Chemical Hygiene Program

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TABLE OF CONTENTS

I. INTRODUCTION

The Chemical Hygiene Program is a written program developed and implemented at the University of Northern Iowa to ensure the safety of employees, including students, whose work involves the use of hazardous chemicals or materials in laboratory facilities. The program establishes procedures, practices, and guidelines for employees working with hazardous chemicals or materials and for those who are responsible for the support of the task. The development and implementation of the Chemical Hygiene Program is mandated in the Occupational Safety and Health Administration (OSHA) 29 CFR 1910.1450, commonly known as the OSHA Lab Safety Standard. The University's Chemical Hygiene Program also supplements and supports the OSHA Hazard Communication standard 29 CFR 1910.1200 and the University Hazard Communication Program developed and implemented to ensure each employee's safety and health from hazardous chemicals or materials in the workplace.

II. ADMINISTRATIVE RESPONSIBILITIES

A. Employees:

Employees are responsible for observing all appropriate procedures, practices and guidelines contained in the Chemical Hygiene Program, as well as other general safety practices. Employees are responsible for ensuring that the lab supervisor is aware when a non-routine task will be performed. Employees are required to attend designated training sessions and for reporting hazardous or unsafe conditions to the lab supervisor, Department Head, Public Safety, University Safety Officer - Dean Shoars at 273-3189 or University Safety Manager – Wendel Reece at 273-7269.

B. Laboratory Supervisor:

The laboratory supervisor is responsible for the application and implementation of the procedures, practices and guidelines in the Chemical Hygiene Program. The lab supervisor will develop written standard operating procedures for the safe use of chemicals or materials, enforce all safety practices and procedures within the work area, identify and schedule employee training, identify and report hazards or unsafe conditions to the Departmental Chemical Hygiene Officer, Department Head or University Safety Officer, and complete all record keeping tasks required in the Chemical Hygiene Program.

C. Department Head:

Departments involved with the use of hazardous chemicals or materials in a laboratory facility are responsible for the application and implementation of the Chemical Hygiene Program within the laboratories under their administrative control. Departments will designate a Departmental Chemical Hygiene Officer to assist laboratory supervisors

with the application and implementation of the Chemical Hygiene Program within their designated laboratories.

D. University Safety Officer:
The University Safety Officer has responsibility for development and implementation of the environmental, health and safety programs at the University of Northern Iowa. The University Safety Officer or designee will oversee the development, application, and implementation of the Chemical Hygiene Program.

The University of Northern Iowa is responsible for assuring the health and safety of its employees and compliance with all related requirements of local, state and federal regulations. The University encourages employees to promote positive attitudes regarding safety by incorporating safety into their work practices and to cooperate fully with the implementation of all environmental, health and safety programs.

III. REQUIRED CONTENT OF A CHEMICAL HYGIENE PROGRAM

The content of the Chemical Hygiene Program must include each of the following elements and must specify specific procedures to ensure protection of all laboratory personnel:

A. Standard operating procedures to be followed when working with specific hazardous chemicals or materials. Specific standard operating procedures are required for each laboratory facility and will be developed by the Department with the responsibility for management of the lab.

B. Criteria for selection and implementation of measures for reducing employee exposure to hazardous chemicals or materials. Such measures included engineering controls, personal protective equipment and hygiene practices. Control measures are considered extremely important in the reduction of exposure to hazardous chemicals or materials.

C. Fume hoods and personal protective equipment must be in proper working order and a written program must exist detailing how it will be maintained.

D. Opportunities for training and information events, including but not limited to safety meetings, briefings, demonstrations, and/or employee safety discussions must take place to ensure employees are notified of any changes that have taken place in the handling of hazardous chemicals or materials.

E. Any procedures, practices, or guidelines that require authorization to use a laboratory facility for extended hours beyond the normal workday.

F. Provisions for medical consultation and examinations, or evaluation in case an employee has been exposed in excess of the PEL (Permissible exposure limit) or action levels that may have routinely occurred.

G. Each Department will designate a Departmental Chemical Hygiene Officer and/or a Departmental Chemical Hygiene Committee to ensure implementation of the Chemical Hygiene Program.
H. Additional measures or provisions that will adequately protect workers while working with particularly hazardous chemicals or materials.

IV. STANDARD OPERATING PROCEDURES

A. Ordering Chemicals
1. Plan the procedures and provide an accurate estimate of the amount of chemical(s) required for the procedure and in quantities that will be used for a period not to exceed 1 year.
2. Select chemicals for which the quality of ventilation is adequate.
3. A Lab Supervisor or a designated individual will authorize ordering chemicals when new procedures are to be conducted or it is likely a new chemical will exceed the Permissible Exposure Limits (PEL) established by OSHA or when other specific acute or chronic hazardous conditions exist. Contact the manufacturer before ordering new or unusual chemicals for which adequate hazard information is not available.
4. Order chemicals in small containers to avoid repackaging.
5. Chemicals should be in tightly closed, sturdy, and appropriate containers.
6. Chemicals should be marked as to the date each was received and opened.
7. Obtain appropriate Material Safety Data Sheets with the initial shipment. Retain copy(s) for Departmental records and forward original(s) to the University Safety Office, mail code 0189.
8. Review and determine the adequacy of storage provisions before the arrival of the chemical(s), including posting appropriate signs and the availability of personal protective equipment.
9. Ensure the chemical is placed on Departmental Chemical Inventory List.
10. Donated chemicals should be accepted only after approval is obtained from Departmental Chemical Hygiene Officer. The chemical should be checked to ensure it is in excellent condition, appropriately labeled and MSDS available. Also assure there is an immediate need for the donated material.

B. Receipt and Distribution of Chemicals
1. Do not accept chemicals that are not properly labeled by the manufacturer, importer, or distributor.
2. Secondary containers (including flasks, test tubes, carboys, etc) must be labeled as to contents of the container and any associated hazardous information.
3. Determine and observe all safe handling and storage procedures.
4. Whenever possible, transport chemicals on freight-only elevators to avoid exposure of passengers.
5. High-pressure gas cylinders will be transported according to Departmental procedures with the use of an appropriate hand truck. Protective valve covers will

be secured during transport and cylinders will be secured with an appropriate securing device at all times.

