

# Chemical Hygiene Plan

Policy 303.9

## 1 Introduction

1.1 The Appalachian State University Chemical Hygiene Plan is the result of efforts by the University Laboratory Safety Standard Committee to comply with requirements of the Occupational Safety and Health Administration's Occupational Exposures to Hazardous Chemicals in Laboratories Standard (29 C.F.R. 1910.1450)

## 2 Scope

## 3 Definitions

## 4 Policy and Procedure Statements

### 4.1 Responsibilities for the Chemical Hygiene Plan

4.1.1 Each department using or maintaining chemicals in a laboratory setting at Appalachian State University shall appoint a chemical hygiene officer who shall be responsible for implementation of the University's Chemical Hygiene Plan.

### 4.2 Department Head

4.2.1 The department head is responsible for:

1. Selecting competent people to carry out the plan,
2. Issuing standard operating procedures for each phase of the plan; e.g., an information and training program,
3. Issuing specific policy statements for elements of the program; e.g., emergency response,
4. Budgeting money for monitoring, medical evaluation, personal protective equipment, or engineering controls if needed,
5. Acting on recommendations submitted by the Chemical Hygiene Officer,
6. Utilizing the University's disciplinary process as a corrective measure against employees who violate procedures in the plan.

### 4.3 Laboratory Supervisor

4.3.1 The laboratory supervisor is responsible for:

1. Notifying employees of monitoring results, if any,
2. Enforcing use of engineering controls, safe work practices, and required personal protective equipment,
3. Making sure that hoods and exhaust fans are functioning properly,
4. Maintaining an adequate supply of personal protective equipment in the laboratory and noting misuse that would diminish effectiveness of the equipment,
5. Answering employees questions and concerns as well as carrying out employees ideas when workable,
6. Forwarding unresolved questions, concerns and unworkable ideas to the Chemical Hygiene Officer for response,
7. Providing training and information to laboratory employees,
8. Considering disciplinary action as a corrective measure against offenders and sending a report of each disciplinary action to the Chemical Hygiene Officer,
9. Making sure employees who develop signs or symptoms associated with hazardous chemicals are given an opportunity to receive medical attention. Make available to employees the Chemical Hygiene Plan, permissible exposure limits for hazardous chemicals, information on signs and symptoms associated with exposures to hazardous chemicals used, and Material Safety Data Sheets for hazardous chemicals used.

### 4.4 Laboratory Employees

4.4.1 Laboratory employees are responsible for:

1. Sharing their knowledge of potential workplace hazards with the Chemical Hygiene Officer and the laboratory supervisor,
2. Informing the supervisor if signs or symptoms develop associated with a hazardous chemical exposure,
3. Complying with basic laboratory rules and procedures,
4. Following established safe work practices,

5. Making an effort to be fully informed, obtaining help when necessary, and using engineering controls and personal protective equipment correctly at all times,

## 4.5 Chemical Hygiene Officer

4.5.1 The Chemical Hygiene Officer is accountable for making sure the plan works. The Chemical Hygiene Officer is responsible for:

1. Keeping the Chemical Hygiene Plan up-to-date,
2. Replying to unresolved questions, concerns, and ideas forwarded by the supervisor,
3. Maintaining, reviewing, interpreting, and analyzing records of monitoring results,
4. Making sure all laboratory employees have been adequately trained and informed,
5. Providing technical support.

## 4.6 Forms

4.6.1 Appendices 12-14 contains forms for recording and reporting a variety of chemical hygiene related events, including training, inspections, monitoring, and the purchase of new chemicals.

1. List of Chemicals Requiring Initial Monitoring
2. Chemical Hazard Audit Checklist
3. Chemical Inventory Form
4. Chemical Hygiene Training Checklist
5. New Chemical Purchasing Request
6. List of Chemical Hygiene Officers
7. New Employees Hazard Communication Orientation and Training Checklist
8. New Chemical Training Checklist
9. Laboratory Safety Inspection Schedule
10. Air Sampling Data
11. Chemical Hygiene Permit
12. Common Glove Materials' Resistance to Chemicals
13. Accident Report Form
14. Workers' Compensation NCIC Form 19

## 4.7 Routes of Exposure

4.7.1 All chemicals are toxic at some dose level depending upon the route of exposure. It is therefore necessary to minimize exposure to chemicals. Chemicals can have local or systemic effects. Local toxicity refers to the direct action of chemicals at the point of contact. Systemic toxicity occurs when the chemical agent is absorbed into the body and distributed throughout the body via the bloodstream, lungs, lymph, etc. Acute effects are observed shortly after exposure. Chronic effects result from long exposure or appear after a latency period. If the effect is observed after a single exposure, it is called acute poisoning or acute toxicity. If the effect is a result of long term exposure or repeated exposure, it is called chronic poisoning.

4.7.2 *Skin (Dermal) Contact* : One of the most frequent exposures to chemicals is by contact with the skin. Spills and splashes contaminate the skin. A common result of skin contact is localized irritation or burns. However, some chemical materials can be absorbed through the skin and produce systemic poisoning. Skin contact hazards are often associated with caustic or acidic cleansers that are highly corrosive to skin or with petroleum-based products which irritate on repeated contact.

4.7.3 *Inhalation* : Inhalation of toxic vapors, mists, gases, or dust can produce poisoning by absorption through the mucous membranes of the mouth, throat, and lungs and can seriously damage these tissues. Inhaled gases or vapors may pass rapidly into the capillaries of the lungs and be carried into the circulatory system. The degree of injury resulting from inhalation of toxic substances depends on the toxicity of the material, its solubility in tissue fluids, its concentration, and the duration of exposure. Inhalation hazards are most often associated with gases and volatile products such as adhesives, wood finishes or paint thinners. Dust and non-volatile liquids can also be an inhalation hazard. Materials in the form of dusts and particulates can become airborne when transferred from one container to another or by grinding and crushing. Splash created from spills and during vigorous shaking and mixing may also form aerosols. Many of the particulates generated during such procedures do not settle out, but remain suspended in the air and are carried about by air currents in the room. Some of these particulates are capable of being inhaled and deposited in the respiratory tract. In many operations, formation of an aerosol is not always obvious, and personnel may not be aware of the hazard.

