Randolph Community College

Chemical Hygiene Plan

Asheboro

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Chemical Hygiene/Laboratories

A. Purpose

This Chemical Hygiene Plan satisfies the requirements of the U.S. Department of Labor, and the NC Department of Occupational Safety and Health Administration, 29 CFR Part 1910.1450, Occupational Exposures to Hazardous Chemicals in Laboratories. The objective of this Standard is to protect employees from health hazards associated with hazardous chemicals in the laboratory.

The Chemical Hygiene Plan (CHP) answers the questions that lab chemical users need to know to work safely. Lab chemical use must be planned to be safe.

B. Scope and Application

There is a preferred way to perform all work with chemicals which can both reduce the probability of an accident or exposure to a negligible level and reduce its consequences to minimal levels should one occur. Before using a chemical, a person should ask "What would happen if ...?." Answers to this question will require an understanding of the hazards associated with the chemical. The chemical's hazards will dictate the precautions to be taken. Few chemicals are without hazards of various kinds and degrees.

1. Staff and students should follow the Chemical Hygiene and Emergency Evacuation Plan to minimize their health and safety risks.
2. The design of the laboratory facility should provide sufficient space for all participants to work safely.
3. Laboratory facilities should only be used by qualified and trained personnel or students.
4. Before undertaking an unfamiliar activity employees and students should consult each chemicals Safety Data Sheets, (SDS) and use proper precautions to minimize chemical exposure.
5. The decision to use a particular substance should be based on the best practice knowledge of each chemical's particular hazard and the availability of proper handling facilities and equipment.

C. Responsibilities

Responsibility for chemical hygiene rests at all levels, from the highest administrative level to the individual employee. The specific components of this responsibility are assigned to those units and/or individuals best positioned and suited to carry out that responsibility.

1. **President**
    a. The President, as executive officer, has the ultimate responsibility for chemical hygiene at Randolph Community College. The President should, with prudent advice from other administrators, provide continuing support for Randolph Community College chemical hygiene

programs, including development and enforcement of the chemical hygiene plan.

b. The President of Randolph Community College is responsible for enforcement of all federal, state, and local health, safety, and environmental regulations and policies including the chemical hygiene plan.

2. **Chemical Hygiene Officer**

The Director of Safety and Emergency Preparedness, with aid from the Lab Safety Coordinator, will serve as the Chemical Hygiene Officer. The Chemical Hygiene Officer should be qualified by training and experience to provide technical guidance, development, and implementation of the Chemical Hygiene Plan. The Chemical Hygiene Officer's responsibilities include:

a. Develop and implement the chemical hygiene plan and the safety plan for Randolph Community College including training, reporting and other functions as needed.
b. Assure that the chemical hygiene plan is reviewed annually and revised as needed so that it is always in compliance with current legal and regulatory requirements.
c. Work with administrators and instructors to develop and implement the safety program and chemical hygiene plan.
d. Assure that inspections in the laboratory are performed and records of inspections are maintained.
e. Monitor the procurement, use and disposal of chemicals used at Randolph Community College.
f. Provide technical assistance to employees on the chemical hygiene plan requirements.
g. Make decisions regarding requests to use chemicals identified as explosive, carcinogenic, mutagenic, highly toxic, or otherwise unsuitable for general instructional laboratories.
h. Determine the need for personal protective equipment.
i. Implement appropriate training with regard to chemical hygiene for all employees whose normal work locations include laboratory areas.
j. Ensure that employees have access to the chemical hygiene plan SDS's, and other suitable reference materials.

3. **Department Heads**

All laboratory supervisors, having direct supervisory authority are responsible for maintaining a laboratory environment that protects the health and safety of employees under their supervision and ensures ongoing regulatory compliance. They are also responsible for having an updated list for all SDS's in the laboratory area.

Department Heads are responsible for monitoring compliance with Randolph Community College Chemical Hygiene Plan within their department and

enforcement of all federal state and local health, safety and environmental regulations and policies.