6. Departmental Chemical Hygiene Officer or designee should only handle the interdepartmental chemical(s) transfers within the University. When such a transfer takes place; a University of Northern Iowa ID will be required along with the signature of the person acquiring the chemical, the department he/she works for, the chemical name, and the amount being transferred. Transferring chemical(s) to personnel outside the University is strictly forbidden.

C. Storage of Chemicals

Proper storage of chemicals is a complex task due to the diverse physical properties of numerous chemicals which may be present in the laboratory. The general procedures should be supplemented with specific procedures for particular laboratory facilities obtained from Material Safety Data Sheets, container labels, or Department Head.

1. All containers are to be properly labeled, in good condition, appropriate type and size for the material stored and must be tightly sealed.
2. Incompatible chemicals will be stored separately by the hazard class such as but not limited to flammable liquids, organic acids, and oxidizers.
3. Secure storage shelves and cabinets to prevent tipping and maintain appropriate aisles clear of obstructions.
4. Storage spaces require properly maintained ventilation and adequate temperature control of the space environment.
5. Do not store liquids above eye level.
6. Flammable liquids exceeding four liters will be contained in an appropriate safety can and stored in *vented* flammable liquid storage cabinets where possible.
7. Use only flammable proof refrigerators for storage of flammable liquids.
8. Dispose of all peroxide forming material within 1 year of purchase or 6 months of opening.
9. Food or food products purchased for human consumption will not be stored within the laboratory work area, refrigerated storage units, or storage area.
10. The storage of highly reactive or corrosive liquids will require the installation of an appropriate containment system such as spill trays.
11. High-pressure gas cylinders will be stored in well-ventilated areas secured by a cylinder clamp, chain or strap or base support. Cylinder must be secured away from heat sources.
12. Chemicals should be stored in secured areas preventing theft and should be locked when unattended.

D. Use of Chemicals

1. Review container labels and MSDS information for identification of the hazards associated with the material to be used.
2. Review emergency procedures and ensure the required supplies and equipment for material release or spill are immediately available.
3. Maintain knowledge of the locations of safety equipment including emergency showers, eyewash stations, fire extinguishers, fire blankets and first aid stations.

4. Avoid working alone in laboratory facilities with hazardous chemicals.
5. Do not eat, drink, smoke, or apply cosmetics in areas where lab chemicals are used or stored.
6. Do not store food items or cosmetics in areas where lab chemicals are used or stored.
7. Confine long hair and loose clothing when working with lab chemicals.
8. Wear appropriate shoes. Sandals or similar open toe shoes are prohibited.
9. Wear appropriate personal protective apparel including eye protection, lab coat, and gloves.
10. The use of respirators requires authorization of the lab supervisor, department head, and inclusion into the University and Departmental Respiratory Protection Program.
11. Immediately remove and properly dispose of significantly contaminated lab apparel.
12. Properly dispose of damaged glassware into designated containers.
13. Do not use mouth suction for pipeting or to start a siphon.
14. Do not smell or taste chemicals.
15. Practice good housekeeping within the lab work area by maintaining properly labeled and stored containers.
16. Keep work areas clean and uncluttered.
17. Wash hands and other exposed skin after working with hazardous chemicals.
18. Do not leave potentially hazardous chemical processes unsupervised or unattended.
19. Conduct processes which may result in the release of toxic vapors, fumes, or dust within a fume hood or other adequate containment, or ventilation device.

E. Use of Flammables/Combustibles

Materials that can generate sufficient vapors to ignite at temperatures below 100 degrees F (38 degrees C) are considered to be "flammable." Materials that require temperatures above 100 degrees F (38 degrees C) for ignition are considered to be "combustibles." Undetectable vapor trails from combustible sources can get into remote ignition sources, causing flashback fires. A fire may also erupt between reactions of flammables, combustibles and oxidizers. The following precautions are to be observed when handling flammable or combustible materials.

1. Open flames, smoking materials, hot surfaces, operation of electrical equipment, sparks, or other similar ignition sources will be eliminated from areas in which flammable or combustible materials are used or stored.
2. Minimal quantities of flammable/combustible material will be stored and used in lab areas.
3. Liquid, flammable material in excess of four liters will be stored in an approved safety can and stored in storage cabinets within designated chemical storage areas which are designed and labeled for the purpose of storing flammable materials.
4. Flammable liquids stored in glass containers shall not exceed one liter unless the chemical purity must be protected and the storage is authorized by the Lab Supervisor.
5. Refrigerators and freezers used for storage of flammable or combustible materials must be explosion proof units designed and labeled for this purpose.

6. When transferring or dispensing flammable liquids from large drums ensure drums are properly grounded. Ensure areas used for storage of flammable and combustible materials are provided with adequate fire detection/fire suppression systems.

F. Use of Corrosives

When handling materials considered chemically reactive at the point of contact and capable of causing damage to human tissue, the following procedures should be observed.

1. Depending on the work performed, faceshields, gloves, rubber aprons, eye protection or boots may be required.
2. Always add acid to water (never the water to acid) to prevent or avoid violent reactions or splattering of the substance.
3. In the event of eye or skin contact with corrosives, immediately flush the area of contact with water for a period of 15 to 20 minutes, remove contaminated clothing, and seek medical assistance. Report all accidents to the Lab Supervisor.

G. Use of Reactives

Chemicals which react rapidly with themselves or other materials often produce a violent release of energy similar to a detonation. Extreme care and caution must be exercised when working with the following materials.

1. PYROPHORICS ignite spontaneously with air.
   Examples: metal alkalis, phosphorus, fine powders of metal such as magnesium, aluminum, zinc.
   Precautions: use or store in a safe environment.
2. OXIDIZERS violently react with organic material.
   Examples: perchloric, chromic and fuming nitric acids.
   Precautions: use minimum amounts and store away from organic material, flammables and reducers.
3. PEROXIDIZABLES can explode with heat, impact or friction.
   Examples: ethyl ether, tetrahydrofuran, isopropyl ether, liquid alkanes and alkenes.
   Precautions: date all peroxidizables when received and when opened for use, dispose of material within six months of opening or twelve months of purchase; never open a container with obvious crystal formations around the lid.
4. WATER REACTIVES react with water to produce hazardous conditions.
   Examples: alkali metals such as lithium, sodium, potassium, acid anhydrides and acid chlorides.
   Precautions: avoid contact and handle away from water; use dry sand to smother fire; provide ventilation to disperse flammable gases.