4.7.4 *Ingestion* : Toxic materials can be ingested when contaminated hands come in contact with the mouth or when contaminated food items are placed in the mouth. Food items and utensils can become contaminated when stored near chemicals.

4.7.5 *Eye (Ocular)* : The eyes are of particular concern because they are so sensitive to irritants. Ocular exposure can occur via

splash or when contaminated hands rub the eyes. Few substances are innocuous in contact with the eyes, and a considerable number are capable of causing burning and loss of vision.

## 4.8 Safety Rules for the Workplace

4.8.1 Safe practice requires being alert and knowledgeable about potential hazards. The first and most important rule is: **DO NOT USE OR HANDLE ANY CHEMICAL UNTIL YOU HAVE READ AND UNDERSTOOD THE MATERIAL SAFETY DATA SHEET(MSDS) AND LABEL FOR THE CHEMICAL.** The second rule is: **SAFETY IS THE RESPONSIBILITY OF EVERY EMPLOYEE.** It requires the full cooperation of all concerned. This means that each person must observe safety precautions and procedures.

4.8.2 Accidents are caused by an indifferent attitude, failure to use common sense, or failure to follow instructions. Be aware of what your fellow workers are doing, because you can be a victim of their mistakes. Do not hesitate to point out to fellow workers that they are engaging in unsafe practices or operations if appropriate. If necessary, report unsafe practices to the supervisor.

4.8.3 Under the Occupational Safety and Health Administration(OSHA) regulations, a specific set of safety rules must be developed and communicated clearly to employees. This document is intended to satisfy that requirement. Each employee shall attest by signature that he/she has read and understands these safety rules. These rules will be rigidly and impartially enforced. Willful noncompliance can result in disciplinary action, including suspension or dismissal from employment. On the other hand, suggestions from employees for improvement of safety rules, practices and equipment are strongly encouraged. Safety meetings will be held at regular intervals with all employees.

4.8.4 An annual inspection of fume hoods and ambient air shall be performed by qualified personnel.

4.8.5 An annual inspection of chemical safety hazards shall be performed by the departmental chairperson or director in each department or other unit engaged in the use of hazardous chemicals.

### 4.8.6 THE FOLLOWING ARE ADDITIONAL RULES THAT APPLY FOR PERSONS IN ALL CHEMICAL WORKPLACES

4.8.7 The laboratory supervisor is responsible for making sure that these rules and procedures are followed in laboratories:

1. Use locally exhausted workplaces for operations when their use is prescribed in the Standard Operating Procedure.  
NOTE : As a general rule, a hood or other local ventilation device is needed when working with volatile substances. Brief intense inhalation of solvents can produce a high brain concentration and symptoms such as dizziness and nausea.
2. Use of gloves, aprons, and chemical goggles plus face shields as splash protection as needed when handling substances that can affect the skin and/or eyes: OSHA does not mandate use of eye protection in laboratories but it is our policy that eye protection shall be the norm all the time in any laboratory where chemicals are handled. OSHA policy about contact lenses ( as stated in the preamble to the revisions to 29 CFR 1910, Subpart 1) is as follows: "Contact lenses do not pose additional hazards to the wearer. The Agency wants to make it clear, however, that contact lenses are not eye protective devices. If eye hazards are present, appropriate eye protection must be worn instead of, or in conjunction with, contact lenses." Unvented goggles are essential if, for therapeutic reasons, contact lenses must be worn.
3. Promptly flush eyes with water for at least 15 minutes if chemicals contact the eyes; seek medical attention if needed.
4. Promptly flush skin with water if chemicals contact skin and seek medical attention if symptoms persist.
5. Inspect goggles before use, wash them before removal, replace them periodically, and use the type of gloves specified in the Standard Operating Procedure. Remove clothing and gloves immediately upon contamination. **NOTE** : *Gloves* should not be relied upon to prevent exposure. Proper technique should prevent material from getting onto the hands; gloves should be worn just in case anything goes wrong. Many chemicals can penetrate rubber and plastic.)
6. Obtain approval of the Chemical Hygiene Officer before modifying ventilation systems.
7. Do not eat, drink, smoke, chew gum, or apply cosmetics in the laboratory and wash hands before conducting these activities.
8. Beware of overly simple rules such as storing like chemicals together, e.g ., this may put concentrated nitric acid with acetic acid, a combination of oxidant and fuel that will combust immediately and violently.
9. Store flammables in a flammable storage cabinet. **NOTE** : *A proper flammable storage cabinet will be made either of thick wood or double-walled metal to provide insulation; it will have hinges and locks that will not fail in a fire, flame-proofed ventilation, and an effective tray to retain the contents of several containers.*
10. Store flammables in refrigerators designed for flammable storage and labeled as to use; do not store flammables in conventional refrigerators.
11. Label all containers and do not deface labels. If a container is unlabeled it is not always possible to determine if the container is safe or merely unmarked. Do not store food or beverages in storage areas, refrigerators, glassware, or utensils which are used for laboratory operations.
12. Do not use damaged glassware.
13. Use equipment only for its designated purpose.
14. Avoid practical jokes, horseplay, or other such behavior in the workplace. Such conduct might confuse, startle, or distract other employees.
15. Call the Fire Department to handle emergencies.

16. Do not use mouth suction for pipetting or starting a siphon.
17. Confine loose clothing and long hair.
18. Wear shoes, but do not wear sandals, high-heeled shoes, open-toed or perforated shoes, shoes made of woven materials, or sneakers.
19. Remove jewelry such as rings, bracelets and watches from the wrists and hands to prevent chemical seepage underneath them, contact with electrical sources and catching on equipment.
20. Keep the work area clean and uncluttered with chemicals and equipment.
21. Whenever possible keep chemicals in cupboards rather than on the bench, with a sign to remind users to wear eye protection when getting material out.
22. Clean up the work area upon completion of an operation or at the end of each day.
23. Do not work alone in the laboratory.
24. Promptly clean up spills, using appropriate protective apparel, equipment and disposal procedures described in the Standard Operating Procedure.
25. Avoid unnecessary exposure to chemicals. Do not smell or taste chemicals.
26. Ensure that necessary safety equipment is readily available and in usable condition.
27. Always know the hazards and physiochemical properties of the chemicals used, e.g ., corrosiveness, flammability, reactivity, and toxicity.
28. Do not perform unauthorized work, preparations and experiments.
29. Always wash face, hands and arms with soap and water before leaving the work area. This applies even if one has been wearing gloves.
30. Never remove chemicals from the facility without proper authorization.
31. Use a carrying container, such as a regular carrier or a box, for hazardous chemicals and apparatus in transit. This will reduce the likelihood of the container breaking and/or catch any liquid spill. Stairs must be negotiated carefully. Elevators, unless specifically indicated and so designated, should not be used for transporting chemicals.
32. No smoking is allowed around chemicals and apparatus in transit.

