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Approved by: Nora Velazquez **Supersedes:** New

Laboratory Safety Program and Chemical Hygiene Plan

Introduction

Keene State College is committed to providing a safe laboratory environment for its faculty, staff, students and visitors. The goal of the Keene State College Laboratory Safety Program and Chemical Hygiene Plan is to minimize the risk of injury or illness to laboratory workers by ensuring that they have the training, information, support and equipment needed to work safely in the laboratory.

Keene State College Policies

Environmental, Health and Safety Policy

Keene State College is committed to providing a safe and healthy environment for its students, employees and campus visitors. Such an environment is essential for the College to meet its mission of instruction, research and public service. Keene State meets this obligation by complying with the University System of New Hampshire (USNH) Policy on Environmental Health and Safety, as well as state and federal environmental, health and safety (EHS) regulations.

Ways to implement the above policy include the following:

- developing and improving programs and procedures to assure compliance with all applicable laws and regulations
- ensuring that personnel are properly trained and provided with appropriate safety and emergency equipment
- taking appropriate action to correct hazards or conditions that endanger health, safety, or the environment
- considering safety and environmental factors in all operating decisions including planning and acquisition
- engaging in sound reuse and recycling practices and exploring feasible opportunities to minimize the amount and toxicity of waste generated
- using energy efficiently throughout our operations
- encouraging personal accountability and emphasizing compliance with standards and conformance with College policies and best practices during employee training and in performance reviews
- communicating our desire to continuously improve our performance and fostering the expectation that every employee, student, and contractor on College premises will follow this policy and report any environmental, health, or safety concern to Keene State College management.
- monitoring our progress through periodic evaluations

Laboratory Security Policy

Safeguarding College resources from unauthorized access, misuse or removal is a duty of all faculty and staff. In laboratories, this obligation rests primarily with the Laboratory Supervisor; however, all laboratory personnel have a responsibility to take reasonable precautions against theft or misuse of materials, particularly those that could threaten the public. Any extraordinary laboratory security measures should be commensurate with the potential risks and imposed in a manner that does not unreasonably hamper research.

At a minimum, the institution expects all laboratory personnel to comply with the following security procedures:

- Question the presence of unfamiliar individuals in laboratories and report all suspicious activity immediately to Campus Safety by calling x8 2228.
- After normal business hours, all laboratories must be locked when not in use

Laboratory building exterior doors are secured after normal business hours. To minimize the likelihood of unauthorized access, all after-hours building users should:

- Avoid providing building access to unfamiliar individuals
- Secure doors behind them
- Immediately report any building security problem to Campus Safety at x8-2228

Research or other activities involving the use of lab space, materials or equipment without the knowledge and approval of the responsible Principal Investigator/Lab Supervisor is strictly prohibited. Violation of this prohibition may result in disciplinary action up to and including termination.

Roles and Responsibilities

Departmental – Science Center Faculty and Staff.

- Establish and implement a Chemical Hygiene Plan.
- Review and update the Chemical Hygiene Plan at least annually.
- Investigate accidents and chemical exposures within the department.
- Act as a liaison between the department and EHS for laboratory safety issues.
- Maintain records of training, chemical Material Safety Data Sheets, exposure monitoring and medical examinations.
- Ensure laboratory workers and lab students receive chemical and procedure-specific training.
- Maintain Spill Kits and First Aid Kits as appropriate to materials in the area.
- Ensure laboratory workers and lab students are aware of the “Right to Know” law and have access to Material Safety Data Sheets at any time.
- Review and approve use of particularly hazardous substances
- Approve laboratory worker's return to work following a chemical exposure requiring medical consultation.
- Ensure laboratory workers attend general training given by EHS.
- Ensure laboratory workers and lab students understand how to work with chemicals safely.
- Provide chemical and procedure-specific training, as needed.

- Provide laboratory workers with appropriate engineering controls and personal protective equipment needed to work safely with hazardous materials. Ensure such equipment is used correctly.
- Review and approve work with particularly hazardous substances

Chemical Hygiene Officer

Requirements:
The OSHA Laboratory standard requires designation of a Chemical Hygiene Officer (CHO). Within Keene State College, there is one CHO, appointed by the Dean of Sciences and Social Sciences, for all departments within the Science Center.

Definition:
The Chemical Hygiene Officer (CHO) is an employee designated by the employer (Dean of Sciences and Social Sciences), and who is qualified by training or experience to provide technical guidance in the development, implementation, and enforcement of the written Chemical Hygiene Plan. The CHO will be technically competent and have appropriate authority to assist with development and administration of department plans. The Chemical Hygiene Officer may be selected from technical staff or faculty within the Science Center.

Duties:
The Chemical Hygiene Officer will assist responsible principal investigators and Department Heads to accomplish the following:

• Work with faculty and staff to implement the plan at the level of individual laboratories, as outlined above.

• Work with faculty and staff to monitor safe procurement, use, and disposal of chemicals.

• Advise faculty, staff, and Keene State College administration concerning adequate facilities and procedures under the regulation.

• Seek ways to improve the Chemical Hygiene Program.

In addition, the Chemical Hygiene Officer will be responsible for knowing the contents of the relevant regulation (Occupational Exposures to Hazardous Chemicals in Laboratories, 29 CFR 1910.1450) as well as the Department Chemical Hygiene Plan.

Environmental Health and Safety (EHS)

- Conduct exposure monitoring, as needed.
- Provide general EHS training.

- Audit the departmental program periodically.
- Provide consultation for safe working guidelines for laboratory workers
- Review the model Chemical Hygiene Plan at least annually
- Inspect fume hoods annually
- Provide consultation for safe work practices for hazardous chemicals
- Conduct limited laboratory safety inspections quarterly

Laboratory Worker (student or staff)

- Attend laboratory safety training.
- Review the Lab Safety, and General Safety Manual
- Follow procedures and laboratory practices outlined in the Chemical Hygiene Plan and Laboratory Safety Programs and as provided by the Dean, Department Chairs lab supervisors and principal investigators.
- Use engineering controls and personal protective equipment, as appropriate.
- Report all incidents, accidents, potential chemical exposures and near miss situations to the departmental supervisors and the EHS Coordinator (x8 2879)

II. : General Laboratory Safety Procedures

Section 1: General Laboratory Safety Procedures

1. Know the materials you are working with (e.g. chemical, biological, radioactive): Refer to written laboratory protocols and review the Material Safety Data Sheets (MSDS) for chemicals. Consider the toxicity of materials, the health and safety hazards of each procedure, the knowledge and experience of laboratory personnel and the safety equipment that is available.
2. Know the location of safety equipment and emergency procedures in your area.
3. Always wear appropriate clothing (e.g. pants, shirts, shoes) and personal protective equipment (e.g. safety glasses, lab coats, gloves) in the laboratory. Open sandals are prohibited; shorts and skirts are not recommended. Remove personal protective equipment before leaving the laboratory.
4. Do not work alone in the building at any time. When hazardous operations are conducted, arrangements should be made to have another person present in the lab.
5. Use a properly operating fume hood when working with hazardous chemicals.
6. Do not eat, smoke, drink, prepare food or apply cosmetics in the laboratory.
7. Keep work areas clean and uncluttered at all times.
8. Do not leave reactions unattended.
9. Unauthorized individuals are prohibited from entering the laboratory.
10. Biological Safety Level (BSL-1) is the designated safety level for biological laboratories. Any change from BSL- 1 to BSL- 2 or higher materials must first be reviewed by EHS.
11. Contact Human Resources for information regarding the requirements of the New Hampshire Youth Employment Law (RSA 276-A).
12. Non-assistance animals are not allowed in campus buildings.