H. Use of Carcinogens/Toxins

Resources:

1. OSHA listed carcinogens.
2. 8th RoC on Carcinogens: Substances Known to be Carcinogens.
3. International Agency for Research on Cancer (IARC) “Carcinogenic to Humans.”
4. Reproductive Toxins List, Appendix VI, list B.

5. Environmental Protection Agency (EPA) Acute Hazardous Waste List, Appendix A, Section F.
6. Chemicals listed by the NTP and IARC as reasonably anticipated to be carcinogens are provided in Appendix IV, list C. These chemicals require similar handling procedures, but require more judgement for use and handling such as duration of use, amount of material used, conditions of use, formulations being used, and requires the authorization to use by a Lab Supervisor.

V. SPECIAL PROCEDURES

A. Americans with Disabilities Act (ADA)
To determine needs and specific issues that may arise when working with physically challenged students contact the Disabilities Services Coordinator, Jane Slykuis (27) 3-2676, if unavailable contact Department Head, Sue Courts (27)3-7224.

B. Use of Select Carcinogens, Reproductive Toxins and Highly Toxic Chemicals
1. Establish a designated area for use and identify the area with signs or posting for limited access.
2. Properly use, maintain, and dispose of all containment devices and personal protective equipment as recommended on Material Safety Data Sheets.
3. Develop written procedures for the safe removal of contaminated waste material.
4. Develop written decontamination procedures for use in designated areas for response to an emergency or routine decontamination event.
5. Personnel working with these chemicals must obtain prior approval of the lab supervisor and department head. All work must be performed in designated areas with minimal quantities of material by properly trained and informed personnel.
5. Hazardous chemicals must be properly stored and secured for limited access.
6. Exemptions:
   - Chemical quantities less than 10 milligrams are exempt from the special procedures.
   - Any quantity of hazardous chemicals should always be used with reasonable precautions and incorporate safe operating procedures that include elimination of the potential for ingestion, inhalation or skin contact.

VI. EMERGENCY RESPONSE

The potential damages sustained or personal injuries incurred from an accident within a university laboratory facility will directly relate to the quality of the laboratory's emergency response plan and procedure. The following components of emergency planning will be required for laboratory facilities.

A. Preplanning Tasks
1. Identify the nature of the operations performed within the work area such as research, instructional, equipment used, anticipated personnel injury.
2. Potential location of a spill or release such as but not limited to floor, corridor,

storage area, and hood.

3. The quantities of potential material release or spill and the type of container such as bottles, pipes, gas cylinders.

4. The chemical or physical properties of the material release such as solid, liquid, gas and air or water reactivity.
5. The hazardous properties of the material such as flammability, corrosive, or toxic.
6. The location of emergency supplies and equipment.
7. Identification of the facility emergency evacuation routes and procedures as well as a list of emergency phone numbers.

B. Equipment/Supplies

Each laboratory will maintain an appropriate inventory of equipment and supplies for management/control of spill and accidents involving the release of hazardous chemicals. The equipment should include safety showers, eyewash station, fire extinguisher, fire blankets and appropriate well-stocked first aid stations. Additional supplies required but not limited to neutralizing agents (such as sodium carbonate, sodium bicarbonate, and sodium bisulfate) and absorbents (such as vermiculite, calcium bentonite and sand).

VII. REPORTING EMERGENCIES

A. When requesting emergency assistance

If reporting fire, medical emergency or criminal act, call UNI Public Safety at (27)3-4000 or dial 9-911 for Cedar Falls Fire, Police or Emergency Medical.

B. Needed information when requesting assistance includes:

1. Location of emergency.
2. Phone number from which call is being made.
3. Caller's name.
4. What assistance is needed.
5. How many injured.
6. Condition of victim/s.
7. What happened (are there chemicals involved.)

C. DO NOT HANG UP FIRST - LET THE DISPATCHER HANG UP FIRST.

VIII. ACCIDENT/INJURY RESPONSE

A. Major Accidents and Injuries

1. If a serious injury of illness occurs, call UNI Public Safety at (27)3-4000.
2. Give your name describe the nature/severity of the medical problems and the campus location of the victim.
3. UNI Public Safety will summon paramedics/ambulance service and can render first aid and CPR.
4. While you wait for response, consider performing the following steps:

- ♦ Keep victim still and comfortable. **DO NOT MOVE VICTIM.**
- ♦ Ask victim, " Are you okay?" and "What is wrong?"
- ♦ Check breathing and conditions of victim.
- ♦ Assist in controlling serious bleeding. Always use a barrier such as a plastic bag when putting direct pressure on wound. **NEVER PUT YOURSELF IN DIRECT CONTACT WITH BLOOD OR BODY FLUIDS.**
- ♦ Look for emergency medical I.D. Question witnesses for additional details.

B. Minor Accidents and Injuries

1. The injured staff member should report immediately to the designated person in the department and follow the department's procedures for seeking treatment. **NOTE: NEVER TRY TO DRIVE YOURSELF TO A HOSPITAL IF THE INJURY IS SERIOUS IN NATURE, CALL UNI PUBLIC SAFETY AT (27)3-4000 FOR ASSISTANCE.**
2. Departments are encouraged to utilize Sartori Memorial Hospital, the designated occupational health provider for the University. **NOTE**: **IF INJURY IS MORE SEVERE IN NATURE THEN TRANSPORTING TO THE NEAREST MEDICAL TREATMENT IS RECOMMENDED**.
3. Within each department, an individual should be identified and designated as the person responsible for reporting injuries and related details to Human Resource Services.
4. All injuries should be reported within 24 hours.
5. Become familiar with the location of first aid kits and report use of first aid supplies to the department where the kit is located.

IX. CHEMICAL SPILL

A. Minor Chemical Spill

1. Notify all individuals in the area regarding the spill or release of material.
2. Evacuate all non-essential personnel from the spill area.
3. If the material is flammable, turn off ignition and heat sources.
4. Avoid breathing vapors and if properly trained use a respirator.
5. Establish exhaust ventilation if safe to do so.
6. Secure supplies and equipment to effect the cleanup.
7. Wear appropriate personal protective equipment (PPE) to prevent contamination or additional exposure.
8. Notify the Department of Public Safety if additional information or assistance is required at (27)3-4000.

B. Major Chemical Spill

Volumes exceeding the capacity of a standard cleanup kit or in which readily available personal protective equipment is not adequate to ensure worker safety.