4. **Randolph Community College Employees**
   Randolph Community College employees and students who normally work in a laboratory are responsible for:
   a. Participating in training programs provided by Randolph Community College.
   b. Maintaining an awareness of health and safety hazards.
   c. Planning and conducting each operation in accordance with Randolph Community College Chemical Hygiene Plan.
   d. Consulting reference materials, including SDSs, related to chemical safety.
   e. Reporting accidents, injuries, unsafe practices and conditions.

D. Standard Operating Procedures

The following general prudent practice guidelines have been shown through experience to be useful for avoiding accidents or reducing injuries associated with the laboratory use of hazardous chemicals:

1. Recommendations for Safety
   a. Supervisors should be informed of accidents, conditions or work practices they believe to be a hazard to themselves, others or the environment.
   b. Before acquiring a chemical or conducting a procedure, lab chemical users must know the hazards and plan and/or acquire or develop appropriate hazard control and emergency equipment.
   c. Users need to know the hazards, safe handling procedures, hazard control measures, proper storage, waste disposal procedures and emergency procedures in advance to work safely.
   d. Every employee involved with the laboratory use of hazardous chemicals must be properly trained in chemical hygiene.
   e. There are general prudent safe work practices that apply to all lab chemical use. Additional precautions are provided for those chemicals with significant potential to harm in the short or long-term (i.e., highly toxic, cancer, reproductive, explosive, flammable hazards).
   f. Every chemical in the lab should be labeled, accounted for and have a definite, proper storage place in the lab. This minimizes safety and health hazards to personnel, equipment, buildings and the environment.
   g. Lab chemical users are responsible for ensuring that all hazardous chemical wastes are disposed of accordingly. Failure to do so could have serious consequences.
   h. Chemical users must plan for the possibility that things may go wrong and be prepared to react appropriately with suitable emergency equipment to minimize injury to personnel and damage to equipment, buildings and the environment.

i. Eating, drinking, gum chewing, application of cosmetics, manipulation of contact lenses and other such activities are restricted.
j. Horseplay is prohibited.
k. Employees or students should not work alone in the lab or chemical storage area.
l. “Wafting” (waving the hand over the opening of the container) to test chemical odors should only be done with extreme caution and only when specifically directed to do so in the written experimental procedure.
m. Chemicals should never be tasted.
n. Always use a bulb or other device for suction. Never pipette by mouth.
o. Do not force glass tubing into rubber stoppers. Lubricate the glass and hold the tubing with a cloth towel as the tubing is inserted into the stopper.
p. Avoid loose or baggy clothing and dangling jewelry. Confine or tie back long hair. Sandals or any open toed shoes are not permitted in the laboratory.

2. Housekeeping
    a. In the event of glass breakage, gloves should be worn and a dust pan and broom used to clean up the broken pieces. Broken glass should be separated from other waste by placing it in a special container marked “Broken Glass”. If the glass was contaminated with chemicals, it must be treated and disposed of as hazardous waste.
    b. All laboratory areas must be kept clean. Floors should be cleaned daily.
    c. Place all wastes in appropriate, properly labeled, segregated receptacles.
    d. Sinks are to be used only for disposal of water and certain solutions designated by the instructor. Other solutions must be placed in the appropriate labeled waste container.
    e. Tabletops are to be swept clean and washed at the end of the lab activity.
    f. Chemicals should not be stored in aisles, on the floor, in stairwells, on desks or laboratory tables.
    g. Before leaving the laboratory, turn off services (gas, electricity, water).
    h. Keep all cabinets and drawers closed when not in use to avoid catching and bumping hazards.