## 4.9 Protective Clothing

4.9.1 Aprons, lab coats, gloves and other protective clothing, preferably made of chemically inert material, should be readily available and used. Note that many lab coats and aprons are made of substances that will burn. Experiments or processes involving corrosive or reactive materials, such as strong acids or bases, require use of goggles or face shields. Gloves must sufficiently protect the arm to minimize the chance of spilled chemicals contacting the skin. Glove material is important. Appendix 23 contains a listing of common glove materials resistant to chemicals. Contaminated gloves must be discarded. Legs and feet should be protected by lab coat and shoes, and in some cases, boots. Where necessary, employees should wear other protective equipment such as safety shoes and hard hats.

4.9.2 Do not use gloves with cracks or small holes in them. Because the permeability of gloves varies from manufacturer to manufacturer, no specific recommendations can be given here. Examine the manufacturer's claims and test data carefully before buying gloves and use them only under the conditions and with the chemicals for which they are intended.

4.9.3 Be certain the manufacturer's or supplier's information on compatibility with the specific chemicals you are using conforms to the ASTM Standard Test Methods for chemical permeability (OccupationalSafetyAndHealthAppendices#toc22 ASTM-F-739).

## 4.10 Ventilation

4.10.1 A large number of common substances present acute and chronic respiratory hazards and should not be used in a confined area. They should be dispensed and handled only where there is adequate ventilation, such as in a hood. Adequate ventilation is defined as ventilation that is sufficient to keep the concentration of a chemical below the threshold limit value or permissible exposure limit for those chemicals for which these values have been established. The threshold limit value or permissible exposure limit is identified on the chemical's Material Safety Data Sheets.

4.10.2 If you smell a chemical, remember that you are inhaling it, but remember that the vapors of many chemicals can be at hazardous concentrations without any noticeable odor. The same applies to dusts, mists and smokes.

4.10.3 Many byproducts of chemical reactions are extremely hazardous, and precautions should be taken when combining chemicals. Planning for the handling and control of these toxic byproducts should be part of the experimental procedure.

## 4.11 House Keeping

4.11.1 Avoid unnecessary hazards by keeping drawers and cabinets closed while working. Never store materials, especially chemicals, on the floor even temporarily. Keep aisles free of obstructions such as chairs, boxes, and waste receptacles. Avoid slipping hazards by keeping the floor clear of ice, stoppers, glass beads, glass rods, other small items, and spilled liquids. Use the required procedure for the proper disposal of chemical wastes and solvents.

## 4.12 Storage/Labeling

4.12.1 Storage and transportation of chemicals should be done safely. Storage equipment must be stable and secure against sliding, collapsing and flooding. Access must be neat, orderly and available only to authorized persons. Review the Material Safety Data Sheets for the chemicals in your work area.

## 4.13 General

4.13.1 Make sure that shelf units are stable and, if likely to tilt, anchored. Storage for large containers of reagents should be provided on a low shelf, preferably in a tray adequate to contain spills or leakage. Chemicals should be arranged in compatible chemical families, not in alphabetical order.

4.13.2 Keep only minimum quantities of flammable liquids in the workplace as required by OSHA guidelines and National Fire Protection Association (NFPA) Standard #45 Fire Protection for Laboratories Using Chemicals. Store larger quantities in approved safety containers or in fire-resistant, properly ventilated solvent cabinets away from ignition sources. Maintain storage for current work only. Large amounts of more than one gallon of flammable liquids should be stored in a separate storage area with an automatic fire extinguishing system. When a flammable liquid is withdrawn from a drum, or when a drum is filled, both the drum and other equipment must be electrically grounded. Flammable liquids must be stored so that accidental contact with strong oxidizing agents is not possible.

4.13.3 Small containers of chemicals should never be stored on the floor, even temporarily. Keep all stored chemicals, especially flammable liquids, away from heat and direct sunlight. Peroxide-forming chemicals deserve special consideration at all times, and particularly in storage. Peroxide formation is accelerated by the presence of UV light and elevated temperature. Careful records of the storage history of compounds that form peroxides on standing should be maintained and periodically reviewed. The date of receipt of every chemical container should be indicated on the label.

4.13.4 Large containers of corrosives should be transported from central storage in a chemically resistant bucket or other containers designed for this purpose. If transferring from a metal container to glass, the metal container should be grounded. Only small quantities should be transferred to glass containers. For added safety for the eyes, corrosives should never be stored above chin level.

## 4.14 Refrigerators

4.14.1 Refrigerators constitute a unique hazard because they might explode when used for storage of volatile or unstable chemicals. Domestic household-type refrigerators should never be used for chemical storage even if they have been modified. The motor and other electrical parts on the exterior of a domestic refrigerator can still ignite flammable vapors in the room. Frost-Free refrigerators have additional hazards.

4.14.2 In so-called explosion-safe refrigerators, the internal wiring has been modified to eliminate ignition sources. However, note that these refrigerators are not explosion proof. Chemicals stored in refrigerators should be sealed, double packaged if possible, labeled with the name of the material, the date placed in the refrigerator, and the name of the person who stored the material. A current inventory should be maintained and posted on the outside of the refrigerator. Old chemicals should be disposed of after a specified storage period.

4.14.3 Food and drink should never be stored in a refrigerator used for chemicals. These refrigerators should be clearly labeled "NO FOOD". Conversely, food refrigerators, which must be always outside of, and away from, the chemical work area should be labeled "FOOD ONLY- NO CHEMICALS."