1. Report spillage of chemical/s immediately to UNI Public Safety at (27) 3-4000.
2. **DO NOT RETURN TO THE AFFECTED AREA**.
3. Anyone who may be contaminated by the spill should avoid contact with others.
   - **DO NOT TOUCH ANYTHING**.
   - Find the closest emergency shower/eyewash and flood chemical burn with water.
   - Remove any contaminated clothing to limit exposure.
4. When reporting, be specific about the nature and location of spilled material. UNI Public Safety will activate the appropriate emergency response units.
5. Persons not trained in spill techniques should immediately evacuate the area and alert others to do the same.
6. Notify emergency personnel of persons with disabilities who are in the building and need help to evacuate.
7. In case of fire, follow the Departmental Fire Safety Response Procedures
   - **DO NOT USE ELEVATORS.**
8. Outside, move to a location far enough away from the building to be deemed safe and also avoid hampering emergency operations.
9. Keep streets and walkways clear for emergency vehicles and personnel.
10. **DO NOT RETURN TO AN EVACUATED BUILDING** unless directed by UNI Police.

X. FIRE SAFETY EMERGENCY ACTION: EVACUATE BUILDING QUICKLY AND SAFELY

A. If You Discover a Fire:

1. Extinguish only if you have been trained and can do so safely and quickly.
   - After extinguishing, call UNI Public Safety (27)3-4000.
2. Fire cannot be extinguished.
   - Confine fire by closing the doors.
   - Pull the nearest fire alarm.
   - Follow general evacuation procedures.

B. General Evacuation Procedures

1. Close hood shutters if working in the laboratory. (Remember ventilation to hoods will shut down preventing spread of fire.)
2. Close doors to your immediate area after emptied.
3. Evacuate the building using the most direct route and nearest exit**. DO NOT USE ELEVATORS.**
4. Outside, move to a location far enough away from the building to be deemed safe and also avoid hampering emergency operations.
5. If you have critical information about fire or persons remaining in building notify a UNI Public Safety Officer at the scene.

6. Keep walkways clear for emergency response personnel/vehicles.
7. **DO NOT ENTER** an evacuated building until directed by UNI Police.

C. Evacuation From immediate Fire Area
   1. Feel door from top to bottom. If it is hot, **DO NOT PROCEED**, go back.
   2. If door is cool, crouch low and open door slowly.
   3. Close door quickly if smoke is present.
   4. If no smoke is present, exit building via nearest exit.
   5. If you encounter heavy smoke in primary exit route, go back and try secondary exit.

D. Trapped in building
   1. Close door and seal opening to prevent smoke from entering room.
   2. Dial (27)3-4000 or 9-911 if possible, inform UNI Public Safety of your location.
   3. If a window is available, attempt to attract the attention of emergency responders.
   4. **DO NOT OPEN THE WINDOW** unless directed by emergency responders.

XI. HANDLING COMPRESSED GAS CYLINDER LEAKS

Major or minor leaks occasionally occur on a compressed gas cylinder and can include one of the component parts at the top of the cylinder. If a leak cannot be stopped by tightening a valve gland or packing the supplier will be notified and the following emergency action initiated:

A. Minor Leak
   1. Flammable, inert, or oxidizing gas cylinders will be moved to an isolated, well ventilated area away from combustible materials. Post signs describing the hazard.
   2. Corrosive and toxic gas cylinders will be moved to an isolated, well ventilated area (e.g. fume hood if possible) and the fumes directed to the appropriate chemical neutralizer.
   3. When moving a leaking cylinder through an occupied area of the facility confine the leaking gas in an appropriate manner.

B. Major Leak
   1. Report the incident to 9-911, or to Department of Public Safety (27) 3-4000 and activate the building alarm.
   2. Don all personal protective apparel and equipment.
   3. Evacuate personnel from the area.
   4. Observe procedures for personal injury accidents or fire as appropriate.

XII. ADMINISTRATIVE CONTROLS

Administrative controls are procedural measures that can be taken to reduce or eliminate hazards associated with the use of hazardous chemicals.

A. Assign a Chemical Hygiene Officer in each department.

B. Ensure personnel in charge of laboratories understand their responsibilities under the Chemical Hygiene Plan.

C. Observe all standard operating practices and procedures for chemical safety, good hygiene, and good housekeeping.

D. Ensure employees are provided with adequate training to work safely with hazardous chemicals/materials.

E. Prior approval, authorization of the department head or designated representative is required for particular hazardous operations, procedures, or activities.

F. Restrict access to areas where hazardous chemicals or material is used or stored.

G. Designate and post signs or placards to identify hazardous areas.

H. Label hazardous material according to university container labeling procedures.

I. Hazardous waste must be managed using University approved procedures according to the University Hazardous Waste Program.

J. Post the entrance to laboratory areas where chemicals are used or stored in the following manner: Emergency information including name and phone number of responsible party to contact in the event of fire, accident, or spill.

K. Identify specific types of hazards such as flammable, radiological, biological with standard signs and symbols contained in the NFPA 704 system.

L. Safety showers, eye wash, fire extinguishers, eye protection, and safety and first aid stations will be properly maintained, identified, and accessible.

M. Chemical containers will be labeled according the standards identified in the University Hazard Communication Program (available at http://www.vpaf.uni.edu/fs/healthsafety/safety/unisafe.shtml (under University Programs.)

N. Radioactive materials must be managed using University approved procedures according to the University Radiation Safety Program (available at University Safety Office in Physical Plant 25.)

XIII. ENGINEERING CONTROLS

Engineering controls are physical measures that can reduce or eliminate the hazards

associated with the use of hazardous chemicals to whatever extent possible through the substitution of less hazardous equipment, chemical, or processes, isolation of the operator or process, establishing local and general exhaust or ventilation.

A. Laboratory Fume Hoods

Laboratory fume hoods are intended to keep chemical vapors from escaping into the laboratory. The hood serves as the primary means for respiratory protection of laboratory personnel with physical isolation and containment of chemicals. A fume hood will be utilized for chemical procedures that have the potential for the following:

1. Airborne concentrations of one or more chemicals approaching the corresponding. Permissible Exposure Limit (PEL).
2. Flammable vapors approaching one tenth of the lower explosion limit.
3. Materials of unknown toxicity.
4. Odors which are potentially annoying to other personnel.

B. Procedures Considered to be Acceptable to Conduct Outside of the Fume Hood System

1. Water-based solutions of salts, dilute acids, bases, or other reagents.
2. Very low volatility liquids or solids.
3. Closed systems that will prevent a significant escape to the laboratory environment.
4. Extremely small quantities of material that might otherwise be considered hazardous.