3. Chemical Procurement
    a. Hazardous chemicals shall be ordered in the smallest practical quantity for the application and within applicable storage quantity limitations. “Less is better” should be the guide for purchasing chemicals. The lower the chemical inventory, the fewer the problems associated with storage, and excessive costs to dispose of outdated or surplus chemicals. Chemicals should be ordered in quantities that are likely to

be consumed in one year or less and should be purchased in the quantities for sufficient use.

b. Chemical manufacturers and suppliers are required to supply a copy of a material safety data sheet the first time the chemical is purchased.
c. The chemical inventory list and SDS book should be updated each time a chemical is received.
d. All chemicals should be stored in sturdy, appropriate containers sealed tightly
e. Labels on incoming containers of hazardous chemicals are not to be removed or defaced.
f. All chemicals should be accompanied by an SDS and adequate identifying labels with proper handling, storage, and disposal instructions.
g. The container should be marked with the full level and date(s) it is received and opened by the user of the chemical.
h. Donated chemicals should be accepted only after approval is obtained from the Chemical Hygiene Officer. It should be established that the donated chemical is in excellent condition, that an appropriate SDS is available, and that there is a specific use for the donated material.

4. Prior Approval
    a. Whenever a new laboratory experiment or test is to be conducted, prior approval should be obtained from the Chemical Hygiene Officer. This approval should also be sought for experiments that have not been performed recently or for which the potential for harm is present.
    b. A list of acceptable chemicals should be developed for use in the classroom. An employee who desires to use a substance that is not on the acceptable list must seek the permission of the chemical hygiene officer. The decision to use the chemical will be based on the best practices knowledge of the user and the availability of proper handling facilities and equipment.
    c. The potential for harm may be affected by a change in the amounts of materials being used, the conditions under which the experiment is to be conducted, or the substitution, deletion or addition of a chemical.

5. Storage and Distribution
    The storage of hazardous chemicals shall be accomplished in a manner that minimizes safety and health hazards to personnel, equipment, buildings, and the environment.
    a. If a chemical has been transferred to a secondary container, the new container should be appropriately labeled including all of the hazard information.
    b. The classification system used for the storage of chemicals should be displayed in the principal storage area. Chemicals should be stored based on the reactive nature, and compatibility group.

c. Large containers and containers with reactive chemicals, such as acids and bases, should be stored separately on lower shelves.
d. Combustible packaging material such as paper and boxes should not be stored near flammable chemical storage cabinets.
e. All storage areas should be securely locked when not in use. Storage and preparation areas should be accessible only to those persons authorized to use the chemicals.
f. Glass bottles containing highly flammable liquids (Class 1A) shall not exceed 500 ml. For larger volumes, metal or approved plastic may not exceed one (1) gallon, and safety cans shall not exceed two (2) gallons (NFPA 45).
g. Chemicals should not be distributed to other persons or to other areas of the college without the prior approval of the Chemical Hygiene Officer.
h. Chemicals should not be transferred to another location without a copy of the appropriate Safety Data Sheet nor without assurance that the person receiving the chemicals has had appropriate training in their use, storage and disposal.
i. Refrigerators used to store flammable chemicals shall be labeled and shall be of explosion proof or of lab safe design (NFPA 45). Household refrigerators are not to be used to store flammable chemicals.

6. Flammables Storage
"Flammable liquid" means any liquid having a flashpoint below 100 degrees F (37.8 degrees C), except any mixture having components with flashpoints of 100 degrees F (37.8 degrees C) or higher.
    a. Not more than 25 gallons of flammable or combustible liquids may be stored in a room outside of an approved storage cabinet.
    b. Not more than 60 gallons of flammable (flashpoint below 140 degrees F) or 120 gallons of combustible (flashpoint at or above 140 degrees F) may be stored in any one storage cabinet.
    c. Not more than three storage cabinets may be present in a single storage area. Quantities in excess of the above shall be stored in an inside storage room constructed to meet the specifications for the particular stored material (e.g., paint) as set forth in Standard Methods of Fire Test of Building Construction and Materials, NFPA 251- 1969.
    d. When transferring significant quantities of flammable liquids from one container to another, it is particularly important that the containers be properly grounded to prevent accidental ignition of flammable vapors and liquids from static electricity or other sources of ignition.

