SAFETY POLICY
DEPARTMENT OF CHEMICAL ENGINEERING

Students who participate in laboratory courses and personnel who work in laboratories are exposed to many kinds of hazards. Laboratories involve a greater variety of potential hazards than do most work places and some of these hazards call for precautions not normally encountered elsewhere.

It has been found through past experience that voluntary safety programs are often inadequate. Good laboratory practices require mandatory rules, regulations, and procedures. The Department of Chemical Engineering's goal in developing a safety policy is the establishment of a program that will protect from injury those working in the laboratory (students, faculty, and staff), visitors and other personnel who may be exposed to hazards from the laboratory, and the environment.

The purpose of this manual is to establish the rules and regulations relating to the safety program of the Department of Chemical Engineering. This manual also outlines implementation guidelines and procedures to be used by the Department's faculty and staff in the administration of the safety program because it is the Department's responsibility to provide, communicate, and enforce these rules and regulations.

RESPONSIBILITY

The Department head is responsible for the establishment of a safety program consistent with the policies of the University of Minnesota, and for the administration and enforcement of the rules and procedures of the program. The Department head will review the program annually.

The Laboratory Services Coordinator shall be designated as the safety director for the Department and be responsible directly to the Department head for coordination of the overall safety program. The safety director shall act as a resource person for the faculty, staff and students. The safety director shall be responsible for record keeping, development and implementation of a safety training and education program, safety inspections, and compliance with safety rules. The safety director is also responsible for coordinating a program of providing safety communications to faculty, staff, and students in order to maintain a high level of safety awareness.

Faculty and/or staff are responsible for the application and enforcement of the safety program in their research laboratories and in the laboratory courses they teach. They are responsible for insuring that (1) appropriate safety orientation and training has been given to individuals when they are first assigned to a laboratory; (2) annual refresher training be provided; (3) staff and students know the safety rules and follow them; (4) adequate emergency equipment in proper working order is available; (5) training in the use of emergency equipment has been provided; and (6) information and training on how to handle special or unusual hazards in nonroutine work or experiments has been given to workers or students.
All faculty, staff, and students are responsible for carrying out their own work in accordance with good safety practices. They should be prepared in advance by reviewing operating and/or experimental procedures to insure that they are safe and know what emergency aids are available, where they are located, and how to use them. The practice of safety in the laboratory requires (1) a desire on the part of the individual to protect himself and his associates, and (2) the need to follow a set of rules, i.e., a vigorous safety policy.

An essential part of the development of young scientists and engineers is that they learn to work with and accept the responsibility for the appropriate use of hazardous substances and to recognize potentially hazardous conditions. Introduction to an awareness of safety and acceptance of responsibility at this point in their education will lead to a greater awareness of safety and responsibility in their future vocations and lead to the design and engineering of safer facilities.

SAFETY RULES

These safety rules ¹,² apply to students, staff, and faculty and to student and research laboratories.

1. Eye protection is required at all times in student laboratories and during the handling of chemicals in research laboratories. Contact lenses can be worn in the laboratory as long as additional eye protection is worn. See Appendix A for a description of proper eye protection equipment.

2. Unprofessional behavior (i.e., horseplay, practical jokes, distracting another person, and acts of carelessness) is prohibited.

3. Unauthorized experiments are prohibited.

4. Eating, drinking and smoking is prohibited in any laboratory or chemical storage area.

5. Mouth suction shall not be used to fill pipets. A pipet bulb or an aspirator shall be used to provide vacuum.


² Safety in Academic Chemistry Laboratories, Page 4, American Chemical Society, (1976)
6. Students shall not work in the laboratory unless the laboratory instructor or faculty member is present. Faculty members shall not work alone in the laboratory unless a second person is in close proximity to the laboratory, or has been asked to check the laboratory at least every one half hour.

7. Bare feet or open toed shoes are not allowed in the laboratory. Shorts are allowed only if a knee length lab coat or apron is used.

8. Loose or torn clothing (i.e., dangling neckties, loose flowing head or shoulder coverings, and overlarge or ragged laboratory coats) is not permitted in the laboratory. Hair longer than shoulder length should be restrained (tied up) when handling chemicals, using an open flame or operating rotating equipment.