13. Refer to *Safety in Academic Chemistry Labs* (ISBN: 0841232598) and *Biosafety in Microbiological and Biomedical Laboratories* (ISBN: 017-040-00547-4) at http://www.cdc.gov/od/ohs/biosfty/bmbl4/bmbl4toc.htm in addition to this manual for other safety procedures to follow in the laboratory.

Section 2: Security

Laboratory security is an integral part of an effective safety program. Follow these steps to ensure a secure working environment in your laboratory:

1. Keep laboratory doors locked when unoccupied.
2. Keep stocks of organisms locked during off hours or when the laboratory is unoccupied.
3. Keep an accurate record of chemicals, stocks, cultures, project materials, growth media, and those items that support project activities.
4. Notify KSC Campus Safety at 8-2228 if materials are missing from laboratories.
5. Inspect all packages arriving at the work area.
6. When research is completed for the day, ensure that chemicals and biological materials have been stored properly and securely.
7. Ask strangers (someone you do not recognize as a co-worker or support staff person) to exit the room if they are not authorized to be there.
8. Discuss other security-specific requirements with your supervisor and colleagues.

Section 3: Laboratory Equipment

The following safety equipment should be available for laboratory personnel working with hazardous materials.

1. Drench Showers

Drench showers and other emergency wash systems are used in an emergency to flush chemicals that have accidentally come in contact with laboratory personnel. In order to wash the body properly, clothing should be removed as water is applied. The drench shower *can* be used to extinguish a clothing fire, but this is *not* recommended if the shower is more than a couple of feet away. The best method of extinguishing a clothing fire is to "Stop, Drop & Roll," and then remove clothing.

At least three feet of space in each direction is required beneath the shower and this area must be kept free of all obstacles (i.e., no waste baskets, etc.). Physical Plant inspects drench showers annually for proper flow and operation. A "DO NOT USE" notice is placed on the unit if the shower is not properly functioning.

2. Eye and Face Washes

The best treatment for chemical splashes of the eye and face is immediate flushing with copious amounts of water for 15 minutes. Eye and face washes are equipped with a stay-open valve. All plumbed eye and face washes should be flushed by laboratory occupants on a *weekly basis* by allowing the water to flow for approximately 3 minutes to remove stagnant water from the pipes. Plastic eye wash bottles ***are not recommended*.**

In general, the emergency eyewash equipment should be installed within 10 seconds walking time from the location of a hazard. The equipment must be installed on the same level as the hazard (accessing the equipment should not require going up or down stairs or ramps). In addition, the path of travel from the hazard to the equipment should be free of obstructions and as straight as possible.

3. Fire Extinguishers

Fire extinguishers are placed inside or in the hallway outside laboratories depending on the hazards. A dry chemical (BC, ABC) type extinguisher is located in laboratory facilities. While not required to use a fire extinguisher in the event of an emergency, a fire extinguisher can be used by staff who have been trained and feel comfortable using the fire extinguisher.

4. First Aid Kits

First aid kits should be available in each laboratory. According to the American National Standards Institute (ANSI), the kit should contain the following:

Item and Minimum Size or Volume*	Minimum Quantity
Absorbent compress, 32 square inches (No side smaller than 4")	1
Adhesive bandages, 1" x 3"	16
Adhesive tape, 5 yards	1
Antiseptic, 0.5 gram application	10
Ice packs	2
Medical exam gloves (disposable)	2 pair
Sterile pads, 3" x 3"	4
Triangular bandage, 40" x 40" x 56"	1

***** *Other items as needed.*

These kits should *not* have topical creams, liquids or ointments that can cause further discomfort and/or hinder medical treatment (except in labs using hydrogen fluoride or hydrofluoric acid, which are required to keep 2.5% calcium gluconate on hand for immediate first aid).

5. Laboratory Safety Information

MSDS, emergency procedures, safety manuals and other references should be readily available for all laboratory personnel. For additional resources, see the CEMS web site at http://www.keene.cems.sr.unh.edu.

6. Laboratory Safety Door Postings and Other

A CEMS hazard and emergency information sign should be posted on the laboratory door exterior, facing the corridor. This sign is used by *emergency response personnel*. The sign identifies hazards within the facility, the responsible faculty member and other persons to be contacted in the event of an emergency. In the event of an accident, chemical spill, fire or personal injury, assistance from a person familiar with the laboratory may be requested. EHS should be consulted about other door postings and signs (e.g. radioactive materials, biohazards) that may be required. Signs should be reviewed by the faculty member at least annually or in the event that pertinent information changes.

7. Open Floor Drains and Sink Traps

In order to reduce odors in buildings, sink traps and floor drains should be filled weekly with one to two liters of water. Laboratories that are not used for long periods of time should be checked regularly to assure that floor drains and sink

traps are filled. No equipment should be placed over floor drains to obstruct this routine maintenance.

8. Sharp Containers and Glass Only Boxes

See the Biosafety section for proper management.

9. Mechanical Pipetting Aids

Mechanical pipetting aids should be used. ***Mouth pipetting is prohibited.***

10. Placement of Safety Equipment

In newly constructed and renovated laboratories, drench showers, eye washes and fire extinguishers are located next to the main door of the facility for occupant safety. A hazard (chemical, fire or personal injury) should not come between you and your safe egress from the room. In addition to the aforementioned safety equipment, emergency gas shut-offs and electric panels are located near the exit for access on the way out.

Section 4: Laboratory Safety Inspections/Surveys

EHS surveys laboratories at least quarterly with a full inspection annually. The safety inspection includes: fume hood operation, laboratory techniques, emergency and safety equipment, chemical storage, electrical safety and general housekeeping. Additional safety surveys are conducted where hazardous waste is stored. EHS also inspects buildings and fire protection equipment to assure compliance with all appropriate state building and fire prevention codes.

Following the laboratory safety survey, a report listing the hazard(s) is sent to the faculty member responsible for the laboratory. The faculty member is responsible for correcting the operational hazards. (KSC is responsible for correcting all infrastructure deficiencies.) If the faculty member fails to correct the hazard, a second notice is sent to the department head and the *Health and Safety committee representative*, with a copy to the faculty member. Follow-up surveys are conducted in laboratories with extremely hazardous conditions and/or numerous violations.

In addition to these annual laboratory safety surveys, laboratory personnel update the chemical inventory and should periodically conduct their own safety inspections.

III. Personal Protective Equipment

Section 1: Personal Protective Equipment Policy

The following personal protective equipment must be available for laboratory personnel and students who are working with hazardous materials. Laboratories must provide personal protective equipment (i.e. safety glasses, laboratory coat) for visitors and to post a sign indicting that eye protection is required where hazardous materials are in use.

Personal protective equipment is not supplied by EHS. However, EHS will assist with recommendations on specific types and uses of protective equipment.

Section 2: Eye and Face Protection

***Eye and face protection must be worn in the laboratory when there is a potential for contact with hazardous chemicals or other agents (e.g. non ionizing radiation, biohazardous materials, aerosolized material, flying objects.)*.** Please note that all protective eye and face wear should meet ANSI Z87.1-1998 and ANSI Z136.1-2000 standards.