E. Compressed Gas

When hazardous compressed gases are purchased, they shall either be bought in returnable cylinders or the vendor should agree to take back used non-returnable cylinders

1. Compressed Gas Storage

   The storage of compressed gas cylinders requires some basic precautions and guidelines:

   a) Cylinders are required to be secured in an upright position on a firm foundation (or otherwise firmly secured) in a safe, dry, well-ventilated place prepared and reserved for the purpose.
   b) Cylinders should not be kept in unventilated enclosures such as lockers.
   c) Cylinders should not be stored in the same area as flammable substances such as oil and volatile liquids, or near sources of heat such as radiators or furnaces.
   d) Cylinders should not be stored near elevators, gangways, stairwells or other places where they can easily be knocked down or damaged.
   e) Cylinder use should be planned so that cylinders are used in the order that they are received from the supplier
   f) Empty and full cylinders are required to be stored separately, with empty cylinders being plainly identified as such to avoid confusion.
   g) LPG tanks shall not be stored inside a building.
   h) Storage locations shall have a BC type fire extinguisher of at least 20 pound capacity.
   i) Oxygen cylinders should not be stored within 20 feet (6 meters) of highly combustible materials, oil, grease, wood shavings or cylinders containing flammable gases.
   j) Oxygen and acetylene are typically paired on a common transfer cart for use. If closer than 20 feet, cylinders should be separated by a wall at least five feet high, with a fire-resistance rating of at least 30 minutes.
   k) Hydrogen cylinders storage locations shall be permanently placarded as follows: “HYDROGEN-FLAMMABLE GAS-NO SMOKING-NO OPEN FLAMES” or equivalent.
   l) Acetylene and liquefied fuel gas cylinders should be stored with the valve end up. If storage is within 100 feet (30.5 meters) of each other and not protected by automatic sprinklers, the total capacity of acetylene cylinders stored and used inside the building should be limited to 2,500 cubic ft.

F. Waste Disposal

Laboratory Supervisors are responsible for ensuring that all used and/or unneeded hazardous chemicals, or articles irreversibly contaminated with these hazardous chemicals are disposed of according to the rules established by Randolph Community College. Generators of hazardous waste which is not acceptable for disposal are financially responsible for the proper and legal disposal of such materials.

Randolph Community College and the Chemical Hygiene Officer shall ensure that the disposal of laboratory chemicals is in compliance with the North Carolina Department of Environment and Natural Resources.

Randolph Community College is considered an Exempted Small Quantity Generator (SQG) and must not generate more than 100 kg of hazardous waste or 1 kg of acutely hazardous waste in each calendar month.

1. Guidelines for Waste Minimization
   The cost of disposing of excess and waste chemicals has become extremely expensive, and frequently exceeds the original cost of purchasing the chemical. Every reasonable effort shall be made to reduce the generation of hazardous waste.
   a. Substitutions, either of chemicals or experiments, should only be made to reduce hazards without sacrificing instructional objectives.
   b. When the risk outweighs the benefit and no substitute is available, then the experiment, procedure, or chemical should be eliminated.
   c. Employees shall minimize generation of hazardous wastes (micro scale labs, selecting less hazardous materials, etc.).
   d. Chemicals should be ordered in quantities that are likely to be consumed in one year or less.
   e. Avoid the inadvertent accumulation of hazardous waste. Potential waste materials are surplus, old, and/or unnecessary chemicals.
   f. Prior to ordering new chemicals, using existing chemicals, or creating products from reactions, employees shall determine if the material should be treated as hazardous waste.

2. Guidelines for Hazardous Waste Disposal
   Laboratory Supervisors are responsible for ensuring that all used and/or unneeded hazardous chemicals or articles irreversibly contaminated with these hazardous chemicals are disposed of appropriately.
   a) Solutions of toxic substances shall not be poured down the drain.
   b) Separate waste containers should be provided for heavy metal compounds, chlorinated hydrocarbons, non-chlorinated hydrocarbons and any other categories recommended by your hazard waste transporter company. Separation of wastes in this manner will make disposal less costly.
   c) Waste chemicals should be stored in appropriately labeled containers.

d) Hazardous wastes should never be placed in the common trash.
e) All waste containers should have an up-to-date log of the material that is being stored in that container:
    1. the chemical name,
    2. the amount of the chemical, and
    3. the date and the initials of the individual adding the hazardous chemical shall be recorded in the log for that container.
f) Waste materials should not be stored in the under the fume hood.