9. Waste disposal procedures as described on page (9) of this manual shall be followed.

10. Protective apparel (i.e, face shields, gloves, and other special clothing) if specified in the experimental instructions shall be used.

11. Students shall use appropriate safety equipment, (i.e., hoods, respirators, masks, etc.) as directed by the laboratory instructions when exposure to gases, vapors, aerosols, and dusts is likely. See Appendix A for descriptions of the different types of respirators and their use.

12. Think, act, and encourage safety until it becomes a habit.

In addition to the above general safety rules, safe laboratory procedures shall be communicated to the students during their laboratory sessions. They will be required to follow these safe laboratory procedures.

SAFETY RULE ENFORCEMENT

A laboratory instructor will pursue the following course of action if students refuse to obey the above safety rules or are not following safe laboratory procedures.

1. The student will be reminded of the safety rule and/or procedure and asked to comply with it. The instructor will record the date of each reminder.

2. If the student continues to ignore the safety rule and/or procedure, he/she will be reprimanded and asked to leave the laboratory for the day.
3. The student may not be able to make up the laboratory assignment. The faculty member in charge of the course will determine if the lab can or cannot be made up.

4. If the laboratory instructor is not the faculty member in charge of the course, the instructor will notify the faculty member of the reprimand in writing. A copy of the memo will be filed in the Department office.

5. If the faculty member is in charge of the laboratory, he/she will make out the reprimand and file a copy in the Department office.

If a laboratory instructor is not enforcing the safety policy, a report by the safety director will be made to the Department head who will take appropriate action.

LABORATORY SAFETY PLAN (LSP)

The Laboratory Safety Plan describes policies, procedures, equipment, personal protective equipment and work practices that are capable of protecting employees from the health hazards presented by many hazardous chemicals used in laboratories. The plan is intended to meet the requirements of the federal Occupational Safety and Health Administration (OSHA) standard 29 CFR 1910.1450, Occupational Exposure to Hazardous Chemicals in Laboratories.

The Laboratory Safety Plan is intended to safely limit laboratory workers' exposure to OSHA-regulated substances. Laboratory workers must not be exposed to substances in excess of the permissible exposure limits (PEL) specified in OSHA rule 29 CFR 1910, Subpart Z. PELs refer to airborne concentrations of substances and are averaged over an eight hour day. A few substances also have "action levels". Action levels are air concentrations below the PEL 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 permissible exposure level there must also be employee medical exposure surveillance.

The 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: i) 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, ii) multiple chemical procedures or chemical substances are used, and iii) protective laboratory practices and equipment are available and in common use to minimize the potential for employee exposures to hazardous chemicals.

At a minimum, the definition covers employees (including student employees, technicians, supervisors, lead researchers and physicians) who use chemicals in teaching, research and clinical laboratories at the University of Minnesota. 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.

The 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 Laboratory Safety Plan is not required.

The University of Minnesota has placed the responsibility for compliance with the individual departments. The UMD Environmental Health and Safety Office (UMD-EHSO) is available for technical and training aid assistance.

ChE’s LABORATORY SAFETY PLAN

The following sections summarize the procedures to be used by the Department of Chemical Engineering in complying with the Laboratory Safety Plan.

A. Information

It is essential that laboratory employees have access to information on the hazards of chemicals and procedures for working safely. Supervisors must ensure that laboratory employees are informed about and have access to the following information.

1. The Department of Chemical Engineering Laboratory Safety Plan and appendices - located in the ChE department office, Engr 176 and the UMD College of Science and Engineering Office, Engr 140. The Laboratory Safety Plan is also available on the Department’s Web site at the following URL http://www.d.umn.edu/che/researchOutreach/labSafetyPlan.pdf and on the Laboratory Services Coordinator Web site at the following URL http://www.d.umn.edu/~dlong/chp/umdchelsp2012.pdf


3. The Permissible Exposure Limits (PEL) for OSHA regulated substances. This can be found in the Department’s Laboratory Safety Plan, Appendix B.