XIV. PERSONAL PROTECTIVE APPAREL AND EQUIPMENT

Personal protective equipment is personal apparel which is typically provided and maintained by the employer, compatible with the required degree of protection from chemicals or hazards. Apparel includes, but not limited to head protection; safety glasses, goggles; aprons, gloves, lab coats; respirators; hearing protection; welding helmets; shoe protection. The Department Head or designee is responsible for the coordination and oversight for the use of personal protective equipment in laboratory facilities.

A. Respiratory Protection

When engineering controls cannot effectively control hazardous chemical contaminants within the work area, personnel will be required to wear respirator protective equipment. Personnel designated to use respiratory equipment must have proper medical exams, must be properly fit and trained for the proper use of a respirator as provided for in the written Departmental Respiratory Program and the regulations identified in 29 CFR, 1910.134.

B. Eye and Face Protection

Eye and face protection is required where there is reasonable probability for eye or face injury. Eye and face protective equipment will meet or exceed the standards set forth by ANZI 87.1 and by OSHA regulations. Shields are not considered a substitute for eye protection.

C. Hand and Body Protection

Specific precautions must be taken to prevent significant exposure to hazardous chemicals through contact with the skin. Appropriate protection should be selected to meet the needs of the specific hazardous environment.

1. Lab coats will be worn by personnel in any area where chemicals are routinely used or stored. Apparel will be laundered frequently and removed immediately if contaminated with hazardous chemicals/materials.
2. Gloves will be required when there is, but not limited to, the potential for contact with corrosive or toxic materials. Gloves will be selected to meet the needs of the hazards. Gloves will be properly maintained and inspected for wear and effectiveness of protection.
3. Required protective apparel and equipment will be selected to meet the needs of the hazardous chemical operation or hazards in the work area and provided by the university at the discretion of the department head or designated representative.
4. Bare feet, sandals, and other open toed shoes are not permitted in chemical laboratories or other hazardous areas. The requirement and need for safety shoes in chemical laboratories can be made after careful review of the hazards by the Lab Supervisor with the authorization of the Department Head.

D. Safety Shields/Containment

1. Fume hoods with drawn sashes, glove boxes, face shields, or other protective devices will be utilized whenever procedures with a high potential for sudden release or splattering is involved. Chemicals which react explosively require special safety shields and/or containment. Fume hoods or other similar devices will be properly maintained and inspected on a regular schedule.
2. Drench type safety showers shall be easily accessible, available within 100 feet or 10 seconds travel time of each area where corrosive or flammable liquids are used or stored, properly maintained and inspected for adequate operation.
3. Eye wash fountains will be accessible in all areas where corrosives, hot liquids, or other irritating hazardous chemicals/materials are used or stored. Eye wash fountains will be properly maintained and inspected on a regular schedule for adequate operation.
4. Fire extinguishers will be accessible, match the fire hazards in the area, tested and inspected according to applicable regulations, and contain either carbon dioxide or dry chemical extinguishing agent.
5. First aid stations will be provided and maintained with the appropriate supplies for the hazards in the work area. Employees will receive specific information and training for the proper use of all first aid material provided in the first aid station.
6. Fire blankets, when provided in hazardous work areas, will not contain asbestos material and will be properly inspected on an annual schedule to ensure their presence and generally acceptable condition as a fire suppression device.
7. Flammables requiring refrigeration will not be stored in domestic refrigerators. The light switch and thermostat could ignite the flammable vapors causing an explosion. Flammables will be stored in either explosion proof or flammable material storage refrigerator.

E. Laboratory Maintenance/Inspection

General laboratory chemical safety will be maintained with an effective inspection program developed and completed by the departmental Chemical Hygiene Officer in conjunction with the individual Lab Supervisor. The documentation and record keeping task associated with an inspection and testing program must be maintained by each Lab Supervisor. Documentation and records must be readily available in the event of an unannounced OSHA inspection. Inspections will consist of a formal review of chemical and general safe practices of the lab, housekeeping, and include maintenance checks of safety related equipment. Requirements of the inspections include:

1. Chemical, general safety practices and housekeeping should be completed quarterly.
2. Eye wash fountains are to be inspected weekly while emergency drench showers will be tested once a semester.
3. Respiratory maintenance will be completed according to procedures and schedule in Departmental Respirator Program.
4. Fume hood inspections will be completed annually by qualified personnel.

XV. INFORMATION AND TRAINING

Departments and ultimately individual Laboratory Supervisors are responsible for ensuring appropriate information and training has been provided to employees who work in laboratories with hazardous chemicals.

A. Employees must be informed of the type and level of hazards to which they could be exposed.

B. Employees must be trained in the safe use and emergency handling for the hazardous chemicals in their work area/lab.

C. Training must be provided to employees initially assigned to work in a lab where hazardous chemicals are present.

D. Training must be provided to employees prior to the introduction of new hazardous chemicals or work procedures according to the University Hazard Communication Program.

E. Required Training Content:

1. Overview of the University Chemical Hygiene Program.
2. Location and availability of the University Chemical Hygiene Program.
3. Location and availability of reference material including MSDS information regarding the hazards and safe practices for working with hazardous chemicals.
4. Permissible exposure limits of OSHA regulated substances or recommended limits imposed by the material's manufacturer or distributor that are not OSHA regulated.
5. Methods or procedures to detect the presence or release of hazardous chemicals.
6. Signs and symptoms associated with laboratory chemical exposure.

7. Physical and health hazards associated with chemicals in the work area.
8. Measures employees can take to protect themselves from hazards including use of standard operating procedures, control measures, personal protective equipment, and emergency procedures.
9. Employees receiving training must sign an appropriate log documenting their attendance of the training event.
10. Each Lab Supervisor will maintain an outline of the training provided and the attendance log. These records must be readily available in the event of an unannounced OSHA inspection.

XVI. EXPOSURE ASSESSMENT/MEDICAL EXAMINATION/EVALUATION

Procedures to follow if suspected overexposure of employees to hazardous chemicals:

A. In emergency where overexposure results in immediate danger to life and health (IDLH):
   1. Call University Public Safety at 273-4000 or 9-911 to report the incident.
   2. The victim will be transported via ambulance to Sartori Memorial Hospital located at 515 College Street, Cedar Falls.
   3. The victim should be accompanied by the MSDS (Material Safety Data Sheet) of the respective chemical/material they were exposed to.