The type of protection needed depends on the hazard (e.g. chemical, ultraviolet light, laser, impact). For instance, when laboratory chemicals are used, approved eye protection is mandatory and chemical splash goggles are recommended. Goggles should be worn over eyeglasses or prescription safety glasses with side shields should be worn. Ordinary prescription glasses do not meet these standards. Face shields should be worn when working with an agent that may adversely affect the skin on the face and/or when proper eye protection is not enough.

Eye, skin and face protection are required when working with severely corrosive or strongly reactive chemicals, with glassware under extreme pressures, in combustion and other high temperature operations and whenever there is a possibility of an explosion or implosion. Special safety glasses and face shields may also be required for work with UV light, lasers and other types of radiation, which is absorbed by the eyes or skin (chemical splash goggles are not adequate for these types of work).

Section 3: Laboratory Coats, Gloves and Other Protective Clothing

Laboratory coats and shoes should be worn when performing laboratory work **(open toed-shoes, sandals, flip-flops, clogs, etc. are prohibited)**. Depending on the type of work, additional personal protective equipment, such as gloves and aprons may be necessary. Coats, aprons and gloves should be removed when leaving the laboratory. Gloves should be replaced immediately if they are contaminated or torn. In situations involving extremely hazardous chemicals, double gloves are recommended. Gloves should be carefully selected for their degradation and permeation characteristics to provide proper protection. The thin, latex, vinyl or nitrile gloves, popular for their dexterity are not appropriate for highly toxic chemicals or solvents. When using chemicals, consult chemical compatibility information that is provided in manufacturer's catalogs or at Lab Safety Supply to help you select the proper gloves and other protective clothing. More information on specific types and uses of personal protective apparel is available from EHS.

Section 4: Respiratory Protection

The use of air-purifying respirators for routine laboratory work is not recommended. Respirators are discouraged because they protect only the wearer and require periodic medical monitoring, specific training and fit testing before they can be worn effectively. Properly operating laboratory fume hoods provide the best overall protection from chemical hazards in the laboratory. However, in some isolated instances it has proven necessary to provide respirators to individuals. In these cases, the procedures outlined in the **KSC Respiratory Protection Program** must be followed.

Section 5: Protective Clothing Beyond the Laboratory

University Policy requires the use of appropriate gloves, safety glasses, lab coats, and other personal protective equipment within the laboratory. The following guidelines state that all contaminated, potentially contaminated, or the perception of potentially contaminated protective clothing and equipment beyond the lab may create a hazard or project a careless image to both colleagues and visitors.

- Wearing gloves outside the lab should be minimized, except to move hazardous materials between laboratories. Instead, transport chemicals from place to place on a cart, in a clean secondary container, or in a bottle carrier with secure handles.

- If there is a need to transport hazardous materials, use a clean, ungloved hand to touch common surfaces and a gloved

hand to carry the items: the one-glove rule. Alternatively, package the material so it may be handled without gloves.

- Gloves should never come in contact with door handles, elevator buttons, telephones, lavatory faucets, vending machines, bottled-water dispensers, ice-making machines, or other surfaces outside the laboratory.

- For the sake of safety, appearances, and courtesy, please do not wear contaminated, stained, or potentially contaminated lab coats and other research clothing and equipment outside of the laboratory.

- Do not carry specimen Dewars or covered, polystyrene boxes with dry ice or cryogenic liquid in a private vehicle. Be aware that strict federal and state regulations address the transport of hazardous (biological, chemical, radiological) materials on public roads.

IV. Ventilation

Section 1: Laboratory Ventilation Policy

All work with hazardous materials must be conducted in the appropriate fume hood, or biological safety cabinet.

General room ventilation does not provide adequate protection against hazardous gases, vapors and aerosols. All work with corrosive, flammable, odoriferous, toxic or other dangerous materials shall be conducted only in a properly operating hood, biological safety cabinet or glovebox. When it is not possible to meet the above requirements, EHS and the Department Chair must evaluate hazards together with the faculty member to determine if work can be conducted safely.

Section 2: Fume Hoods

Fume hoods are checked annually by EHS. The velocity of the air at the face of the hood is measured with the sash half-open and the results are posted on a sticker, which is attached to the upper right-hand corner of the sash. Variable air volume (VAV) hoods maintain a constant face velocity at different sash heights. Generally, when conducting experiments, researchers should have the sash closed as much as possible.

Hoods that do not meet the minimum exhaust requirements during EHS inspections are posted with “DO NOT USE” notes and Physical Plant is notified about the need for repairs. Once repairs have been made, EHS will test the fume hood for proper operation.

1. Procedures for Proper Use of Fume Hoods

Before using the hood, make sure air is entering the hood and hood is functioning properly. Report any problems to Physical Plant. Do not block baffle openings or place bulky items in the hood that will prevent air from entering the baffle opening.

a. Ensure that air is entering the unit.
b. Ensure the baffle openings are not blocked and air is flowing properly.
c. Conduct work at least six inches from the edge of the hood.
d. Lower the sash to protect yourself from dangerous reactions.
e. Keep hood clean and uncluttered. Wipe up spills immediately.
f. Be aware that drafts from open windows, open doors, fans, air conditioners, high traffic walkways may interfere with normal hood exhaust.

2. Fume Hood Alarms

Fume hood alarms indicate substandard operation of fume hoods. They are installed on every new fume hood system and on those which have been upgraded. The fume hood alarm (audio/visual) will indicate an exhaust flow malfunction by an audio and visual alarm. If the fume hood alarm sounds, close the sash and notify Physical Plant. Do not use the fume hood, until repairs have been made and EHS has removed the “Do Not Use” sign.

Section 5: Biological Safety Cabinets

Class II (vertical laminar flow) biological safety cabinets (BSC) provide a partial containment system for the safe handling of pathogenic microorganisms. To ensure safety, BSCs must be used correctly with good microbiological techniques and be in proper mechanical working order. Cabinets must be certified for performance upon installation using ***National Sanitation Foundation (NSF) Standard #49, section 6.*** Recertification must be conducted annually or during the interim if the cabinet is moved or if a problem is suspected. Certification information is available by calling EHS.

The following rules apply to biological safety cabinets:

1. BSC is certified annually by an outside company.
2. BSC is decontaminated frequently and after work is complete.
3. Gas lines are prohibited in a re-circulating BSC.
4. Open flames are prohibited inside a BSC.
5. Toxic chemicals are prohibited inside a BSC.
6. Ultraviolet lights are routinely checked and replaced as needed.

Section 6: Laminar Flow Hoods

Laminar flow hoods are present in a number of laboratory facilities. These clean benches provide a very clean environment but must be used only for the manipulation of non-hazardous materials. Since the operator sits in the downstream exhaust from the clean bench, this equipment must never be used for the handling of toxic, infectious or sensitizing materials, including volatile chemicals, cell culture materials (except plant cell cultures) or drug formulations.

V. General Chemical Handling

Section 1: Chemical Procurement and Distribution

1. Plan experiments with safety in mind. Substitute less hazardous chemicals in laboratory procedures when possible. Examples include substituting methyl tertiary-butyl ether (MTBE) for ethyl ether, toluene for benzene and dichloromethane for chloroform and carbon tetrachloride.