## 4.15 Labeling

4.15.1 The OSHA Booklet 3084, Chemical Hazard Communication, summarizes the federal regulatory requirements for the labeling of containers in the workplace. Appalachian State University's Hazard Communication Standard Written Program also contains labeling requirements. These documents may be reviewed in the Occupational Safety and Health Office.

4.15.2 All chemicals received for use should be labeled with the date received and expected shelf life. Chemicals that are repackaged should have secure, waterproof labels, marked with waterproof ink, that contain information about hazards, as well as name, date packaged, and strength of purity. The Material Safety Data Sheets must be readily available in each work area where hazardous chemicals are used.

## 4.16 Special Chemical Hazards

4.16.1 **Employees should read and understand the Material Safety Data Sheets and labels for the chemicals present in their work area.**

4.16.2 Solvents

1. Hazards - Most of the commonly used solvents are volatile and are harmful even when relatively small amounts are inhaled. Many are readily absorbed through the skin. Most are flammable. All organic solvents should be regarded as hazardous unless definitely known to be safe.
2. Flammable liquids - A flammable liquid itself does not burn; it is the vapor from the liquid that burns. The vaporization rate increases as the temperature increases; therefore, a flammable liquid is more hazardous at elevated temperatures than at normal temperatures.
3. Fire and explosion hazards associated with flammable liquids can be minimized by observing the following precautions:
  1. **Keep flammable liquids away from heat, direct sunlight, and sources of static electrical charge.**
  2. Do not heat flammable liquids directly over a flame or other sources of heat that can generate sparks or that has a surface temperature in excess of that which might cause auto-ignition.
  3. Do not dispose of flammable liquids in sinks or drains.
  4. A fume hood or equivalent should be used when appreciable quantities of flammable materials are transferred from one container to another, allowed to stand in open containers, or heated in open containers.

## 4.17 Acids

4.17.1 Acids from batteries and other sources should be kept away from alkaline materials, e.g. ammonia, lye, bleach, and combustible materials, e.g. paper, wood, cloth. These compounds produce severe skin burns; some are volatile and can burn the lungs if inhaled. When handling acids, wear gloves and splash goggles. Work in a fume hood if concentrated acids are used. Always add acid to water slowly and continue stirring to prevent splattering.

## 4.18 Alkalies(Bases)

4.18.1 All alkalies, including those used as cleaning products, should be kept away from acids, e.g., battery acid, toilet bowl cleaners. These substances can cause serious eye damage, including blindness, even on short-term exposure. They are also caustic, producing serious drying and cracking of skin, as well as burns. When handling bases, always wear splash goggles and gloves. Bases also generated heat when mixed with water, so add them slowly and continue stirring.

## 4.19 Safety Equipment

4.19.1 Employees should read and understand the Material Safety Data Sheets and labels for the chemicals present in their work areas.

## 4.20 Eye Washes

4.20.1 Emergency eyewash fountains should deliver a gentle flow of potable, aerated water. The eye wash spray should not be located where it can be contaminated by waste material. Eye washes are not to be considered alternatives to goggles, but are absolutely essential. For chemical splashes, at least a 15 minute flush is recommended. Immediately flush the eyes with a copious amount of water under gentle pressure, checking for and removing contact lenses at once. However, contact lenses may be difficult to remove and the essential irrigation must not be delayed. After flushing, the injured person must be given prompt medical attention, regardless of the severity of the injury. Keep the eyes immobilized with clean, wet, soft, cold pad while transporting the injured person to medical facilities.

## 4.21 Safety Showers

4.21.1 Safety showers should be clearly labeled. The shower area must be readily accessible and be kept clear of obstructions. Chain pulls should be provided with a large ring. Even better, a double ring at right angles can be installed. The valve should open readily and ideally remain open until intentionally closed. Water flow must be sufficient to drench the subject rapidly and to accommodate more than one person if necessary. Potable water should be used in safety showers. Although an associated floor basin is desirable, its absence should not prohibit installation of a safety shower. The shower will be tested by department chairperson, laboratory supervisor, or chemical hygiene officer, and a record kept of such test. The shower's location should be clearly labeled.

## 4.22 Fire Extinguishers

4.22.1 Fire extinguishers at Appalachian State University are of a convenient size for rapid use. There should be at least one extinguisher easily accessible to each work area in accordance with North Carolina State Building Codes and applicable NFPA Codes. Dry chemical fire extinguishers may be preferred for certain areas, but carbon dioxide is satisfactory for most small fires and is cleaner to use around most equipment. Extinguishers must be inspected on a regular basis by designated University employees and recharged promptly after use. Records of inspection and recharging must be maintained by the inspecting department. Conventional dry chemical extinguishers expel a stream of sodium or potassium bicarbonate powder and are not recommended for Class A fires, e.g., wood, paper. Multipurpose dry chemical extinguishers release a stream of monoammonium phosphate as the extinguishing agents and are often preferred. However, carbon dioxide and dry-chemical fire

extinguishers will intensify fires involving certain reactive metals, and should not be used. Review the Material Safety data sheets for chemicals in your work area and learn which fire extinguishers should be used and when.

## **4.23 Laboratory Fume Hoods**

4.23.1 Fume hoods serve to control toxic, offensive, or flammable vapors. Apparatus used in hoods should be fitted with condensers, traps, or scrubbers to contain or collect waste solvents or toxic vapors. The hood is not a means for disposing of chemicals.

4.23.2 The department's laboratory supervisor or chemical hygiene officer should train all employees how to determine, before each use, that the hood is working properly. Before each use, employees must make that determination. Adequate air flow and the absence of excessive turbulence are necessary for safe operation. Equipment should be placed as far back in the hood as practical and activities carried out at least 15 cm or 6 inches from the front edge of the hood. A yellow line painted 6 inches from the edge would serve to indicate the limit of usage. Keep your head outside of the hood face. It is recommended that all exit ports from gas chromatographic or atomic absorption spectrometer units be connected to an efficient hood to remove toxic substances from the laboratory environment.

4.23.3 Hoods should never be used for storage of chemicals. In the event of an accident or fire every item in the hood may be involved, including those stored in the hood. Chemicals should be removed from hoods and stored in appropriate locations following designated use.