4. Signs and symptoms associated with exposures to hazardous chemicals. Laboratory Chemical Safety Summaries are included on pages 235-413 of the 1995 edition of Prudent Practices.
5. Material safety data sheets (MSDS) for chemicals used in the Department of Chemical Engineering are located in the individual laboratories and also in the office of the Lab Services Coordinator, Engr 226.

6. Information on chemical waste disposal and spill response is found in the University of Minnesota guidebook, “Hazardous Chemical Waste Management, 5th edition.”

B. Training (Faculty and Staff)

Each new faculty or staff member will be given the initial ChE training program before they begin work in a laboratory where hazardous chemicals are used, but no later than 6 weeks after their first day of employment with the Department. The initial training of employees will be conducted by the safety director and shall consist of viewing Three Web Text Based training modules. These modules have a 15 question quiz following the training. These three training modules are automatically entered into the Faculty/Staff on line training record when they are completed. The training shall also include viewing up to 8 video based on line videos. The Web based Training Modules and videos can be accessed at the URL http://www.d.umn.edu/ehso/safety/lsptrain.html. Depending on the research being conducted, normally only 4 of the videos will need to be viewed.

The collection of videos at this time consists of the following. The first four are required viewing for the ChE Initial Training

1. Chemical Safety
2. Prudent Storage of Chemicals
3. Emergency Response
4. Sharps Safety
5. Chemical Waste Management
6. Glassware Washing and Autoclaving
7. Centrifugation Safety
8. Animal Biosafety Level 1 (ABSL1)

In addition to viewing the videos, additional information as required by the Laboratory Safety Plan will be provided to the employee. Refresher training shall be provided annually.

A Training Certification Record (Business Administration Form 725A will be filled out and signed by each employee and the safety director each time training is given. The original will be kept in the Department Office. A copy will be kept in the Lab Services Coordinator’s office. These records will be retained for five (5) years.
B. Training (Students)

Prior to, or during the first laboratory period for each course, time shall be spent reviewing the items listed below. The faculty member teaching the course shall determine when and how to present the material.

1. The Department safety rules and any other safety related information about the laboratory procedures to be used.

2. The Laboratory Safety Plan and how it affects the students.

3. The Material Safety Data Sheets (MSDS) and how to interpret them.

4. Waste chemical disposal procedures.

C. Material Safety Data Sheets (MSDS)

A master notebook containing an MSDS, also known as Form OSHA-20, for each chemical used by the Department will be kept in the Laboratory Services Coordinator's office and in a folder on the Lab Services Coordinator's computer. An MSDS will be requested from the supplier whenever chemicals are ordered. If an MSDS is not received from the supplier, one will be located or the information compiled from reference materials in order to keep the list up to date. Reference materials that contain the information that is required on an MSDS will be purchased or borrowed from other departments. Purchased reference material will be kept in the Laboratory Services Coordinator's office.

A copy of an MSDS for each chemical stored and/or used during a laboratory course will be placed in a notebook located in the laboratory. The Laboratory Services Coordinator will be responsible for insuring that these notebooks are checked and updated prior to the start of each laboratory course.

A copy of an MSDS for each chemical stored and/or used in a faculty research laboratory will be kept in a notebook located in the laboratory. It will be the responsibility of the faculty member in charge of the lab to insure that the notebook is kept up to date.

Each laboratory experiment write up shall include a short note which contains information on the MSDS and gives the location of the notebook in the laboratory. Information on necessary personal protective equipment, special procedures, use of hoods, waste disposal procedures, etc. will be included in the note. If the laboratory manual is purchased from a publisher and it does not contain the pertinent safety information, the information will be communicated to the students via a handout and verbally at the beginning of the laboratory period.
SAFETY COMMITTEE

A safety committee will be organized to advise and assist the Department head in establishing safe working conditions and practices. The committee will consist of the department head, the safety director and the faculty member in charge of the laboratory course. The department head shall be chairperson of the committee. The committee will meet once every three months at a time selected by the committee. A faculty member can request a meeting at any time if there is a safety problem that requires the committee's attention. Students can petition the committee in writing to be heard on items related to safety within the Department.

The major duties of the safety committee are listed below, but shall not be limited to this list.

1. Be aware of new federal and state regulations as they are promulgated and assist in making modifications to the safety policy and Departmental procedures in order to comply with these new regulations.