2. Before ordering new chemicals, check the chemical surplus list on the KSC CEMS website at http://www.keene.cems.sr.unh.edu to see if the chemical you need is available for free. Estimate the amount of chemical required for each experiment and order only what is necessary. Excess chemicals are very expensive to dispose of and can cause a hazard if stored too long.

3. Orders for all hazardous chemicals can be placed via CEMS or via phone.

4. MSDS can be found on the CEMS website at http://www.cems.sr.unh.edu or through a chemical vendor.

5. Keep your chemical inventory and your emergency signs updated at http://www.keene.cems.sr.unh.edu.

6. Before opening a package containing hazardous substances, inspect the packaging carefully for any signs of breakage or leakage of material. If there are any signs of leakage, place package in chemical fume hood, protect from exposure and call EHS for assistance.

Section 2: Chemical Storage

The number and amounts of chemicals that need to be stored should be reduced to an absolute minimum. Keene State must keep flammable liquid storage less than 45 gallons total in the Science Center. Chemicals should be stored based on their compatibility; compatible chemicals can be stored alphabetically. Acids, flammable liquids, oxidizers and highly reactive chemicals should all be separated and stored properly to avoid an unwanted chemical reaction. The MSDS should be consulted for specific informationon incompatibilities. The following are general guidelines:

- Storage areas should be well ventilated (consult with EHS).
- Large containers of reagents should be stored on low shelving, preferably in trays to contain all leaks and spills.
- Chemicals should not be stored on the floor, on bench tops or inside fume hoods.
- Inventories of storage areas should be conducted on an ongoing basis and results should be posted on the CEMS website at http://www.keene.cems.sr.unh.edu.
- Odiferous chemicals should be stored inside vented cabinets or fume hoods.
- Reactive chemicals should be stored appropriately.
- Flammables requiring refrigeration shall be stored in explosion-safe refrigerators.

Section 3: Labeling Chemicals

All containers must be labeled with the chemical constituents and hazard. It is recommended that the user's name also appear on the label. Labels on incoming containers must not be removed or defaced. Dating is required for certain materials; dating the label is especially important in the case of compounds which have a specified shelf life, such as those that will form peroxides (e.g. ethyl ether).

Identifying unknown materials for disposal is extremely costly. All laboratory personnel who are leaving the College are responsible for identifying and properly disposing of the chemical waste in their laboratory. Contact EHS for additional information.

Section 4: Chemical Inventory

The OSHA Hazard Communication Standard requires KSC to maintain an inventory of hazardous chemicals. A hazardous chemical is defined as any liquid, solid or gas that could present a physical or health hazard to an employee. KSC accomplishes this goal through the use of the online Chemical and Environmental Management System (CEMS). All hazardous chemicals used at KSC must be registered through CEMS.

EHS recommends that any chemical with a Material Safety Data Sheet (MSDS) be included in the CEMS inventory. The National Fire Protection Association (NFPA) also recommends that an inventory of all hazardous and non-hazardous materials be maintained. The City of Keene Fire Department uses the online CEMS inventory when responding to an emergency.

Section 5: Transportation of Chemicals

Secondary containment of chemicals is required when transporting bottles of chemicals outside the laboratory. Secondary containment is a durable container (e.g. “Rubber Maid” tote, plastic pail or bottle carrier) capable of containing the contents of the original container in the event of a spill. Secondary containers should be used when chemicals are carried through corridors, stairways and inside elevators. Under no circumstances should anyone transport chemical containers in a passenger elevator without the use of secondary containers.

Section 6: Chemical Waste

Most of the waste chemicals resulting from laboratory experiments are hazardous and their generation, storage and disposal must be given consideration in ***every*** experiment. Each laboratory must follow the procedures specified in the KSC **Hazardous Waste Procedure**, available on the EHS website or by calling 8-2879.

KSC has the following requirements for chemical waste containers:

- ***Labeling:*** The label must contain the words “Hazardous Waste”, the full chemical name of the material (not formula) and the EPA designated waste code.
- ***Packaging:*** The chemical waste container must be compatible with the material and have a cap in place at all times, except when actively filling or discharging the bottle or can. Place the primary, chemical container into a secondary container for additional protection.

- ***Storage:*** The chemical waste must be stored in a location specifically for “Hazardous Waste.”
- Hazardous waste that is not properly packaged and labeled cannot be removed by EHS.
- See the Hazardous Waste procedure for more detailed information.

Section 7: Special Handling for Chemicals

Flammable Liquids

Fire hazards are associated with vapors from the flammable liquid. In order for a fire to occur, the following conditions must be met:

- Concentration of the vapor must be between the upper and lower explosion limit .
- An oxidizing material (e.g. oxygen in the room) must be present.
- Source of ignition.

To work safely with flammable liquids:

- Order only the amounts that are necessary.
- Remove all nearby sources of ignition.
- Heat flammable liquids with safe heating equipment (e.g. mantles) or explosion safe equipment.
- When transferring flammable liquids using metal containers, ground both containers. Avoid the use of plastic containers which require special grounding techniques.
- Store flammable liquids in safety cans, flammable storage cabinets or flammable storage refrigerators.
- Locate all distillation apparatus inside the fume hood.
- Do not leave solvent distillation processes unattended.

Storage of Flammable Liquids

Limits for the storage of flammable solvents are based on fire hazards associated with each liquid. The following requirements must be followed:

- Flammable liquids stored in the laboratory should be kept to a minimum.
- Flammable liquids should not be stored next to incompatible chemicals.
- Storage of flammable liquids outside approved flammable storage cabinets and safety cans must not exceed 10 gallons per 100 square feet of laboratory space, including waste.

- If you have flammable storage cabinets and approved safety cans, storage must not exceed 20 gallons per 100 square feet of laboratory space.

There are also maximum container size requirements for different classes of flammable liquids and limits for the maximum amounts stored in a laboratory (see below). Consult EHS for more information.

Safety Cans

Safety cans are approved by Underwriter Laboratory (UL) or Factory Mutual (FM) for flammable and (non-corrosive) combustible materials. They are made of 22-gauge steel and have a self-closing lid or quarter turn spigot.

Flammable Storage Cabinets

Flammable storage cabinets are designed to contain a fire for 10 minutes, enough time to allow you to escape. According to the National Fire Protection Association, flammable storage cabinets are not required to be ventilated. If there are ventilation openings in the cabinet, then: (1) The ventilation opening must be sealed with materials providing fire protection at least equivalent to that of the construction of the cabinet; or, (2) The cabinet must be vented outdoors using appropriate fire protection piping. Flammable storage cabinets should not be vented by removing bung caps.

Follow these procedures when using or considering the use of flammable storage cabinets:

- Flammable storage cabinets should not be located near exits, electrical panels or sources of heat or ignition.
- Flammable storage cabinets must be listed by Factory Mutual, Underwriter's Laboratory or other qualified testing agencies.
- The flammable storage cabinet must be clearly labeled with a sign which reads: “Flammable - Keep Fire Away.”
- Materials stored inside of the flammable storage cabinet should be compatible with the cabinet's design and construction.
- Acids should not be stored in a flammable storage cabinet due to possible corrosion of the cabinet and incompatibility with organic solvents.