## **4.24 Sinks**

4.24.1 Sinks should have rubber or plastic mats on their bottoms, but not over the drains. Each sink should have ample hot water and soap. A pair of loose-fitting, coarse leather gloves may be useful for removing broken glass, but care must be exercised to prevent glove contamination by chemicals.

## **4.25 Emergency Action**

4.25.1 Employees should read and understand the Material Safety Data Sheets and labels for the chemical present in their work area.

4.25.2 When an emergency occurs:

1. Report the nature and location of the emergency to the Boone Police Dispatchers and ASU Police by dialing 9-911 and 2150; giving your name, telephone number, and campus location. Tell where you will meet the emergency vehicle. If individuals are involved, report how many, whether they are unconscious, burned or trapped; whether an explosion has occurred; and whether there is or has been a chemical or electrical fire.
2. If the fire alarm sounds or your remaining in the area becomes threatened, leave your location immediately. Tell others in the area about the nature of the emergency as time permits and proceed immediately to the nearest exit as indicated on the emergency evacuation plan posted in your department or area.
3. Meet the ambulance or fire crews outside at the place you indicated. Send someone else if you cannot go.
4. Do not make any other telephone calls unless they directly related to the control of the emergency.

## **4.26 Accident Reporting**

4.26.1 All accidents involving injuries or toxic chemical exposures must be reported to the Occupational Safety and Health Office. Accidents resulting in even minor medical treatment must be recorded. Workers' Compensation accidents and injuries require completion of the North Carolina Industrial Commission Form 19 and other related forms. Form 19 is available from the University's Web Site, electronic forms section. These must be completed and forwarded to the Occupational Safety and Health Office within five days of the accident or injury. Accidents involving major spills of hazardous chemicals must also be reported to the Physical Plant at extension 3190 immediately. Other departmental accidents or injuries should also be reported to the Occupational Safety and Health Office on the one page Accident Report form . Contact the Occupational Safety and Health Office for assistance reporting procedures or to receive additional forms at extension 4008.

## **4.27 Administration of First Aid**

**4.27.1 Employees should read and understand the Material Safety Data Sheets and labels for the chemicals present in their work area.**

4.27.2 Do what is necessary to protect life while waiting for assistance. Keep calm and follow these specific procedures:

1. Do not move any injured persons unless they are in immediate danger from chemical exposure or fire. Keep them warm. Unnecessary movement can severely complicate neck injuries and fractures.
2. If chemicals have been spilled on someone, wash the affected area thoroughly for at least 15 minutes using a safety

shower if appropriate. If chemicals are in the eyes, irrigate eyes at least 15 minutes until medical help arrives. Check for and remove any contact lenses before irrigation. Contact lenses may be difficult to remove and the irrigation must not be delayed. Do not attempt to wipe chemicals from contaminated clothing. Contaminated clothing, shoes, jewelry, etc. must be removed promptly. Modesty is not a substitute for safety. Use caution when removing pullover shirts or sweaters to prevent contamination of the eyes. It may be better to cut the garments off.

3. Use a blanket in shock cases and for the protection of an injured person from exposure in route to medical aid.
4. If a person's clothing is on fire, use the safety shower. If the shower is not readily available, drench the individual with water or wrap the person in a coat, fire blanket or whatever is available to extinguish the fire and roll the person on the floor. Quickly remove any clothing contaminated with chemicals. Again, caution should be used when removing pullover shirts or sweaters to prevent contamination of the eyes. Drench with water to remove heat and place clean cloths on burned areas. Wrap the injured person to avoid shock and exposure. Get medical attention promptly.
5. If there is a small fire with little personal risk and you have been trained in proper use of fire extinguishers, use the nearest extinguishers. Bear in mind that carbon dioxide and dry-chemical fire extinguishers will intensify fires involving certain reactive metal, and should not be used. If the fire is very small, it may be extinguished by smothering it with a nonflammable material such as an inverted beaker or metal waste basket. Fight the fire from a position of escape. Know that it is easy to underestimate a fire. Turn off electrical circuits and gas lines. Leave the building by the most direct and accessible route. Close fire doors behind you. Do not use elevators to leave the building; use the stairs. Keep the lights on.
6. Anyone overcome with smoke or fumes should be removed to a safe area with uncontaminated air and treated for shock. Perform rescue breathing if needed and you are properly trained. Arrange for oxygen inhalation, if necessary.
7. If hazardous chemicals are ingested, follow the first aid treatment prescribed by the Statewide Poison Control Center in Charlotte at 1-800-848-6946. Never give anything by mouth to an unconscious person. Attempt to learn exactly what substances were ingested and inform the medical facility staff while the victim is in route to a hospital, if possible. Locally contact Watauga Medical Center at 262-4100 for poison treatment.
8. Provide rescue breathing if the injured person is not breathing and you are properly trained. If the victim's condition worsens and there is no breathing or pulse provide CPR, if properly trained and get medical attention.
9. If an individual is bleeding severely, control the bleeding by compressing the wound with a clean cloth or sterile material. Elevate the injury above the level of the heart. If blood is spurting, place a pad directly on the cut, apply firm pressure and elevate the injury site if possible. Wrap the injured person to avoid shock and get immediate medical attention. In the case of a less severe cut, wash the cut, cover with a clean cloth and get medical attention. A pressure pad may be applied firmly on the wound to control or stop bleeding. If necessary, add direct pressure to appropriate pressure points to help control or stop bleeding. Tourniquets should be used only as a last resort by persons trained in first aid.
10. Do not touch a person in contact with a live electrical circuit. Disconnect the power first or you may be seriously injured. Call for additional assistance.

## 4.28 Chemical Spills

### 4.28.1 Employees should read and understand the Material Safety Data Sheets and labels for the chemicals present in their work area.