B. For situations where overexposure does not result in an immediate danger to life and health but it is suspected that long term damage to the health of the employee is possible:
   1. Exposed person will follow the normal reporting procedure for their respective department.
   2. Employee exposure to a hazardous chemical/material must be assessed through monitoring if there is reason to believe that an overexposure has occurred.
   3. If employee is referred to the designated University Occupational Health Provider, a copy of the MSDS sheet of the chemical/material that they were exposed to will be taken to the appointment.

XVII. LABORATORY HOOD SYSTEMS

Laboratory hoods are designed to protect laboratory personnel by capturing or containing contaminates such as chemical vapors, gases, dusts, mists, fumes and preventing escape into the laboratory environment. Hoods provide physical isolation and containment of chemicals and their reactions. A laboratory hood is a ventilated, enclosed workspace capable of capturing, containing, and exhausting fumes, vapors, and particulate matter generated inside the enclosure. It consists of side, back, and top enclosure panels, a work surface or counter top, access opening called the face, a sash, and an exhaust plenum with a baffle system for regulating airflow. Laminar flow cabinets, biological safety cabinets, and glove boxes are not laboratory hoods.

The purpose for guidelines is to provide general information regarding the selection, use,

installation, design and performance of local exhaust hoods. Local exhaust hoods in laboratory facilities should comply with the most recent edition of INDUSTRIAL VENTILATION published by the American Conference of Governmental Industrial Hygienists (ACGIH), Uniform Mechanical Code, as well as the applicable American Society of Heating, Refrigeration and Air-Condition Engineers (ASHRAE) standards, and National Fire Protection Association (NFPA) codes, NFPA 91, NFPA 45.

A. Hood Types

Local exhaust hoods include:

1. ENCLOSURE HOODS surround the point of emission and would be appropriate for chemicals in laboratory areas. Auxiliary air, by-pass, conventional, specialty and variable air volume are types of enclosure hoods.
2. CAPTURE HOODS grab air contaminates that are generated from a point outside the hood. A capture hood would be a snorkel hood used to ventilate a welding or grinding operation.
3. RECEIVING HOODS exhaust material that is thrown into the hood. A receiving hood would be a canopy hood used to ventilate the heat from an autoclave.
4. SPECIALTY HOODS
   - ♦ Explosion-proof hoods have "explosion-proof" electrical devices. The hood will not contain an explosion but the electrical equipment will not provide a source of ignition.
   - ♦ Perchloric acid hoods are designed for use with perchloric acid and must be equipped with a water wash system for the hood and ductwork.
   - ♦ Radioisotope hoods are designed for use with radioactive chemicals and constructed from stainless steel without seams or ledges.
   - ♦ Variable air volume hood maintains a constant face velocity regardless of sash position.
   - ♦ Biological safety cabinet is not a laboratory hood and considered to be a special safety enclosure used to handle and contain pathogenic microorganisms. The cabinet is designed to protect the product and also provides limited protection for lab personnel by utilizing an inward airflow away from the employee.
   - ♦ Laminar flow cabinets are not laboratory hoods and provide no protection for lab personnel and are intended to provide a clean airflow for the product protection. It is typically a ventilated, partially enclosed cabinet with airflow over the work surface.

B. Work Practices

Laboratory hoods do not provide absolute containment or absolute personal protection from exposure to hazardous chemicals or materials. The following guidelines describe safe work practices for the use of laboratory hoods.

1. The department will ensure safe hood operation by completing annual tests and inspections.
2. Conduct all operations that may generate hazardous air contaminants inside a hood.
3. Properly use traps or scrubbers when toxic or noxious vapors are generated.
4. Use only materials that are appropriate for the hazard rating of the hood.

5. Confirm the exhaust system is operating properly by verifying airflow through the hood.
6. Always turn on interior lighting for proper illumination of the work surface.
7. Keep all apparatus at least six inches back from the face of the hood.
8. Never put your head inside a hood with the potential for exposure to hazardous contaminates.
9. Hoods should not be utilized as a waste disposal mechanism for volatile materials.
10. Do not use hoods for the storage of chemicals or apparatus.
11. Place all heat generating equipment in the rear of the hood to minimize the effect of convection currents on airflow.
12. The hood sash is designed to be used as a limited safety shield and should be as low as practical. Maintain the hood sash height no higher than 18 inches and no lower than 12 inches unless specified by the manufacture or authorized by the Lab Supervisor or department head.
13. Use an appropriate barricade in front of the hood if there is a chance of explosion or eruption of material. The sash is not an appropriate barrier.
14. Place large apparatus to the rear of the hood and rise off the surface two to three inches to allow airflow under the object and into the lower rear exhaust opening. Maintain a distance of at least one inch from the rear so as not to block the flow of air into baffles.
15. Minimize occupant traffic past the face of the hood.
16. Do not place electrical receptacles or other potential electrical spark sources inside the hood when flammable liquids or gases are present. No permanent electrical receptacles are permitted in fume hoods unless approved by the manufacturer.
17. Provide adequate maintenance for all hood exhaust systems and building supply air systems.
18. Do not block air supply vents or exhausts, and do not remove sash or panels of the fume hood.

C. Perchloric Acid
1. Identify perchloric acid hoods with appropriate signs and never use perchloric acids in a hood that is not designed for perchloric acid.
2. Do not use a perchloric acid hood as a general laboratory fume hood system.
3. Do not use organic materials in a hood designed for perchloric acid.
4. Use water wash down provisions after each use.
5. Use the lowest quantity of perchloric acid to fit procedural requirements.
6. Spark producing apparatus should not be used inside a perchloric acid hood.
7. Apparatus used within the hood should have inorganic coatings or lubricants.
8. Perchloric acid hoods require ductwork labels for the hazard and the fan system identified with proper hazards identification.

D. Radioisotope Laboratory Hood
1. Identify radioisotope laboratory hoods with the appropriate warning signs according to the University Radiation Safety Program.
2. Do not use radioisotope hoods as a general-purpose laboratory hood system.

3. Properly test the system for residual radioactivity prior to performance of repair, inspection or disassembly.
4. Properly identify all ductwork and drains with appropriate warning signs according to University Radiation Safety Program.