G. Chemical Spills and Other Accidental Releases

If the situation is life or health threatening or you are unsure, immediately evacuate the laboratory, floor, or building (whatever is appropriate), shut doors to the area and alert those in the vicinity to do the same. If necessary, activate the nearest fire alarm and evacuate the building.

1. From a remote location, immediately call emergency services as dictated by your campus emergency response plan.

2. If the chemical involved in the spill is judged to present an immediate hazard, evacuation is to be absolute, and the area should be isolated until a HAZMAT team arrives.

3. If hazardous vapors are present, the area should be isolated, and evacuated. This will frequently mean waiting for the arrival of a HAZMAT team.

4. If a volatile, flammable material is spilled, turn off all electrical apparatus and evacuate the area.

5. If the spill material was a hazardous chemical, all of the materials involved in the cleanup will usually be considered to be hazardous waste and must be disposed of as such.

6. Mercury Spill
    a. Each lab should have immediate access to a Mercury Spill Kit, which may be acquired through lab purchasing supply.
    b. Restrict foot traffic in the area, protect sinks and floor drains from contamination.
    c. Do not put sulfur on the spill; it hinders clean-up and makes ultimate disposal difficult and more expensive

7. If there is no immediate danger (flammable, toxic, reactive, corrosive) to personnel, containment should be accomplished by use of materials in the laboratory's material spill kit. A spill kit should be accessible for each science laboratory. The spill kit should include:
    a. Spill control pillows

b. Inert absorbents such as vermiculite, clay, sand, or kitty litter
c. Neutralizing agents for acid spills such as sodium carbonate and sodium hydrogen carbonate
d. Neutralizing agents for alkali spills such as sodium hydrogen sulfate and citric acid
e. Quantities of cleanup materials sufficient for the largest anticipated spill.
f. Large plastic scoops and other equipment such as brooms, pails, bags, and dust pans.
g. Appropriate personal protective equipment

8. Consult the SDS for appropriate cleanup procedures.

9. If the quantity of the spilled material exceeds the employee's ability or training, seal the area until appropriately trained personnel arrive.

10. If the situation is not health-threatening and trained people and proper clean-up equipment are on hand, clean-up the spill and dispose of waste materials properly.

H. Engineering Controls

All hazards can be controlled and this can most effectively be accomplished by first applying engineering controls (e.g., ventilation, isolation, etc.) that are supplemented by administrative controls (e.g., training, policies, procedures, etc.). Personal protective equipment (e.g., gloves, goggles, lab coats, etc.) is only considered when other controls are not technically or operationally sufficient or financially feasible.

Engineering controls may be defined as an installation of equipment or other physical facilities including, if necessary, the selection and arrangement of experimental equipment. Engineering controls remove the hazard, either by initial design specifications or by applying methods of substitution, minimization, isolation or ventilation.

Engineering controls are the most effective hazard control methods, especially when introduced at the conceptual stage of planning when control measures can be integrated more readily into the design. They tend to be more effective than other hazard controls (administrative controls and personal protective equipment) because they remove the source of the hazard or reduce the hazard rather than lessen the damage that may result from the hazard.

1. Substitution
   Substitution refers to the replacement of a hazardous material or process with one that is less hazardous (e.g. the replacement of mercury thermometers with alcohol thermometers or dip coating materials rather than spray coating to reduce the inhalation hazard).

Substitution is usually the least expensive and the most positive method of controlling hazards and should always be the first engineering hazard control measure considered.

2. Minimization
   Minimization is the expression used when a hazard is lessened by scaling down the hazardous process. Hence, the quantity of hazardous materials used and stored is reduced, lessening the potential hazards (e.g. using micro-scale glassware so that chemical reactions can be carried out on a smaller scale).

   Minimization should always be the next engineering control measure attempted after examining substitution followed by the consideration of isolation.

3. Isolation
   Isolation is the term applied when a barrier is interposed between a material, equipment or process hazard and the property or persons who might be affected by the hazard (e.g. glove box, blast shield).