2. Review new procedures or experiments that may require safety equipment not available in the Department and make recommendations on possible ways to implement the procedures within the safety policy of the Department.

3. Make recommendations on additions and/or deletions to the safety policy and act as a resource when needed by faculty and staff members.

4. Review all accidents that occur in the department and make recommendations on the implementation of new procedures and/or purchase of new equipment to insure that the accident does not happen again.

SAFETY AWARENESS

Where appropriate, signs will be posted warning students, employees, and visitors of areas where hazardous operations are being carried out; where toxic or highly flammable chemicals are being used; and where certain procedures are prohibited. Special procedures, waste disposal techniques, etc. will also be posted when necessary.

Next to the exit(s) in each laboratory and office a card shall be posted showing the location of phones, fire extinguishers, emergency showers and eyewashes and the quickest route out of the lab and building.
Located in each lab and office will be a list of emergency phone numbers. The list may include, but not be limited to the following:

- Fire Department
- Poison Control
- Ambulance
- Maintenance
- Hospital
- After Hours
- Infirmary
- Faculty member in charge
- University Police
- Department Head

SAFETY INSPECTION

Once a month the safety director will conduct a safety tour of the Department. The purpose of the tour will be to check for safety violations in the laboratories and check for proper operation of the safety equipment. The safety equipment listed below will be checked. This list is not all inclusive and other equipment may be added to the list.

1. Emergency showers and eyewashes
2. Fire extinguishers
3. First aid kits
4. Spill cleanup kits
5. Fume hood operation
6. Personal protective equipment (gloves, respirators, goggles, shields, etc.)

A check list will be made up and used during the safety tour. This list will be kept on file in the Department office. Eventually the information from the safety tour will be placed into computer files for storage and retrieval. Faculty members will be notified of safety violations in their labs and will be responsible for correcting the violation. Safety violations in student laboratories will be corrected as quickly as possible by the safety director. The safety director and/or Department head will also make unscheduled tours of the laboratories during the year checking for safety violations.

SPILLS

Experience has shown that the accidental release of hazardous substances is a common occurrence and requires preplanning for procedures that will minimize exposure of personnel and property. As the type and the amount of chemicals to be used in the laboratories become known, appropriate supplies and equipment will be purchased to deal with the spill. These supplies may include, but not be limited to neutralizing agents, absorbents, appropriate protective equipment, and appropriate disposal containers.

If a spill does occur, the following general procedures may be used, but should be
tailored to the type of spill:

1. Attend to any persons who may be contaminated.
2. Notify emergency personnel if necessary (dial 911).
3. Notify the Department safety director.
4. Notify the UMD Office of Environmental Health and Safety (218-726-7273)
5. Notify persons in the immediate area about the spill.
6. Evacuate all nonessential personnel from the spill area.
7. If the spill is flammable material, turn off ignition and heat sources.
8. Avoid breathing vapors of the spilled material; if necessary, use a respirator.
9. Leave on, or turn on exhaust ventilation if it is safe to do so.
10. Secure supplies needed to cleanup the spill. A spill cart on wheels with all necessary supplies for safely cleaning up most spills is available in Chem 103.
11. Wear appropriate apparel during cleanup.

WASTE DISPOSAL

Proper waste disposal procedures will be used in the student and research laboratories. The faculty member in charge of the research laboratory will be responsible for proper waste disposal procedures from his/her lab. Students will be informed during the first laboratory session about proper waste disposal techniques. Each experimental write up (if required) will include a section on proper disposal of the materials used during the experiment. The University Hazardous Chemical Waste Management Guidebook will be used as a reference in determining the proper disposal procedures.

Usually, small quantities of non-hazardous water-soluble, essentially neutral pH, substances may be flushed down the drain with relatively large quantities of running water. Larger quantities of non-hazardous and small quantities of hazardous water-soluble materials require permission by the Department of Environmental Health and Safety before they can be sewered. All other materials require special handling. They will normally be saved for purification by distillation and/or disposal through the University Hazardous Waste Disposal System.