Flammable Storage Refrigerators

Flammable liquids should not be stored in an ordinary household-type refrigerator. Flammable storage refrigerators are specially designed to prevent internal explosions caused by flammable vapors coming in contact with ignition sources (e.g. the temperature control switch or the light). An updated log of the chemicals stored in the refrigerator should be kept in the lab, preferably in a plastic pocket attached to the door. The chemical inventory is available on the CEMS website at http://www.keene.cems.sr.unh.edu.

Important: Food and beverages must never be stored in any laboratory refrigerator in which chemicals, biological and radioactive materials are kept. If the food and beverage items are being used for research purposes, they must be labeled, "For Experimental Use Only."

Corrosive Chemicals

Corrosive chemicals include strong acids and bases, dehydrating agents, nonmetal chlorides and halogens. These chemicals are acute health hazards and present problems in handling and storage. In addition to general procedures for handling of chemicals detailed in this manual, the following procedures should be followed:

- Purchase corrosives in containers coated with a protective plastic film, when available.
- Store corrosives under the hood, on low shelving or in storage cabinets. Gas cylinders (lecture size) should not be stored in the same cabinet with corrosive liquid, because of possible cylinder/valve damage.
- Properly segregate hazardous materials to prevent fire, explosion or toxic gas release.

Compressed Gases

Compressed gases may present both physical and health hazards. Gases may be flammable, reactive, corrosive or toxic and these properties must be considered when developing experimental procedures and designing apparatus. In addition, compressed gases, when not handled properly or not contained in properly designed vessels, can be extremely hazardous with a high potential for explosion. All procedures and experimental apparatus used in the handling of extremely toxic gases and gases with a high potential for explosion should be approved by EHS, prior to implementation.

Although each approved gas cylinder is designed, constructed and tested to safely contain its contents, the following procedures should be taken in handling and storing of compressed gases.

Procedures for Proper Handling of Gas Cylinders

- Cylinders must be clearly marked with their contents.
- Regulators must be compatible with gas cylinders. Do not use adapters.
- Cylinders must be secured to a wall or bench. A gas cylinder cart or stand is also acceptable.
- Cylinders must be stored in a cool, dry and well-ventilated area away from ignition sources, electrical supply sources and heat.
- A safety cap or regulator must always be attached to the cylinder.
- Transport capped cylinders on an approved cylinder cart.
- Be familiar with the special hazards associated with compressed gases or cryogenic liquefied gases in use.
- Store full cylinders away from empty cylinders.
- Store oxidizers away from flammable gases.
- Do not store cylinders with acids and/or bases.
- Keep flammable gases away from doorways.
- Work with particularly hazardous gases with special procedures and in approved gas storage cabinets.

Particularly Hazardous Chemicals

Highly Reactive Chemicals

Highly reactive chemicals are inherently unstable and can react in an uncontrolled manner to liberate heat, toxic gases or explosion. These include shock sensitive chemicals, high-energy oxidizers and peroxide formers. Before working with these materials, safety information should be reviewed to evaluate proper storage and handling procedures. In addition to the general procedures above, the following procedures are recommended:

- Secure reaction equipment properly.
- Use impact protection (shields and guards) in addition to chemical splash protection (i.e. eye protection, face shields, gloves, laboratory coats).
- Handle shock-sensitive chemicals gently to avoid friction, grinding and impact.
- Dispose of reagents with suspect purity and age.

If the risks are high, experiments should be performed in an isolated facility with explosion venting and explosion-resistant construction.

Peroxidizable Compounds

Under normal storage conditions, peroxides can form and accumulate in peroxidizable compounds. Peroxides may then explode violently when chemicals are subject to thermal or mechanical shock. To prevent accidents, peroxidizable compounds should be identified, dated upon opening, inventoried and evaluated for safe use after three months. Do not store peroxidizable compounds in colorless glass bottles. Formation of peroxides is catalyzed by light. More information is available in the National Safety Council Publication, "Recognition and Handling of Peroxidizable Compounds".

Chemicals of High Acute and Chronic Toxicity

Certain chemicals have been identified as causing acute health effects or long-term chronic health effects. Substances of high acute toxicity cause immediate health effects at very low concentrations. (Moderately toxic LD_{50} of 500-5,000 mg/kg; very toxic LD_{50} of 50-500 mg/kg, extremely toxic LD_{50} of 5-50mg/kg and supertoxic LD_{50} <5mg/kg, see glossary for explanation of LD_{50}). Some examples of chemicals with high acute toxicity are hydrogen cyanide, phosgene or arsine. Research with hazardous chemicals with ACGIH TLV-TWA value or ceiling value < 10 ppm should receive prior approval from EHS.

Substances that have high chronic toxicity cause damage after repeated exposure over a period of time. These may include carcinogens such as benzene reproductive toxins, mutagens, teratogens and sensitizers. Laboratory personnel (male and female) of childbearing age should be notified of any reproductive toxins being used in the laboratory. Any employee who is pregnant or planning to become pregnant should contact EHS and her personal physician or a health physician at KSC's worker health provider at the Dartmouth Keene Clinic to assess potential exposures.

Procedures for Handling Highly Toxic Chemicals

Because chemicals with high acute toxicity and those with high chronic toxicity are hazardous at very low concentrations, the following practices must be observed:

- Notify all employees of the particular hazards associated with this work.

- Minimize contact with these chemicals by any route of exposure (inhalation, skin contact, mucous membrane contact or injection).
- Work only in a properly operating chemical fume hood or glove box.
- Remove all protective clothing before leaving the area and decontaminate it or if disposable, place it in a plastic bag and secure it. Call EHS for disposal.
- Establish an emergency plan for each operation.
- Decontaminate work surfaces after completing procedures.
- Do not conduct normal laboratory work in the designated area until decontaminated.

VI. Biological Safety

Section 1: Pathogenic Microorganisms

Keene State College does not work with organisms that would be considered infectious agents or pathogenic in the Science Center. Thus the appropriate safety level for the Science Center would be Biosafety Level – 1 or BSL –1. If any faculty desire to change this designation, EHS must first be consulted to ensure proper safety measures are in place, prior to start of experimental work or study.

For further information on the various safety levels designated for microorganisms, and the safe work practices required at each level, consult the guidelines specified in *Biosafety in Microbiological and Biomedical Laboratories (BMBL)* at http://www.cdc.gov/od/ohs/biosfty/bmbl4/bmbl4toc.htm.

Section 2: Human Blood and Body Fluids

The Science Center does not work on research with human blood/body fluids and tissues. EHS must be consulted prior to any change in this policy. Laboratory practices should be followed on the assumption that all human blood, body fluid and tissues are infectious (universal precautions). The Centers for Disease Control and National Institutes for Health recommend that Biological Safety Level Two (BSL-2) standards, containment and facilities be used for activities involving clinical specimens, body fluids and tissues from humans or from laboratory animals infected or inoculated with human material. These standards should also be applied to work with human cells in culture, human serum-derived reagents which may be used as controls and blood obtained from the Red Cross. (Go to

http://www.cdc.gov/od/ohs/biosfty/bmbl4/bmbl4toc.htm for additional information.)

Section 4: Recombinant DNA

Keene State College does not work with recombinant DNA. The U.S. Department of Health and Human Services has published guidelines which specify practices for constructing and handling recombinant DNA molecules and organisms and viruses containing recombinant DNA molecules. (Go to http://www.nih.gov/od/oba/ for additional information.)