   Isolation is particularly useful when the material, equipment or process requires minimal contact or manipulations. When these previously mentioned control methods are not feasible, ventilation is the next desirable engineering option.

4. Ventilation
   Ventilation is used to control toxic and/or flammable atmospheres by exhausting or supplying air to either remove hazardous atmospheres at their source or diluting them to a safe level.
   a. The two types of ventilation are typically termed local exhaust and general ventilation. Local exhaust attempts to enclose the material, equipment or process as much as possible and to withdraw air from the physical enclosure at a rate sufficient to assure that the direction of air movement at all openings is always into the enclosure (e.g. fume hood).
   b. General ventilation attempts to control hazardous atmospheres by diluting the atmosphere to a safe level by either exhausting or supplying air to the general area (e.g. evaporative cooler).
   c. Local exhaust is always the preferable ventilation method but is typically more costly. For some situations, general ventilation may suffice but only if the following criteria are met: only small quantities of air contaminants are released into the area at fairly uniform rates; there is sufficient distance between the person and the contaminant source to allow sufficient air movement to dilute the contaminant to a safe level; only materials of low toxicity or flammability are being used; there is no need to collect or filter the contaminant before the exhaust air is

discharged into the environment (including the rest of the building), and the contaminant will not produce corrosion or other damage to equipment in the area or in any way affect other building occupants outside the general use area (e.g. foul odors).

5. Fume Hoods
   A standard fume hood is a fire and chemical resistant enclosure with one opening (face) in the front with a movable window (sash) to allow user access into the interior. Large volumes of air are drawn through the face and out the top to contain and remove contaminants from the laboratory.
   a. Laboratory fume hoods are the most important components used to protect laboratory employees and students from exposure to hazardous chemicals and agents used in the laboratory.
   b. Laboratory fume hoods are not meant for either storage or disposal of chemicals. For example, if a hood must be used for storage, it may not provide adequate ventilation for flammable chemicals.
   c. Laboratory activities that may release airborne contaminants, hazardous vapors or gaseous substances above the Permissible Exposure Limit (PEL) or Thresholds Limit Value (TLV) concentrations must be carried out in the fume hood.
   d. In most cases, the recommended face velocity of a fume hood is between 80 and 100 feet per minute (fpm).
   e. Any fume hood that does not pass inspection must be taken out of service immediately, and should not be used until the hood has been repaired and will pass inspection.
   f. Fume hood air velocity should be tested at least annually.

I. Administrative Controls

Administrative controls consist of managerial efforts to reduce hazards through planning, information and training (e.g. hazard communication), written policies and procedures (i.e. the Chemical Hygiene Plan), safe work practices, and environmental and medical surveillance (e.g. work place inspections, equipment preventive maintenance, and exposure monitoring).

Because they primarily address the human element of hazard controls, they are of vital importance and are always used to control chemical hazards.

1. Chemical Inventory
   a. A chemical inventory should be updated each time a chemical is received or consumed. The list should be audited for accuracy at least annually. The chemical inventory list should contain the following information about each chemical found in storage:
      i) Physical location of the chemical,
      ii) the chemical name,
      iii) manufacturer,
      iv) estimated quantity and
      v) SDS.

b. You may add other information such as, is the chemical extremely hazardous, a carcinogen, the CAS number, container type/size and if it is a liquid or solid.

c. A printed copy of the most recent inventory should be kept by the chemical hygiene officer.
d. Laboratory chemicals should be properly labeled to identify any hazards.
e. All chemicals should remain stored in their original bottle. The original manufacturer's label identifying potential hazards, the date of purchase, the date opened and the initials of the person who opened the container.
f. If a chemical has been transferred to a secondary container, the new container should be appropriately labeled with the chemical name, formula, concentration (if in solution), solvent (if in solution), hazard warnings and name or initials of the person responsible for the transfer.
g. Unlabeled bottles should not be opened, and such materials should be disposed of promptly.
h. Emergency telephone numbers shall be posted in all laboratory areas.
i. Emergency evacuation and appropriate warnings signs shall be used to indicate the location of exits, evacuation routes, safety showers, eyewash stations, fire extinguishers, fire blankets, first aid kits, fume hoods and other safety equipment.
j. Posters to reinforce laboratory safety procedures are recommended.

