chemicals by any route.

Do not smell or taste any chemicals.

Encourage safe work practices in co-workers by setting the proper example. Horseplay is strictly forbidden.

Seek information and advice from knowledgeable persons, standards and codes about the hazards present in the laboratory. Plan operations, equipment and protective measures accordingly.

Use engineering controls in accordance with CHP procedures.

Inspect personal protective equipment prior to use and wear appropriate protective equipment as procedures dictate and when necessary to avoid exposure.

G. Labeling

All containers in the laboratory shall be labeled with the identity and hazard warning. This includes chemical containers and waste containers. The labels shall be informative and durable, and at a minimum, will identify contents, source, and date of acquisition and indication of hazard.

The individual using the container with a grease pencil shall label portable containers.

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.

The labeling program shall be periodically inspected by the Safety Officer to ensure that labels have not been defaced or removed.

5.0 CRITERIA FOR IMPLEMENTATION OF CONTROL MEASURES

A. When to use fume hoods:

- i. Hoods should be used **WHENEVER POSSIBLE** to contain and exhaust toxic, offensive or flammable materials. Processes that have potential
- ii. for generating hazardous airborne chemical concentrations should be carried out within the fume hood.

B. When to use safety shields or other containment devices:

- i. Safety shields must be used where the possibility exists for laboratory scale detonation. Protective devices, such as long and short handled tongs for holding or manipulating hazardous items should be used **WHENEVER POSSIBLE**.

C. When to use personal protective equipment:

- i. Eye Protection – Safety goggles or all personnel in the laboratory must wear laboratory splash glasses whenever hazardous chemicals are in use. **NO EXCEPTIONS**.
- ii. Gloves – Gloves should be worn to protect the skin from chemical and physical (e.g. heat, cold) exposures. Soiled or damaged gloves should be decontaminated and disposed of properly.
- iii. Respirators – Respirator protection may be necessary to maintain chemical exposure below OSHA's PEL. Respirators will be provided, if necessary.

D. When to institute special work practices:

The laboratory Instructor and the Safety Officer must approve special work practices. If particularly hazardous chemicals are to be used (e.g. carcinogens, reproductive toxins, teratogens, or acutely toxic chemicals), specific work practices and work locations must be designated.

6.0 FUME HOOD MANAGEMENT

- A. Frequency and type of monitoring – all local exhaust hoods used for primary containment control will be monitored for adequate airflow on an annual schedule. The survey will be completed with a calibrated velometer.
- B. Acceptable operating range – Minimum face velocities of at least 100 linear fpm must be maintained for each hood. If the face velocity does not meet a recommended minimum of 100 linear fpm, maintenance personnel must be contacted to repair or upgrade the hood.

7.0 EMPLOYEE INFORMATION AND TRAINING

A. Information

1. A copy of 29 CFR 1910.1450 (Laboratory Safety / Chemical Hygiene Standard) can be found on the OSHA web-site: www.osha.gov.

2. The Threshold Limit Values published by the American Conference of Governmental Industrial Hygienists can be found in the Documentation Section of the manual. Recommended exposure limits for other hazardous chemicals, information on signs and symptoms associated with exposures to hazardous chemicals, material safety data sheets, and other information on the hazards, safe handling, storage and disposal of hazardous chemicals can be found in this manual.
3. A list of OSHA health hazard definitions, and lists of select carcinogens, reproductive toxins and high acute toxicity materials are included in the Documentation Section of the manual.

B. Training

1. Employees will be provided with training to ensure that they are apprised of the hazards of chemicals present in their work area. 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 exposure situations. Refresher training will be provided annually.
2. Students will receive safety training in conjunction with the course curriculum, as provided by the instructor.
3. Employee training will include:
 - Methods and observations that may be used to detect the presence or release of a hazardous chemical.
 - The physical and health hazards of chemicals in the work area.
 - The measures employees can take to protect themselves from these hazards.
 - The applicable details of the Chemical Hygiene Plan
1. The training will be completed online.

8.0 REQUIRED APPROVALS

Certain laboratory procedures, which present serious health hazards upon exposure, require prior approval by the Safety Officer / Chemical Hygiene Officer before work may commence.