E. Laboratory Hood Operating Procedures

1. The appropriate sash height will be identified on each laboratory hood system. The sash should not be raised above this height, as it will compromise the safety of lab personnel.
2. The average face velocity of the hood determines the rating of the hood. Only materials that are within that rating should be placed in that hood.
3. Work practices and make-up air will affect the performance of laboratory hoods. Face velocity should be about 100 feet per minute at the highest sash height. Working sash height should be no higher than 18 inches and no lower than 12 inches. Face velocity may be as low as 75 feet per minute and as high as 150 feet per minute.
4. Airflow indicators should be provided on new or existing hood systems. An air flow indicator can be as simple as a ribbon attached to the sash to indicate the fan is operating and air is moving into the hood.
5. Laboratory hood system will be inspected and tested when installed or modified and at least annually thereafter. Test and inspections should include:
   - ♦ Visual inspection of the interior, sash and visible duct work. Air flow indicators and low airflow alarms should be tested.
   - ♦ A smoke tube should be used to verify inward airflow and turbulence around the perimeter of the face of the opening.
   - ♦ The average face velocity should be confirmed and used to determine the rating of the hood and the appropriate use of the hood.
   - ♦ An inspection tag should be place on the hood to confirm completion of the inspection and satisfactory operation.
6. If a laboratory hood does not pass an annual inspection the hood will be tagged out of service pending evaluation and repair. The Lab Supervisor or department head is responsible for requesting the assistance of appropriate repair personnel.
7. A sound level test should be completed to confirm measurements less than 85 dBA with the hood in operation

XVIII. MATERIAL SAFETY DATA SHEETS

A. Section I: Chemical Information

The chemical and common name(s) must be provided for single chemical substances. The identification on the MSDS must cross-reference with the label on the container.

B. Section II: Hazardous Ingredients

A hazardous chemical mixture that has been tested as a whole to determine its hazards, the chemical and common names of the ingredients associated with the hazards, and the common name of the mixture must be listed. If the chemical is a mixture that has not been tested as whole, the chemical and common names of all ingredients determined to be health hazards and comprising 1% or greater of the composition must be listed. All components of a mixture determined to present a physical hazard must be listed.

Chemicals and common names of carcinogens must be listed if they are present in the mixture at levels of 0.1% or greater. Carcinogens are defined to be those established as described in the latest editions of a) National Toxicology Program (NTP) Annual Report on Carcinogens, (b) International Agency for Research on Cancer (IARC) Monographs, or (C) 29 CFR Part 1910, Subpart Z, "Toxic and Hazardous Substances," OSHA.

Chemical and common names of all ingredients determined to be health hazards and comprising less than 1% (0.1 for carcinogens) of the mixture must also be listed if they can still exceed an established Permissible Exposure Limit (PEL) or Threshold Limit Value (TLV) or present a health risk to exposed employees at these concentrations.

C. Section III: Physical and Chemical Characteristics

The physical and chemical characteristics of the hazardous substance must be listed. The items include boiling and freezing points, density, vapor pressure, specific gravity, solubility, volatility, and the products general appearance and odor.

D. Section IV: Fire and Explosion Hazard Data

The compounds potential for fire and explosion must be described. The fire hazards of the chemical and the conditions under which it could ignite or explode must be identified. Describe the fire fighting methods and recommended extinguishing agents.

E. Section V: Reactivity Data

This section presents information about other chemicals and substances with which the chemical is incompatible, or with which it reacts. Information on any hazardous decomposition product, such as carbon monoxide, must be included.

F. Section VI: Health Hazards

The health hazards of the chemical, together with the signs and symptoms of exposure must be listed. In addition, any medical conditions that are aggravated by exposure to the compound, must be listed. The specific types of chemical health hazards defined in the standard include carcinogens, corrosives, toxins, irritants, sensitizers, mutagens, teratogens, and the effect on target organs (i.e. liver, kidney, nervous system, blood, lungs, mucous membranes, reproductive systems, skin, eyes, etc.)

The route of entry section describes the primary pathway by which the chemical enters the body. There are three principle routes of entry: inhalation, ingestion, skin

absorption. This section also supplies the OSHA PEL, the ACGIH TLV, and other exposure levels used or recommended by the manufacturer. If OSHA, the National Toxicology Program (NPT), or the International Agency lists the compound as a carcinogen (cancer causing agent) for Research on Cancer (IARC), the information must be identified on the MSDS.

G. Section VII: Precautions for Safe Handling and Use
The standard requires the preparer to describe the precautions for safe handling and use. These include recommended industrial hygiene practices, precautions to be taken during repair and maintenance of equipment, and procedures for clean up spills and leaks. Some manufacturers also use this section to include information not specifically required by the standard, such as EPA waste disposal methods and state and local requirements. (Spill or leak procedures)

H. Section VIII: Control Measures
This section requires the preparer of the MSDS to list any generally applicable control measures. These include engineering controls, safe handling procedures, and personal protective equipment. Information is often include on the use goggles, gloves, body suits, respirators, and face shields. Special precautions and any additional safety and health information not addressed in other sections of the MSDS.

I. Section IX: First Aid Measures
This section provides a list of emergency first aid measures to follow in case a chemical is accidentally inhaled, ingested, or comes in contact with the skin or eyes. It also provides any additional notes that may be necessary for a physician to treat a patient when exposed to that chemical.

J. Section X: Date of MSDS preparation or latest revision

K. Section XI: Chemical Manufacturer
Provides name, address, and telephone number of the entity responsible for preparing and distributing the MSDS.

APPENDIX A

Glossary
frequently used terms in this program

ABSORPTION - movement of a material or substance through the skin.

ACUTE EFFECT - an adverse effect, usually the result of a short-term and high level exposure, with symptoms developing rapidly.

ACID - corrosive material which reacts with a base to form a salt and water

ANTIDOTE - an agent that neutralizes or counteracts the effect of poison.

ASPHYXIANT - a vapor or gas which can cause unconsciousness or death by suffocation

AUTOIGNITION TEMPERATURE - the approximate lowest temperature at which a flammable gas or vapor-air mixture will spontaneously ignite without spark or flame. Vapor and gases will spontaneously ignite at a lower temperature in oxygen than in air.

CARCINOGENIC AGENT - a material that is capable of producing an abnormal growth (cancer) that can spread from one tissue to another.

CHEMICAL ASPHYXIANT - a substance that prevents the body from receiving or utilizing an adequate oxygen supply.