2. Personal Protective Equipment
   Only when adequate engineering and administrative hazard controls are not technically, operationally or financially feasible, personal protective equipment (PPE) must be considered as a supplement. PPE does not eliminate hazards but merely minimizes damage from hazards.
   a. Personal protective equipment (PPE) includes a wide variety of items worn by an individual to isolate the person from chemical hazards.
   b. PPE includes articles to protect the eyes, skin, and the respiratory tract (e.g. goggles, face shields, coats, gloves, aprons, respirators). In some situations, PPE may be the only reasonable hazard control option, but for many reasons it is the least desirable means of controlling chemical hazards.
   c. The effectiveness of PPE is highly dependent on the user.
   d. Each type of PPE has specific applications, advantages, limitations and potential problems associated with their misuse, and those using PPE must be fully knowledgeable of these considerations.
   e. PPE must match the hazards and the conditions of use and be properly maintained in order to be effective. Their misuse may directly or indirectly contribute to the hazard or create a new one.

f. The material of construction must be compatible with the chemical's hazards and must maximize protection, dexterity and comfort. It is the responsibility of Randolph Community College to provide appropriate safety and emergency equipment for employees.
g. Laboratory aprons or coats, eye protection and non-permeable gloves are considered standard equipment for school laboratory programs and should be readily available to employees and students.
h. Lab coats or aprons worn in the laboratory should offer protection from splashes and spills and should be fire resistant and easy to remove in case of an accident.
i. All eye protection devices should conform to ANSI Standard Z87.1-2010.
j. Eyeglasses, even with side shields, are not acceptable protection against chemical splashes. Chemical splash safety goggles should be used as the standard protective eyewear. Such goggles should fit the face surrounding the eyes snugly to protect the eyes from a variety of hazards.
k. Any experiment that involves heating glassware or chemicals shall require the use of chemical splash safety goggles. The goggles also serve to reduce dust and fumes from reaching the eye.
l. Chemical splash goggles must be worn at all times when contact lenses are worn.
m. Full face shields protect the face and throat. They must be worn for protection when there is a greater risk of injury from flying particles and harmful chemical splashes. A full face shield should also be worn when an operation involves a pressurized system that may explode or an evacuated system that may implode. For full protection, safety goggles must be worn with the face shield.
n. Standing shields should be used when there is a potential for explosions, implosions or splashes, or when corrosive liquids are used.
o. A standing shield should be used for group protection from chemical splash and impact. The standing safety shield should be used with safety goggles and, if appropriate, with a face shield.
p. When gloves are required, many kinds of gloves are available but are not always suitable for all situations. The SDS should be consulted for information regarding the proper type of gloves to be used.

J. Safety/Emergency Response and Equipment

1. Randolph Community College should ensure that adequate emergency equipment is available in the laboratory and inspected periodically to ensure that it is functioning properly. All affected employees should be properly trained in the use of each item.

2. Never block access to emergency equipment, showers, eyewashes, or exits. Exit doors will be clearly marked and free of obstructions to permit a quick and safe escape in an emergency.

3. Never leave a flame unattended. Proper Bunsen burner procedures shall be followed at all times. Should a fire drill or any other evacuation occur during a lab activity, turn off all Bunsen burners and electrical equipment. Leave the room as directed.

4. Safety equipment will be tagged following an inspection showing the date, inspector and results.

5. Emergency equipment items that should be available include: eyewash stations, fire extinguishers of the appropriate type, safety showers, first aid kits, telephone for emergencies, fire blankets and identification signs.

6. Multipurpose fire extinguishers should be available in the laboratory. A multipurpose, ABC fire extinguisher can be used on all fires EXCEPT for class D fires (burning metal). Extinguishers should be visually checked monthly and inspected and tested annually.

7. All eye wash stations and safety showers will be capable of supplying a continuous flow of aerated, tepid, potable water to both eyes for at least 15 minutes. The valve should remain in the open position without the need to hold the valve.