### 4.28.2 General actions for non-contained spills, refer to emergency number contacts.

1. Immediately alert fellow workers and supervisor.
2. Follow relevant instructions on the Material Safety Data Sheets for the spilled chemical.
3. For all spills, remove contaminated clothing immediately and wash the skin with soap and water. Flush skin with water for no less than fifteen minutes. Clothes must be laundered before reuse and not washed with other clothing.
4. If there is no fire hazard and the material is not volatile or toxic, clean up as directed on the Material Safety Data Sheets. To facilitate cleaning up liquids, use an absorbent material that will neutralize the liquids if possible a combination of phosphate, sand followed by sodium bicarbonate solution or powder for acids, sodium thiosulfate solution for bromine, etc. Commercial absorbents such as Oil-Dri and Zorb-All, vermiculite, or small particles about 30 mesh of kitty litter or other satisfactory clay absorbents are also recommended. Dry sand is less effective. A dustpan and brush should be used and protective gloves should be worn. While wearing gloves, clean the contaminated area with soap and water and mop dry. If the spill is on the floor, some absorbent should be sprinkled on the spot to prevent slipping. Caution: Vermiculite and some other absorbents create a slipping hazard when wet.
5. If a volatile, flammable or toxic material is spilled, immediately warn everyone to extinguish flames and turn off spark-producing equipment such as brush-type motors. Shut down all equipment and vacate the area until it is decontaminated. The supervisor or unit director will be responsible for designating the extent of evacuation and the proper cleanup procedures.
6. Avoid skin contact and, to prevent inhalation, use appropriate breathing apparatus. Clothing contaminated by spills or splashes should be immediately removed to prevent skin penetration. Launder or clean contaminated clothing before reuse. Replace protective clothing as necessary.
7. Many small liquid spills <100 ml can be absorbed with paper towels, sand, or an absorbent. However, paper towels can increase the surface area and evaporation, increasing the fire hazard. Most solid spills can be brushed up and disposed of in appropriate solid-waste containers, but care must be exercised to avoid reactive combinations. Do not leave paper towels or other materials used to clean up a spill in open trash cans in the work area. Dispose of them properly as



instructed on the Material Safety Data Sheet.

## 4.29 Spills of Specific Types of Chemicals

1. Acids and other acid materials . Use calcined, absorbent products, such as Oil-Dry, Zorb-All or dry sand. Avoid contact with skin. Use appropriate personal protective equipment during cleanup procedures.
2. Mercury . Because of the high toxicity of mercury vapor, personnel should receive training in the safe use of mercury before being permitted to work with this chemical. Spilled mercury should be immediately and thoroughly cleaned with an aspirator bulb or a vacuum device. If a mercury cleanup unit is available, become familiar with its location and proper use. Mercury spilled into floor cracks can be made nonvolatile by amalgamation with zinc dust. Domestic vacuum cleaners must not be used because they will only redistribute mercury aerosols and spread the concentration. Use appropriate personal protective equipment during cleanup procedures.

## 4.30 Chemicals on the Skin

4.30.1 For spills covering small amounts of skin, immediately flush with water no less than fifteen minutes. If there is no visible burn, wash with warm water and soap, removing any jewelry to facilitate removal of any residual materials. Check Material Safety Data Sheets to see if any delayed effects should be expected. If a delayed reaction is noted, seek medical attention immediately and explain carefully what chemicals were involved. Remember to provide a copy of the Material Safety Data Sheets to the treating physician.

4.30.2 For larger spills, quickly remove all contaminated clothing and shoes while using the safety shower. Seconds count and no time should be wasted because of modesty. Be careful not to spread the chemical on the skin or especially in the eyes. Immediately flood the affected body area with tempered water for at least fifteen minutes. Resume if pain returns. Do not use creams, lotions or salves. Get medical attention as soon as possible. Remember to provide a copy of the Material Safety Data Sheets to the treating physician.

## 4.31 Fires and Explosions

4.31.1 Be familiar with the Fire and Explosion Hazard information on the Material Safety Data Sheets for each chemical in your work area.

4.31.2 The best way to fight a fire is to prevent it. Fires can be prevented or their severity considerably reduced by proper housekeeping. This includes prompt removal of waste, separation of flammable liquids from combustible material such as cardboard boxes, paper towels, etc., storage of limited quantities of flammable material, and unobstructed aisles and exits. Fires can be prevented and their severity reduced by thoughtful reflection about what you are doing. Stand back, take a look, and ask: Are there any frayed wires? Is a sparking motor stirrer being used to stir that flammable liquid? Are those bottles too close to the edge of the bench? Is the work space cluttered? Do I understand each of the potential hazards in what I am about to do? Am I prepared in advance to take preventive steps?

4.31.3 When a fire occurs, the following actions are recommended:

1. Remain calm. Activate the nearest Pull-Station Fire Alarm. Notify co-workers and supervisor. Call Boone Fire Department 9-911 and Appalachian State University police 2150. Follow the emergency procedures noted in the EMERGENCY ACTION Section.
2. If you have been trained in the use of fire extinguishers, fight the fire in a position from which you can escape, but only if you are confident that you will be successful. Bear in mind that carbon dioxide and dry-chemical fire extinguishers will intensify fires involving certain reactive metals, and should not be used. Small fires just starting often can be extinguished, but not always. If not extinguished, a fire can quickly threaten your life and the lives of your co-workers. Remember, it is easy to underestimate a fire.
3. A fire contained in a small vessel can usually be suffocated by covering the vessel. Do not pick up the vessel. Do not use dry towels or cloths. Remove nearby flammable materials to avoid possible spread of the fire.
4. If a spilled or sprayed liquid is burning over an area too large for the fire to be suffocated quickly and simply, all persons should leave this area.
5. Toxic gases and smoke may be present during a fire and those trying to contain the fire must avoid breathing gases and smoke. These fires should be fought only by properly trained and equipped personnel.
6. Smother fires involving very reactive metals with powdered graphite, Pyrene G-1, or with a special fire extinguisher for metal fires such as Ansul Met-L-X. Carbon dioxide and the usual dry-chemical fire extinguishers will intensify fires of alkali, alkaline earth, and certain other metals, including aluminum, magnesium, zirconium, hafnium, thorium, and uranium.
7. Firefighters should be informed what chemicals are involved, or which chemicals may become involved. A current inventory list is required and a copy should be readily available both in and outside the work area and should be shared with Boone Fire Department.
8. Fire involving chemicals increase the possibility of explosions. Special care should be taken to keep fire or excessive heat from volatile solvents, compressed gas cylinders, reactive metals, and explosive compounds.

9. Immediately after the fire, all extinguishers that were used should be recharge or replaced with full ones. Contact the Building Services Department at extension 4048 for recharge and replacement.