EMERGENCY PROCEDURES

The prompt and orderly evacuation of faculty, staff and students from the building in the event of a fire, explosion, or other emergency is the first and most important action to be taken. Each faculty and staff member is responsible for keeping the routes of egress free of obstructions and knowing the recommended exit routes from his or her work area. He/She is expected to assist students whenever possible during an emergency. Faculty and staff members are also responsible for knowing the location of and maintaining access to emergency and safety equipment.
If a fire is discovered in the ChE Department or the Engineering Building, warn other occupants to evacuate the area. Fight the fire using the proper fire extinguisher only if the fire is small enough to put out easily and it will not endanger you or others. If the fire is too large or you are unsure about being able to extinguish the fire, confine the area by closing doors and windows. Activate the fire alarm if there is one and call the Fire Department by dialing 911. Give the dispatcher the UMD address, the name of the building, its location on campus (1303 Ordean Court [off St. Marie St.]) and the nature of the emergency. If it is possible without endangering yourself, recheck the area of the building in the vicinity of the fire for other personnel or students before exiting the building. Do NOT re-enter the room where the fire is confined. Wait outside the building for the Fire Department so that you are able to guide them to the fire and provide them with information about the fire.

If an accident does occur in a laboratory, the course of action taken will depend on the severity of the accident. Administer first aid as appropriate. A first aid kit will be located in the lab (Engr 167). If the injury is of the type that can be handled by an outpatient clinic (i.e., a cut that requires a few stitches, a small chemical burn, etc.) the person can be taken to the UMD Health Services. The Health Service is open from 9:00 a.m. to 4:30 p.m. Monday through Friday during Academic semesters. During Summer Sessions the Health Services is open from 9:00 a.m. to 3:00 p.m. Monday through Friday.

The injured person can be taken to one of the two hospital emergency rooms (depending on his/her choice) or an ambulance can be dispatched by dialing 911 if the accident is more serious. The dispatcher should be given the UMD address, the name of the building, its location on campus (1303 Ordean Court [off St. Marie St.]) and the nature of the emergency. After calling the ambulance, the person making the call should go out to meet the ambulance, or send someone out to meet it in order to guide the emergency personnel to the injured. At least one person should stay with the injured until the emergency personnel arrive. The two Duluth Hospitals, addresses and emergency room phone numbers are listed below. The third hospital listed, Miller-Dwan Medical Center, is for burn injuries.

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<thead>
<tr>
<th>Hospital</th>
<th>Address</th>
<th>Phone</th>
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<tr>
<td>St. Mary's Hospital</td>
<td>407 E. 3rd St.</td>
<td>726-4357</td>
</tr>
<tr>
<td>St. Luke's Hospital</td>
<td>915 E. 1st St.</td>
<td>726-5616</td>
</tr>
<tr>
<td>Miller-Dawn Medical Center</td>
<td>502 E. 2nd St.</td>
<td>720-1215</td>
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<tr>
<td>(Burn Center)</td>
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ACCIDENT REPORTING

All accidents occurring to regular employees, part-time employees, temporary employees, and student employees in the laboratory will be reported in writing to the
safety director by filling out BA Form 596, First Report of Injury, within 48 hours of the accident. For non-employees, visitors, and students a non-employee injury report form (BA Form 165) will be filed with the safety director within 48 hours of the accident. The Department will then forward the report to the UMD Environmental Health and Safety Department within 72 hours of the accident. Accident reports will be reviewed by the safety committee at their scheduled meeting. If a severe accident occurs, a special meeting of the safety committee will be called to immediately review the accident and recommend changes that will insure the safety of the students, faculty, and staff of the department.

REVIEW

This Safety Policy will be reviewed annually by the Safety Committee and additions and/or deletions will be made as necessary to provide a policy consistent with modern safety rules and practices and new laws that are promulgated by the Federal and State governments.

The University of Minnesota is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, religion, color, sex, national origin, handicap, age, or veteran status.
SAFETY VIOLATION BY STUDENT

DATE _______________________
TIME _______________________
COURSE ______________________

FACULTY MEMBER IN CHARGE ________________________________

ACTION TAKEN ___________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

_________________________________________________________________

SIGNATURE __________________________________
LABORATORY INSTRUCTOR

Form ChE 100