For Northland, prior approval is required before proceeding with the following procedures:

- Working with Carcinogens/ Teratogens /Mutagens

Biology Departments
Chemistry Departments

9.0 MEDICAL CONSULTATION AND EXAMINATION

A. An employee who works with hazardous chemicals and:

- develops symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory
- works where exposure monitoring reveals an exposure level routinely above the OSHA action level or, in the absence of a designated action level, exposure above the OSHA Permissible Exposure Limit, (PEL), (as published in 29 CFR 1910.1000, 1990) for OSHA regulated substances for which there are medical monitoring and medical surveillance requirements. Chemicals that fall within this category are:
 - Asbestos
 - Vinyl Chloride
 - Inorganic Arsenic
 - Lead
 - Benzene
 - Coke Oven Emissions
 - Cotton Dust
 - 1, 2-Dibromo-3-Chloropropane
 - Acrylonitrile
 - Ethylene Oxide
 - Formaldehyde
 - Carbon Tetrachloride
 - 2-aminonaphthalene
- or is exposed to a hazardous chemical during a spill, leak, or explosion or other occurrence resulting in exposure is entitled to medical attention including an examination and follow-up exams as deemed necessary by the physician chosen for the employee.

An examination is provided without cost to the employee, without loss of pay, and conducted at a reasonable time and place.

B. Procedures to secure medical consultation and examination are as follows:

1. Report exposure to the Chemical Hygiene Officer & Safety Officer.
2. Seek medical care at a health care center of the employee's choice.
3. The employer will provide the following information to the physician:

- a) Identity of hazardous chemical.
 - b) Description of conditions under which exposure occurred.
 - c) Description of signs and symptoms employee is experiencing.
4. A written opinion from the physician shall be provided to the employer including:
- a) Recommendation for further medical follow-up.
 - b) Results of medical exam and tests.
 - c) Any medical condition revealed during the exam that places the employee at increased risk.
 - d) A statement that the employee has been informed by the physician of the results of the exam and any medical condition that may require further treatment or examination.

10.0 ADDITIONAL PROTECTION FOR WORK WITH PARTICULARLY HAZARDOUS SUBSTANCES

- A. Work with selected carcinogens, reproductive toxins and substances that have a high degree of acute toxicity may require additional employee protection. Specific consideration will be given to:
- establishment of a designated area
 - use of containment devices such as fume hoods or glove boxes
 - procedures for safe removal of contaminated waste
 - and decontamination procedures.

11.0 EMERGENCY RESPONSE/CHEMICAL SPILLS

All laboratory employees / personnel (especially those involved in the use of chemicals) should be familiar with the Employer's Emergency Response / Action Plan. This plan shall contain emergency telephone numbers and spill response contacts.

- A. When chemical spills occur within the Laboratory, the following procedures are followed to prevent injury or property loss:
1. Provide any first aid (if necessary) to affected personnel. Liberally use eyewash station and/or safety shower to flush affected areas. MEI recommends flushing continuously for at least 15 minutes. A large exposure to the body merits ambulatory service.
 2. Notify Director of Facilities & Safety Officer of spill. If spill is large or extremely hazardous, the Administration will be notified. First Aid personnel may also require notification.
 3. Evacuate personnel / students from the area.

4. If spilled materials exhibit flammability, eliminate ignition sources, such as hot plates, Bunsen burners, etc.
5. Avoid all contact with spilled material. If necessary, don protective gloves, gown, goggles and/or respirator.
6. Obtain supplies from Chemical Spill Clean-up Kit and/or contact local emergency services (i.e. HAZMAT / HAZWOPER) for assistance if needed.
7. Neutralize acids and bases.
8. Contain collected materials and label container with name of contents and also as Hazardous Waste.
9. Always refer to SDS for special precautions or spill cleanup requirements.

B. Liquid Spills

1. Confine spill to small area as practical.
2. For small quantities of acids or bases, use the neutralizing agent from the chemical spill clean-up kit. An absorbent material specifically prepared for acid/base spills may also be used.
3. For small quantities of other materials, such as organic solvents, utilize an absorbent material to clean up spill. Examples of sorbent materials are vermiculite, dry sand, paper towels, etc.
4. For large quantities of inorganic acids and bases, flush with large amounts of water, preferably toward a containment area or drain. *CAUTION must be taken not to add too much water to create a flood which may react with water-reactive materials and cause spattering and additional personnel exposure.
5. If possible, utilize a mop to pick up as much of the spilled material. An excellent clean-up device is the mop bucket and wringer to collect the liquid.
6. Carefully pick up and decontaminate bottles, broken glass and/or other containers. Decontaminate over the bucket and pail to collect contaminated wash.
7. Avoid using any shop vacuum, which is not rated for chemical clean up. A potential exists for atomizing hazardous wastes and creating a potential human inhalation exposure.
8. If the spill is extremely volatile (high vapor pressure), allow the spill to evaporate and exhaust out the laboratory exhaust (e.g., fume hood).

9. Properly containerize, label, store and/or dispose of collected hazardous waste. (See waste disposal section for methods).

C. Solid Spills

1. If possible, sweep solid spills of low toxicity into a designated, easily decontaminated, dust pan and place in a labeled container for storage and/or disposal.