## **4.32 Evacuation and Fire Drills**

4.32.1 Every employee should be aware of the location of the fire exits, telephones, alarms and their operation. Emergency drills must be scheduled and held on a regular basis. Employees will be instructed by the department chairperson or unit director to go to a prearranged area outside the danger area and remain in that area until accounted for and given further instructions.

## **4.33 Use of Fire Extinguishers**

4.33.1 Every person should be aware of the location of fire extinguishers and annually given hands-on training in the proper manner of operation. Any use of a fire extinguisher must be reported to your supervisor and Building Services personnel at extension 4048 so the extinguisher can be refilled and replaced promptly. Fire extinguisher demonstrations for groups of 20 or less can be arranged by contacting the Occupational Safety and Health Office.

## **4.34 Safety Training**

### **4.34.1 CHEMICAL HAZARDS ORIENTATION**

4.34.2 Employees who work with or are potentially exposed to hazardous chemicals must be trained regarding hazards of these chemicals in the work area and the manner in which these chemicals are to be handled and disposed of safely. The information provided by the container labels and the Material Safety Data Sheets, which are required under the OSHA Laboratory Standard as well as State Right-to-Know laws, should be understood by each employee prior to chemical usage or potential exposure. Initial Chemical Training on the State of North Carolina Right-to-Know and Laboratory Safety Standards, as well as the Chemical Hygiene Plan, is available from department chairpersons or unit directors, and the Occupational Safety and Health Office. Subsequent training as to specific laboratory hazards must be the responsibility of the laboratory supervisor or department chemical hygiene officer.

## **4.35 Medical Consultations and Examinations**

4.35.1 Under certain circumstances, the University will provide employees who work with hazardous chemicals an opportunity to receive medical treatment at no cost to the employee. Medical care will be provided by or be conducted under the direct supervision of a licensed physician. An opportunity to receive medical services will be made available if one of these conditions exists:

1. An employee develops signs or symptoms suspected to be associated with a hazardous chemical to which he/she may have been exposed.
2. Monitoring reveals an exposure level routinely above the action level or Permissible Exposure Limit (PEL) for an OSHA-regulated substance with requirements for exposure monitoring and medical surveillance, in which case the requirements of the application standard apply.
3. An event in the work area, such as a spill, leak or explosion, results in the likelihood of exposure.

## **4.36 Material Safety Data Sheets (MSDS)**

4.36.1 Material Safety Data Sheets provide safe storage and chemical use information. They must be available for employees use in the laboratory or other work areas. Material Safety Data Sheets are provided by manufacturers, vendors or distributors of chemical products following initial purchase or change in the chemical product. Updates are to be furnished at no cost to the agency. Employees shall receive initial training on Material Safety Data Sheets and other Hazard Communication Program information at employee orientation sessions. Follow-up training on the Lab Safety Standard should be provided by departmental chairpersons or unit directors. Employees shall sign appropriate forms before receiving a copy of the Chemical Hygiene Plan.

## **4.37 Appalachian State University Right-To-Know Hazard Communication Policy**

4.37.1 This program will describe how Appalachian State University intends to protect the safety and health of our employees who are exposed to hazardous chemicals in the workplace, and to comply with the provisions of 29 CFR 1910.1200.

4.37.2 Dr. Evan Rowe has been assigned the title of Hazard Communication Program Monitor and is responsible for monitoring all related activities to ensure compliance with both the intent and specifics of this program.

4.37.3 Each supervisor will be held responsible for strict adherence to these policies and will closely monitor all activities involving hazardous chemicals.

4.37.4 Each employee will carefully follow established work practices and promptly report observed or potential problems to supervision.

4.37.5 There is no job at Appalachian State University so vital or urgent as to justify the risk of employee overexposure to a hazardous chemical. Ask when in doubt. Proceed with a job only after being satisfied that it is safe for you to do so.

4.37.6 Lists of hazardous chemical for workplaces have been made and are readily available, upon request, to any employee, working on any shift. It is located at the Occupational Safety and Health Office.

4.37.7 A Material Safety Data Sheet (MSDS) for each hazardous chemical on the list referenced above is on file at Occupational Safety and Health Office. The MSDS for any hazardous chemical is readily available for review by any employee upon request, through their immediate supervisor.

4.37.8 Ms. Beth Clark is responsible to ensure that the list of hazardous chemicals is kept current and that a current MSDS for each hazardous chemical used is on hand. A chemical that is not shown on the current list will not be ordered without prior coordination with the Purchasing Office.

4.37.9 All containers of hazardous chemicals in each workplace will be conspicuously labeled with the identity of the chemical (same as on the applicable MSDS), and the appropriate hazard warnings. If the chemical is a known or suspected cancer causing agent (carcinogen), or if it is known to affect a specific organ of the body, this information will also be placed on the container label. The person having supervisory responsibility for the storage or use of each hazardous chemical will ensure that such labels are not defaced and that they remain legible at all times. Department supervisors will ensure that an adequate supply of labels is kept on hand and made available to the responsible chemical users.

4.37.10 Department supervisors are responsible for anticipating, as much as possible, the hazards that would be present for non-routine tasks, such as a chemical spill or container rupture. Clean-up procedures and proper personal protective equipment shall be considered and adequate training for such tasks shall be addressed.

4.37.11 When an outside contractor will be used, it will be the responsibility of the applicable department supervisor to advise the contractor of any hazardous chemicals to which their employees may be exposed and the appropriate protective measures to be taken. Conversely, it will be the same manager's responsibility to determine if the contractor will be using any hazardous chemicals during this work that would expose Appalachian State University employees. Appropriate training and protective measures must be taken in order to protect Appalachian State University employees. Design and Construction is to be advised prior to any work being performed by an outside contractor involving hazardous chemicals.

4.37.12 All employees exposed to any hazardous chemical will complete an information and training program which includes at least the subjects listed below. New employees must complete similar instruction before initial exposure to any hazardous chemical in the workplace.

4.37.13 Adequate training of all employees exposed to hazardous chemicals will be given by department supervisors assisted as needed by the Hazard Communication Program Monitor.