CHRONIC EFFECT - an adverse effect, usually the result of a long-term and low-level exposure, with symptoms developing slowly.

COMBUSTIBILITY - the capacity of a material to fuel fire. A term used to classify certain liquids on the basis of their flash points.

CORROSIVITY - the capacity of a material to cause immediate and extensive damage to human tissue at the site of contact.

CRYOGENICITY - the capacity of a material to produce very low temperatures.

DENSITY - the physical quantity which is expressed as a mass per volume ratio.

DERMAL SENSITIZATION - exposure of an agent to the skin that results in an immune response.

ENVIRONMENTAL IMPACT - reference to the possible adverse effects of the release of a material or substance to the environment.

EPA U.S. ENVIRONMENTAL PROTECTION AGENCY - the federal agency with environmental protection, regulatory, and enforcement responsibility.

EXPLOSION HAZARD - hazards which may result from exposure of a material to heat or flame.

EXPOSURE LIMIT - a limit set to minimize employee exposure to a hazardous material. Some terms used include Threshold Limit Value (TLV), Permissible Exposure Limit (PEL), and Short Term Exposure Limit (STEL.)

EXTINGUISHING AGENT - an agent suitable for controlling or putting out a fire.

FIRE POINT - the lowest temperature at which a material can evolve vapors fast enough to support continuous combustion.

FLAMMABILITY - the capacity of a material to easily ignite and burn rapidly. A term used to classify certain liquids on the basis of their flash point.

FLAMMABLE LIMITS - the range of concentration in which a given material will burn. The range is limited by the LOWER EXPLOSION LIMIT (LEL) and the UPPER EXPLOSION LIMIT (UEL.)

FLASH POINT - the temperature at which a liquid produces enough vapor to burn.

HAZARDOUS MATERIAL - any substance having properties capable of producing adverse effects on the health and safety of individuals.

IGNITION SOURCE - anything that provides heat, spark or flame sufficient to cause combustion or explosion.

INCOMPATIBLE - substances that could cause adverse reactions from contact with one another.

INGESTION - taking a substance into the body by mouth.

INHALATION - taking a substance into the body by breathing.

IRRITANT - a material that will cause an inflammatory response or reaction of the eye, skin or respiratory system, following single or multiple exposures.

LOCAL EXHAUST - a system for capturing and exhausting contaminants from air at the point where the contaminants are released.

OSHA Occupational Safety and Health Administration - federal agency with safety and health regulatory authority for most U.S. businesses.

PEL PERMISSIBLE EXPOSURE LIMIT - term used to express the airborne concentration of a material to which nearly all persons can be exposed day after day, without adverse effects.

PPM PARTS PER MILLION - a unit for measuring the concentration of a substance in a volume per volume ratio.

PRECAUTIONARY STATEMENTS - statement warning product users of potentially harmful hazards that may be attributed to the product.

RADIOACTIVE - the property of an isotope or element that is characterized by producing an abnormal growth (cancer) that can spread from one tissue to another.

STEL SHORT TERM EXPOSURE LIMIT - a fifteen-minute time-weighted average exposure that should not be exceeded any time during the workday, even if the TLV is not exceeded.

TLV THRESHOLD LIMIT VALUE - term used to express the airborne concentration of a material to that nearly all persons can be exposed day after day, without adverse effects.

TOXICITY - the capacity of a material to produce adverse health effects resulting from overexposure to that material.

APPENDIX B

MSDS(s) Information

I. Procedure for obtaining an MSDS(s) sheet

A. What must be done if the MSDS(s) for hazardous chemical or material in the work area is not currently available to the employees using the material?

1. Check with the Departmental Chemical Hygiene Officer to see if it is available in the Departmental MSDS(s) binder/file.
2. Check the master file of MSDS(s) at the Physical Plant
   If the MSDS(s) is available, request a copy for the chemical or material and include it in the Departmental MSDS(s) binder/file.

B. In the event an MSDS(s) is not available, check online with the vendor.

1. Most vendors provide online MSDS(s) sheets as a service to their customers. MSDS(s) sheets may also be supplied by other online services such as VERMONT SIRI, MSDS(s) online, or Cornell online.
   - ♦ Most often when conducting an online search, list the exact chemical or material name, catalog number (if using the vendor's online service) or CAS number.
   - ♦ Remember that OSHA Hazardous Communication Program 29 CFR, 1910.1200 and the University Hazard Communication Program requires you to secure a copy of the MSDS(s).
2. In the event an MSDS(s) sheet is not available online write the manufacturer or distributor.
   - ♦ OSHA Hazardous Communication Program 29 CFR, 1910.1200 and the University Hazard Communication Program requires you to secure a copy of the MSDS(s).
   - ♦ List the exact chemical name used on the product. Include CAS number or other identifying information, if available.
   - ♦ Keep a copy of the "request" letter on file.
3. After obtaining a copy of the MSDS(s) information for the departmental safety records send the original to the University Safety Office, House 26- mail code 0197 and place a copy of the MSDS(s) in the work area for employees.
4. A manufacturer or distributors refusal to provide the appropriate MSDS(s) must be attached to request letter and forwarded to the University Safety Officer, mail code 0189.

II. Sample MSDS Request Format

MSDS REQUEST FORM

(Date)

(Name/ Address of the Manufacturer)

Dear Sir or Madam:

The University of Northern Iowa requests your assistance to comply with 1910.1200, Occupational Safety and Health, hazardous Communication Standard. Please provide an appropriate Material Safety Data Sheet(s) for the following chemical or material purchased by University of Northern Iowa, Cedar Falls, Iowa, 50614.

(List the Chemical(s) or Material(s))

The University of Northern Iowa expects to receive the MSDS(s) information within ten (10) working days of your receipt of this request. Please send any additional information regarding the safety and health requirements of material specified.

Forward the information to the following address:

(Departmental Address)

Respectfully,

(Name/Title)

APPENDIX C

Sample Training Record

Training Record:

Instructor: _____

Date: _____

Session Name: _____

Time: _____

Print Name	Write Name	Department

Training synopsis or outline:

APPENDIX D

Sample Inspections Guidelines

	Date Initials				
Containers Close					
Containers labeled					
Containers leaking					
Compatible material					
Required signs					
Spill Equipment					
Safety Equipment					
Storage Integrity					
Comments:					

Departmental inspections need to be specific to lab conditions and items listed in sample may need to be expanded to assure compliance.