D. Additional Spills

Mercury – Clean up with pre-purchased spill clean-up kit. Collect Hg in a sealed container to prevent exposure to Hg vapors. Large spills or spills that render some Hg unavailable for clean up (e.g., Hg in floor cracks or beneath lab benches); an airborne evaluation of Hg vapor content may be required.

E. Compressed Gas Cylinders

Compressed gas cylinders, if present, are to be stored and maintained in accordance to the Compressed Gas Association guidelines and best practices. Emergency handling of compressed gas cylinders will be delegated to trained emergency personnel (i.e. fire department, etc).

C. Incident Report

An incident investigation should take place after each spill and/or accident. The Incident report should be completed by the Instructor / Instructor and forwarded to the Administration, Chemical Hygiene Officer and Safety Officer.

D. Waste Disposal

If waste is generated, disposal will be conducted in accordance to the Hazardous Waste Management Plan. All Chemistry chemicals will be disposed through the University of Minnesota

12.0 REVIEW AND UPDATE

This Chemical Hygiene Plan will be reviewed and updated annually.

SUGGESTED CHEMICAL STORAGE PATTERN

Storage of laboratory chemicals presents an ongoing safety hazard for science departments. Many chemicals are incompatible with each other. The common method of storing these products in alphabetical order sometimes results in incompatible shelved materials. For example, storing strong oxidizing materials next to organic chemicals can present a hazard. A possible solution is to separate chemicals into their organic and inorganic families and then to further divide the materials into related and compatible families. Below is a list of compatible families. The following page provides this family arrangement pictured as shelf areas in the chemical storage area.

INORGANIC

1. Metals, Hydrides
2. Acetates, Halides, Iodides, Sulfates, Sulfites, Halogens, Thiosulfates, Phosphates
3. Amides, Nitrates, (except Ammonium Nitrate), Nitrites, Azides
4. Hydroxides, Oxides, Silicates, Carbonates, Carbon
5. Sulfides, Selenides, Phosphides, Carbides, Nitrides
6. Bromates, Perchlorates, Perchloric Acid, Chlorites, Hypochlorites, Peroxides, Hydrogen Peroxides
7. Arsenates, Cyanides, Cyanates
8. Borates, Chromates, Manganates, Permanganates
9. Acids (except Nitric)
* Nitric Acid is isolated/stored by itself

ORGANIC

1. Acids, Anhydrides, Peracids
2. Alcohols, Glycols, Amines, Amides, Imines, Imides
3. Hydrocarbons, Esters, Aldehydes
4. Esters, Ketones, Ketenes, Halogenated Hydrocarbons, Ethylene Oxide
5. Epoxy Compounds, Isocyanates
6. Peroxides, Hydroperoxides, Azides
7. Sulfides, Polysulfides, Sulfoxides, Nitriles
8. Phenols, Cresols
10. Sulfur, Phosphorus, Arsenic, Phosphorus Pentoxide

ADDITIONAL STORAGE SUGGESTIONS

1. Avoid floor chemical storage (even temporarily).
2. No top shelf chemical storage.
3. No chemicals stored above eye level.
4. Shelf assemblies are firmly secured to walls. Avoid island shelf assemblies.
5. Provide anti-roll-off lips on all shelves.
6. Ideally shelving assemblies would be of wood construction.
7. Avoid metal, adjustable shelf supports and clips. Better fixed, wooden supports.
8. Store acids in dedicated acid cabinets. Store Nitric Acid in that same cabinet **ONLY** if isolated from other acids. Store both inorganic and some organic acids in the acid cabinet.
9. Store flammables in a dedicated flammables cabinet.
10. Store severe poisons in a dedicated poisons cabinet.
11. Segregate known or suspect carcinogens from other chemicals.

If you store volatile materials (ether, hydrocarbons, etc.) in a refrigerator, the refrigerator must be explosion-proof. The thermostat switch or light switch in a standard refrigerator may spark and set off the volatile vapors in the refrigerator and cause an explosion.

SUGGESTED SHELF STORAGE PATTERN – INORGANIC

INORGANIC #10	INORGANIC #7
INORGANIC #2	ONORGANIC #5
INORGANIC #3	INORGANIC #8
INORGANIC #1	INORGANIC #6
INORGANIC #4	MISCELLANEOUS

Note: Avoid storage of any chemicals on the floor.
#9 – Store acids in a designated cabinet.

SUGGESTED SHELF STORAGE PATTERN – ORGANIC

ORGANIC #2	ORGANIC #8
ORGANIC #3	ORGANIC #6
ORGANIC #4	ORGANIC #1
ORGANIC #5	MISCELLANEOUS
ORGANIC #7	MISCELLANEOUS

Note: Avoid storage of any chemicals on the floor.