Section 5: Environmental Samples

Environmental samples, such as water, air or earth, may contain pathogens (i.e. bacteria, viruses, spores) that could present a health hazard to people, animals or the environment. Using appropriate personal protective equipment when collecting environmental samples will reduce exposure to potential pathogens. Use care when handling environmental samples, especially if the sample will be enhanced in the laboratory by culturing or other growing mechanisms. Techniques used to enhance and/or culture environmental samples should be conducted at BSL-2 or higher levels in an appropriate containment device, such as a biological safety cabinet or fume hood. If the environmental sample is sterilized prior to experimentation, then the sample may be manipulated in a BSL-1 rated laboratory.

Section 6: Teratogenic Agents

Research or work with biological agents possessing teratogenic or mutagenic capabilities, such as *Rubella*, *herpes* or *cytomegalovirus* or other agents that could cause fetal death such as *Brucella*, may pose a significant health risk and are prohibited at Keene State College.

Section 7: Biosafety Practices and Safety Equipment

Biohazard Laboratory Inspections

In addition to routine laboratory inspections, EHS conducts a biohazard evaluation of all laboratories in which biohazards have been identified, to insure that appropriate facilities and procedures are being used. Microbiological techniques, treatment and disposal of biohazardous waste, safety equipment and facilities and proper training of laboratory personnel are evaluated.

Biohazard Signs and Labels

A biological hazard sign with the international biological warning symbol must be affixed to the doors of all biosafety level 2 or higher laboratories. In addition, equipment used to store biohazardous materials (e.g. incubators, refrigerators, freezers) and receptacles for storage of biohazardous waste must be labeled.

Since there is by policy decision, no BSL- 1 or higher biological organisms (no infectious agents), labels are not required in the Science Center. Labels may be used to indicate the presence of biological materials in storage, but NOT on waste bags. Biological materials at BSL-1 still must be handled with care, appropriate PPE must be worn (gloves, lab coats, and safety glasses at the minimum) and waste must be disposed of properly to protect human health and the environment, as outlined in the next section.

Section 9: Biohazardous Waste Disposal Practices

Storage, Treatment and Disposal of Biohazardous Waste

Keene State College does not generate infectious waste, and therefore does not meet the definition of needing biohazardous waste handling procedures. However, bacteria contaminated materials, while not considered infectious or biohazardous waste by regulatory definitions, can still cause harm to human health, such as cleaning and janitorial staff. Therefore biological materials must be disinfected prior to disposal. Biological wastes fall into two categories: sharps and other waste. While not considered infectious, used sharps (i.e., pipette tips) should be segregated and placed in a solid, rigid plastic container labeled “Non infectious sharps” and “Not for Recycling”. Care should be taken to place all needles and syringes and other sharps in puncture proof containers. All biological waste must be decontaminated by autoclaving, or chemical disinfection. Once this material has been properly decontaminated by autoclaving or chemical disinfection, it may be disposed as regular trash. DO NOT USE RED BIOHAZARDOUS LABELED BAGS FOR DISPOSAL OF BIOLOGICAL LAB WASTE. It is acceptable to use a red colored bag (WITHOUT THE LABEL) to collect waste. HOWEVER THIS BAG MUST THEN BE PLACED INTO A DARK BAG AFTER AUTOCLAVING FOR TRASH DISPOSAL. NEVER THROW A RED BAG INTO THE SOLID WASTE RECEPTACLE – THIS IMPLIES BIOHAZARDOUS WASTE.

Important: Any existing biohazard label should be removed from decontaminated material before disposal with regular trash.

Autoclave Maintenance and Testing

To insure sterility of materials and adequate decontamination of wastes, it is important for all departments to maintain autoclaves and to train personnel in their proper use. All autoclaves on campus should be checked monthly with chemical strips or by spore testing to make sure they are operating properly and the procedures are adequate for the decontamination of biological waste A record of decontamination must be kept.

Section 10: Biological Spills

The proper procedures to deal with biological spills vary depending on the agent, quantity and location of the event. However, in order to quickly clean-up a biological spill, your laboratory should keep a spill kit handy. A spill kit should include:

- Concentrated disinfectant (chlorine bleach or Lysol®).
- Packages of paper towels.
- Forceps to pick up broken glass.
- Household rubber gloves.
- Utility gloves.
- Several waste collection bags.

Spill in a Biological Safety Cabinet

1. LEAVE THE CABINET TURNED ON.
2. While wearing gloves, spray or wipe cabinet walls, work surfaces and equipment with disinfectant. If necessary, flood the work surface, as well as drain pans and catch basins below the work surface, with a disinfectant for at least 20 minutes contact time.
3. Soak up the disinfectant and spill with paper towels. Drain the catch basin into a container. Lift front exhaust grill and tray and wipe all surfaces. Ensure that no paper towels or solid debris are blown into the area beneath the grill. Autoclave all clean-up materials and protective clothing. Wash hands and exposed skin areas with disinfectant.

Small spill of BSL-1 material outside of a safety cabinet (<500 ml spill and able to be covered by a few paper towels)

1. Wearing gloves and a lab coat, cover the spill with paper towels and an appropriate disinfectant.
2. Allow sufficient contact time with disinfectant (usually >20 minutes).
3. Pick up towels and discard into biological waste container.
4. Pick up broken glass with forceps and place in Sharps container.
5. Re-wipe the spill area with disinfectant and wash your hands with soap or hand washing disinfectant.

Large spill of BSL-1 material outside of a safety cabinet (>500 ml)

- **GET HELP! Notify your supervisor.**
- The methods are the same as for small BSL-1 skills, only on a larger scale.

Blood (from injury)

1. Wearing household gloves and a lab coat, absorb blood with paper towels.
2. Using a detergent solution, clean the spill site of all visible blood.
3. Wipe down the spill site with paper towels soaked in a disinfectant such as chlorine bleach, diluted 1:10.
4. Discard all contaminated materials in a biohazard waste container.
5. Wash your hands with soap or hand washing disinfectant.

Personal Protective Equipment to protect against human blood

Gloves	Worn for touching blood and body fluids requiring universal precautions, mucous membranes or non-intact skin of all patients and for handling items or surfaces soiled with blood or body fluids to which universal precautions apply.
Masks, eye protection, face shields	Worn to prevent exposure of mucous membranes of the mouth, nose and eyes during procedures that are likely to generate droplets of blood or body fluids requiring universal precautions.
Lab coats, gowns, aprons	Worn during procedures that are likely to generate splashes of blood or body fluids requiring universal precautions.

Section 11: Ethidium Bromide Handling and Disposal

EtBr is commonly used as a non-radioactive marker for identifying and visualizing nucleic acid bands in electrophoresis and in other methods of gel-based nucleic acid separation. EtBr is a dark red, crystalline, non-volatile solid, moderately soluble in water, which fluoresces readily with a reddish-brown color when exposed to ultraviolet light (UV). Its formula is 2,7-Diamino-10-ethyl-9-phenyl-phenanthridium bromide, CAS# 1239-45-8. Although it is an effective tool, its hazardous properties require special safe handling and disposal procedures.