#### **4.38 Employee Information for this Program will Include**

1. The purpose and need for such a program, including the basic concept that gives every employee the right to know about hazardous chemicals with which they work,
2. The location and availability of the written Hazard Communication Program, plus the list of hazardous chemicals and their corresponding MSDSs,
3. The identity upon request, of any chemical to which the employee is exposed. In the case of a trade secret chemical, the name shown on the MSDS will be provided.

#### **4.39 Employee Training shall Include at Least the Following**

1. Methods and observation used to detect the presence or release of a hazardous chemical in the work area such as monitoring devices, appearance, or odor,
2. The physical and health hazards associated with each chemical, as specified in the MSDS,
3. Action that employees can take to protect their safety and health, including specific procedures that have been established for normal work practices, emergency procedures, and policies on the use of personal protective equipment,
4. Details of the Hazard Communication Program, including an explanation of the labeling system used on in-house containers or hazardous chemical. Also, details of how employees can obtain and use information contained in the MSDS.

4.39.1 It is the intent of Appalachian State University's management to protect the safety and health of each employee, our most valuable and valued asset. By following correct procedures, no employee should experience any harmful effects from working with chemicals in their workplace.

4.39.2 Contact the Occupational Safety and Health Office at 262-4007 if you need further information.

## 4.40 Lab Bench Cleanup and Disposal of Chemicals

4.40.1 In the laboratory and elsewhere, keeping things clean and neat generally makes for safer working conditions. Work spaces should be kept clean and neat. Broken glassware, leftover chemicals and even scraps of paper can cause accidents. Careless disposal can cause problems. Two or more incompatible chemicals spilled together on a lab bench or put into the same disposal container can catch fire spontaneously or explode. Solid or liquid chemicals put into the sink drain can injure the environment. Broken glass in a waste paper basket can injure the person who empties the basket.

4.40.2 Safety can be promoted by following a few common sense practices when cleaning up the workplace and disposing of chemicals. One basic principle applies: Keep each different class of leftover chemicals in a separated disposal container.

4.40.3 Put ordinary waste paper in a wastepaper basket or into some other container. If a piece of paper is contaminated, such as paper toweling used to clean up a spill, it must be packaged and disposed of as a hazardous waste.

4.40.4 For leftover and unused chemicals, put each solid and liquid in its own specially marked container. Close the container after each use. Never deliberately put chemical, solid or liquid, into the sink or down a drain. If this happens accidentally, notify your supervisor at once. Broken glass belongs in its own marked waste container. Place broken plastic apparatus in a separately marked waste container. Broken thermometers may contain mercury; these belong in their own special broken thermometer container.

4.40.5 Clean glassware at the laboratory sink or in laboratory dishwashers. Use hot water if available, plus soap or other detergent and mild scouring powder, if necessary. Wear impervious gloves that have been checked to ensure that no holes are present. Use brushes of suitable stiffness and size. Avoid accumulating too many articles in the cleanup area. Work space around a sink is usually limited.

4.40.6 Piling up cleaned or contaminated glassware often lead to breakage. Remember that the turbid water in a sink may hide a jagged edge on a piece of broken glass.

4.40.7 Avoid the use of strong chemical agents such as nitric acid, sulfuric acid, other strong oxidizers, flammable liquid solvents, or any chemical with a "per" in its name such perchloric acid, ammonium persulfate, etc unless specifically instructed to do so. Use appropriate protective equipment when using strong chemical cleaning agents. A number of explosions involving strong oxidizing cleaning solutions such as chromic sulfuric acid mixtures have been reported. Dispose of excess or leftover chemicals promptly. Directions for disposal should be obtained from the supervisor. To minimize disposal problems when ordering chemicals, always specify the smallest amount needed.

## 4.41 Waste Disposal

4.41.1 Review the Material Safety Data Sheets recommendations for waste disposal methods.

4.41.2 Disposal of certain chemical wastes is governed by the Resource Conservation and Recovery Act of 1976, and Environmental Protection Agency related requirements. Additional restrictions and requirements are placed on agencies by local and state personnel.

4.41.3 Hazardous as defined by Resource Conservation Recovery Act, means corrosive, ignitable, reactive, toxic, radioactive, infectious, phytotoxic, mutagenic, or identified by name as being acutely hazardous. Each of these terms is uniquely defined. For further information refer to 40 C.F.R. 261 or contact the Occupational Safety and Health Office for detailed definitions. Appalachian State University also provides a collection and disposal service for generators of hazardous chemical waste. Arrangements for collection will be made by the Departmental Safety Officer by contacting Jim Rice at 262-3190.

## 4.42 Reporting and Responsibility

4.42.1 All hazardous or life threatening situations that occur in an area related to safe use of chemicals should be reported to the Occupational Safety and Health Office, at 262-4007. It is the responsibility of each and every employee to know and properly contact his/her supervisor regarding chemical exposure without delay. Contact your supervisor and/or the Occupational Safety and Health Office for further information. For non-contained spills refer to Appalachian State University Emergency Numbers and Agencies listed in Appendix 3 of the Occupational Safety and Health section of the Resource Manual.

## 4.43 A.R. Smith Department of Chemistry Appendix to the Chemical Hygiene Plan

1. Every employee shall follow the current safety rules for the A. R. Smith Department of Chemistry.
2. Every employee shall be provided with the most current edition of the American Chemical Society publications 1 , 2 , "Safety in Academic Chemistry Laboratories," Volumes 1 & 2. Guidance for specific chemicals and operations is provided in these publications. It is the employee's responsibility to become familiar with information relevant to their lab operations in these publications.
3. Every employee shall receive training as required in the most current edition of the University Chemical Hygiene Plan. The

training procedure is outlined in the A.R. Smith Department of Chemistry Chemical Hygiene Training Checklist.

1. American Chemical Society Joint Board - Council Committee on Chemical Safety. Safety in Academic Chemistry Laboratories: Accident Prevention for College and University Students, 7th ed.; American Chemical Society: Washington, DC , 2003.
2. American Chemical Society Joint Board - Council Committee on Chemical Safety. Safety in Academic Chemistry Laboratories: Accident Prevention for Faculty and Administrators, 7th ed.; American Chemical Society: Washington, DC , 2003.

## **5 Additional References**

## **6 Authority**

## **7 Contact Information**

## **8 Original Effective Date**

## **9 Revision Dates**