Handling

EtBr is a potent mutagen and is moderately toxic after an acute exposure. EtBr can be absorbed through skin, so it is important to avoid any direct contact with the chemical. EtBr is also an irritant to the skin, eyes, mouth and upper respiratory tract. It should be stored away from strong oxidizing agents in a cool, dry place and the container must be kept undamaged and tightly closed. Individuals using EtBr should follow these safety procedures:

- EtBr users should receive documented safety training on its hazards.
- EtBr must appear on the laboratory's chemical inventory, with accurate estimates of on-hand quantities.
- Pure EtBr should only be handled in a fume hood, with the user wearing protective equipment that includes a lab coat, closed-toe shoes, chemically resistant gloves and chemical safety goggles (not just safety glasses).

Disposal

EtBr wastes are not regulated by the State of New Hampshire or the U.S. EPA. The wastes are prudently managed by laboratory staff and EH&S to minimize human and environmental exposure.

VII. Employee Monitoring

Monitoring and Employee Assessment:
Employee exposure determination shall be done in accordance with paragraph (d) of the 29 CFR 1910.1450.

<u>Employee exposure determination:</u>
Initial monitoring shall be performed if there is reason to believe that exposure levels for a substance routinely exceed the action level (or in the absence of action level, the permissible exposure level (PEL) or in some cases, the short-term exposure level (STEL)).

<u>Periodic monitoring:</u>
If the initial monitoring performed discloses employee exposure over the action level (or in the absence of action level, the PEL and/or the STEL), the employer shall immediately comply with the exposure monitoring provisions of the relevant standard. Monitoring may be determined in accordance with the relevant standard. Within 15 working days after the receipt of any monitoring results, the employee will be notified of these results in writing either individually or by posting results in an appropriate location that is accessible to employees.

Anyone with a "reason to believe that exposure levels for a substance routinely exceed the action level, or in the absence of an action level, the PEL or STEL" may initiate the monitoring process. Requests for monitoring should be made through the Chemical Hygiene Officer and supervisor.

VII: Hazardous Waste Procedure

B. Identification of Hazardous Waste

Waste must be first designated for disposal. The generator makes a determination that the material is no longer useful, cannot be recovered or recycled, and possesses a hazardous characteristic. The generator then applies the following protocol:

- Is the material a listed waste? See Appendix A of the full Keene State College Hazardous Waste Procedure for Listed Wastes. (Acutely Hazardous Waste (P codes), Toxic Hazardous Wastes (U codes), EPA Generic Industrial Process Waste (F code), NH Generic Industrial Process Waste (NH code), or EPA Specific Industrial Process Wastes (K code). This information can also be accessed at: http://www.des.state.nh.us/rules/hwrules.pdf
-
- Does the material exhibit one or more of the following hazardous characteristics:

  - Ignitability (D001):
    - Liquids with a flash point less than 140° F (60 °C)
    - Solids that can ignite under standard conditions
    - Ignitable compressed gases or oxidizers

  -Corrosivity (D002):
    - Liquids that have a pH less than or equal to 2.0 or greater than or equal to 12.5
    - Liquids that corrode steel at a rate greater than 0.25 inches per year at a test temperature

  -Reactivity (D003):
    - Contains Cyanides or Sulfides which can generate toxic fumes if exposed to pH conditions between 2.0 and 12.5

- React violently to form potentially explosive mixtures or can generate toxic gases if mixed with water
- Are normally unstable and readily undergo violent change without detonating
- Can detonate or explode if heated or exposed to a strong igniting source
- Can detonate or explode under standard conditions
- Are classified by the Federal Department of Transportation as explosives

-Toxicity (all other D codes):

- A waste exhibits the characteristics of TCLP Toxicity if its extract [from a precise extraction procedure called the Toxicity Characteristic Leaching Procedure (TCLP)] contains any of 25 listed organic compounds, 8 metals, 4 pesticides and 2 herbicides in concentrations equal to or greater than the specified limits

- If the material meets any of the above criteria, it must be managed as a hazardous waste.
- If a material (such as water or spill cleanup materials [soil, sand, cloths, kitty litter]) is mixed with a listed waste, the mixture must be treated as a hazardous waste.
- If the material (such as water or spill cleanup materials [soil, sand, cloths, kitty litter]) is mixed with a characteristic waste, if the resultant mixture exhibits one or more of the hazardous characteristics, then it is a hazardous waste.
- Residues left in containers may be considered hazardous waste. Call the EHS Coordinator at ext. 8 2879 for guidance.
- Contact EHS if the waste needs an immediate pickup by an outside vendor. Generally hazardous waste pickups are made at the end of each semester, and once during the summer.
- Asbestos containing materials or PCB materials are not considered hazardous waste but must be managed via special federal and state procedures. Contact EHS for guidance at ext. 8 2879.

C. Satellite Accumulation Area (SAA)/Small Quantity Generator

A small quantity generator may “accumulate” hazardous waste up to 1000 kgs of nonacutely hazardous waste (no U or P codes) for an indefinite period <u>without</u> a special permit per NH Env – Wm 508.03. Acutely hazardous waste exceeding 2.2 lbs must be

disposed of within 90 days. In order to meet 508.03, certain special requirements must be met including weekly inspections, spill control materials located in SAA, the SAA stays under the control of the 'process operator' (person responsible for the area), and posting of emergency information. This Satellite Accumulation Area provision requires that an Emergency Contact (the 'process operator' or someone familiar with the daily operation of the area) must be designated and the Emergency Contact phone number posted in the SAA.

D. Container Management

•Containers must be in good condition and compatible with hazardous waste to be placed inside. For example, acids and bases must be stored separately and in plastic or glass containers.
•Containers must be kept closed except during filling.
•Satellite containers must be marked with the accumulation start date once waste is so designated.
•Containers must be clearly marked, "Hazardous Waste" . The label must be unobscured.

- Do not store any other material (such as new chemical reagents) in the satellite accumulation area

E. Labeling Hazardous Waste Containers

- **Use the Red & White "Hazardous Waste" label. Call EHS at ext. 8 2879 if you need more labels.**
- **Segregate wastes into containers based on chemical families and DOT classifications: corrosives, flammables, compressed gases, carcinogens, toxics (metals such as lead or chromium). When hazardous waste is shipped offsite, it must be designated with its proper DOT shipping name, in addition to the applicable EPA/NH waste codes. Therefore, it is critical to segregate hazardous wastes initially based on their DOT hazard classification. Within that, additional segregations should be made. For example, flammable liquids such as acetone should be segregated from flammable chlorinated liquids such as chloroform.**
- **List the top three most hazardous constituents in the container in order of concentration. If it is in a solution of water, write the top three hazardous constituents "in water". Remember, to consider the need to accurately 'name' the chemicals for the protection of emergency**

response workers that would respond in the event of a transportation spill. Therefore, do not use chemical formulas.

- **List the appropriate EPA waste code. See above or** : http://www.des.state.nh.us/rules/hwrules.pdf for more information on proper codes.
- **Write this appropriate chemical information on the Hazardous Waste Label. If you are not sure, or need help with this process, contact the EHS Coordinator.**
- **Remember that your initial labeling information will be the basis of assigning a proper DOT shipping name, and EPA code. This information is carried through on the hazardous waste manifest, which tracks the hazardous waste through the transportation to the final disposal process (tracking from cradle to grave). The manifest is what is used as the main decision making tool by emergency response personnel in the event of an transportation emergency. This information is also used in determining the appropriate waste management technology to neutralize the waste (i.e., incineration). It all starts with YOU accurately labeling the material!**

Hazardous Waste spills may activate Keene State College Contingency Plan. See the next section for the abbreviated version.

IX. Emergency Plan/Spill Response

Keene State College Environmental Health and Safety and the Department of Sciences have developed this Emergency Response Procedure and Evacuation Plan in order to inform faculty, staff, students, and visitors of the appropriate procedures to be followed in the event of an emergency in the Science Center. As the Science Center has laboratories and chemical storage areas, a more detailed procedure is necessary than the general Keene State College Evacuation Plan. This procedure contains information on what is considered an emergency, and who should be contacted. *In the event that there is a high level of uncertainty on how to categorize a situation, it is recommended to always act conservatively with consideration of human health and safety. In other words, **if there is any doubt on what to do**, choose the most protective action and **dial 911 for assistance**.*

Emergency Numbers

Fire/Ambulance/Major Chemical Spill 911

Clean Harbors Emergency Chemical Spill response team (Keene State College's contractor vendor for clean up) 603 224 6626 (day) 24 hour line – 1-800-OIL TANK

Campus Safety (first aid, security issues, report of student injury) 358–2228

Environmental Health and Safety 358- 2879

1. Preparation

The first step in any emergency procedure is to be prepared by knowing the hazards of the various materials in each lab. Review the material safety data sheets on materials used in the lab, and review with students their responsibilities in the event of a chemical spill or fire. Material safety data sheets should be available to students and visitors who have concerns or questions regarding the hazardous characteristics of the chemicals. Chemical containers should be clearly labeled with the contents and any required hazard warnings. Labs should have appropriate signage on the door indicating the predominant hazards in each room and emergency contact information.

2. Chemical Spills

a. **Minor Chemical spill** – A minor chemical spill is considered one that laboratory staff or faculty are capable of handling safely without assistance and where there is no injury or threat of imminent injury. Typically, a minor spill would be considered less than 0.5 liter (as a rule of thumb) of a material that is not highly toxic. Spill kits are available in each laboratory and should only be used by those qualified staff or faculty with knowledge of the properties and hazards posed by the chemical, and any potential dangers posed by the location of the spill. Spill cleanup materials should be segregated for hazardous waste disposal. EHS should be contacted for advice and assistance at 358 2879.

b. Basic Procedure for a Minor Chemical Spill:

- Alert all persons nearby spill area.
- Use eyewash or safety shower if needed to decontaminate.
- Use spill kit to clean up and segregate clean up materials for hazardous waste disposal. Use proper personal protective equipment, which at a minimum will include chemical resistant gloves and safety glasses.
- Decontaminate spill area with water or soap/water mixture if a non-reactive chemical.
- Wash hands thoroughly and seek medical attention if necessary.
- Notify EHS 358 2879.

c. **Major Chemical Spills** – all other spills not described above are considered major spills. Keene State College does not have an on-site emergency response team; therefore, primary response is to evacuate, call 358 –2228 or 911, and protect human health.

The Basic Procedure is as follows:

- Avoid breathing vapors of spilled material.
- If possible and safe to do so, turn off any ignition source or gas emergency shutoff valve.
- Remove any contaminated persons from spill area and decontaminate via eyewash or safety shower. The use of a safety shower is never a mistake – do not be reluctant to use the shower in the event of personal chemical contamination.
- Evacuate the area and close the door to the lab.
- Call 358 –2228 or 911 and notify the operator of the location, nature and volume of the spill.
- Contact Campus Safety to initiate internal notifications, including EHS. EHS/Campus Safety or Keene HazMat should be directed to contact Clean Harbors for spill clean up and disposal.

d. Biological spills

Keene State College Science Lab does not work with biological agents above Biosafety Level 1. Biological level 1 spills can be cleaned up using basic personal protective equipment and a disinfectant solution such as a bleach solution.

Basic procedure for a biological level 1 spill includes:

- Place paper towels over the spill area. Wear chemical resistant gloves and safety glasses.
- Soak paper towels with disinfectant.
- Allows paper towels to stand for 15 minutes contact time.
- Place towels in plastic bag for disposal.
- Clean spill area with fresh disinfectant and paper towels. Place in plastic bag.
- Throw all materials in the trash. If there is a chance that chemical contamination has also occurred, contact EHS at 358 2879 for proper disposal procedures.

3. Fire or Explosion

In the event of a fire or explosion,**

- Evacuate the fire area. Turn off the emergency gas shutoff if it is safe to do so. (See Appendix 1 for the Emergency Gas Shutoff Protocol).
- Close the door behind you.

- If someone is on fire, locate the fire blanket, direct the person to 'stop, drop, and roll' and use the blanket to cover the person to snuff out the flames. Seek assistance.
- Notify nearby occupants and pull the nearest fire alarm to activate the building alarm system.
- Proceed in an orderly fashion to the nearest exit. Use the stairwells, not the elevator. If there is smoke, stay low to the ground as smoke and heat will rise.
- Gather at the predetermined evacuation point (determined by each department and communicated to students at the start of each semester). Stay away from the building.
- Call 358 – 2228 or 911 and report the location of the fire and any additional information.

** Department protocols may required faculty or staff to be trained in the use of a fire extinguisher. There is no requirement to use a fire extinguisher in the event of a fire. However, if you have been trained, if the fire is small (rule of thumb: less than a wastepaper basket) and you feel you can capably use the fire extinguisher, locate the nearest fire extinguisher for use. Contact Campus Safety at 358 2228 as an additional follow-up and to ensure the fire extinguisher is replaced.

If in doubt, evacuate and call 911.

4. Medical Emergency

Serious injuries that require an ambulance should be reported to 911 immediately.

Serious injuries include but are not limited to: chest pain, difficulty breathing, unconsciousness, large area of body contacted by a hazardous chemical, broken bone or profuse bleeding.

All other injuries should be reported to Campus Safety at 358 2228 for evaluation of the need for medical assistance. Campus Safety will also document the report and include EHS on the report distribution.

Very minor (first aid) injuries can be addressed via use of first aid kits within the lab. The instructor should complete a 'Near Miss' Accident Report to determine what happened and what can be done to prevent recurrence. For more information, see http://www.keene.edu/ehs/accident.cfm.

Appendix 1: Emergency Gas Shut off Protocol

Gas in labs is used very infrequently, ranging from 0 to 3 labs in a given semester.

- The default condition for the gas shutoff valve will be the "Off" position with the door locked. In the past, the primary safety concern has been the possible

accidental or intentional opening of gas jets in an unoccupied lab. The new lab cutoff valves minimize that possibility.

- Keys for the shutoff will be issued to faculty or staff with lab responsibility and a copy kept in the Dean's Office.
- When use of gas is required, the lab instructor will check that gas jets on the benches are in the ":Off" position, unlock the shutoff cabinet, and turn the gas "On." Gas use in most laboratories is rare.
- The door to the shutoff valve will be kept open and unlocked during lab, to allow the gas to be turned off in case of emergency.
- At the conclusion of the lab, the lab instructor will check that gas jets are off, turn off the lab gas shutoff valve, and lock the door.
- This procedure will be included in the orientation of all lab instructors, and students will be instructed on how to turn lab gas off in an emergency.