8. Each storeroom should be equipped with a heat sensor and smoke alarm.

9. All electrical outlets should have a grounding connection accommodating a three prong plug.

10. In case of emergency, employees should know how to cut off electricity to the laboratory

11. Laboratory lighting should be on a separate circuit from electrical outlets.

12. If electrical equipment shows evidence of over-heating, it should be immediately unplugged.

13. Ground-fault circuit interrupters (GFCI) as required by code to protect users from electrical shock.

K. Training Requirements

1. The objective of the employee/student training and information program is to ensure that all individuals at risk are adequately trained and informed about:
    a. The laboratory standard, 29 CFR 1910,
    b. Safety Data Sheets, (SDS),
    c. proper labeling,
    d. the chemical hygiene plan,

e. the physical and health hazards associated with hazardous chemicals present in the laboratory,
f. the proper procedures to minimize risk of exposure, and
g. the proper response to accidents.

2. Records of any employee training, air concentration monitoring, exposure assessments, medical consultations and medical examinations must be kept for at least thirty (30) years after the employee ceases employment with Randolph Community College.

3. Such information shall be provided at the time of the employee's initial assignment to a work area where hazardous chemicals are present and prior to reassignments into other areas where there may be exposure situations.

4. All employees should be trained in the methods and observations that may be used to detect the presence or release of hazardous chemicals.

5. Employees shall be informed of the signs and symptoms associated with exposures to hazardous chemicals used in the laboratory.

6. The frequency of refresher information and training shall be determined by Randolph Community College.

L. Medical Consultations and Examinations

Randolph Community College laboratory instructors do not regularly handle significant quantities of materials that are acutely or chronically toxic; therefore, regular medical surveillance is not necessary.

1. Factors which may raise the possibility of overexposure and therefore warrant an initial measurement of employee exposure include:
    a. The manner in which the chemical procedures or operations involving the particular substances were conducted.
    b. The existence of historical monitoring data that shows elevated exposures to the particular substance for similar operations.
    c. The use of a procedure that involves significant quantities or is performed over an extended period of time.
    d. There is reason to believe that an exposure limit may be exceeded.
    e. Signs or symptoms of exposure (e.g., skin or eye irritation, shortness of breath, nausea or headache)

2. If the substance in question does not have exposure monitoring or a medical surveillance requirement, exposure monitoring and medical surveillance shall be continued until exposure levels are determined to be below the action level or 50% of the Permissible Exposure Limits (PEL). In the absence of PEL, the American Congress of Governmental Industrial Hygienist Threshold Limit Values (ACGIH TLV) should be referenced.

3. If the initial monitoring discloses employee exposure over the action level or in the absence of an action level, the PEL, the employer shall immediately comply with the exposure monitoring provisions of the relevant standard for that substance.

4. The employer shall, within fifteen (15) working days after the receipt of any monitoring results, notify the employee of these results.

5. The following substances are regulated by OSHA standards and require monitoring: lead, benzene, 1, 2-dibromo-3-chloropropane, acrylonitrile, ethylene oxide, formaldehyde, asbestos, vinyl chloride and inorganic arsenic.

6. In the event that an employee is exposed to levels of a hazardous chemical that exceeds the established PEL or TLV, or should the employee exhibit signs or symptoms of such exposure, the employee should seek appropriate medical attention.

7. All medical examinations and consultations shall be provided without cost to the employee and shall be performed by or under the direct supervision of a licensed physician, without loss of pay and at a reasonable time and place.

M. Hazardous Chemicals

This section of the plan describes the specific and general control measures that are designed to reduce the exposure of instructors, aides, other employees and students to extremely hazardous substances (EHS). Employees should read and understand these practices before commencing a procedure using extremely hazardous substances

EHSs include highly toxic chemicals, reproductive toxins and select carcinogens. In addition, our laboratory may contain highly flammable chemicals, highly reactive chemicals and highly corrosive chemicals.

The use of these substances requires prior approval of the Chemical Hygiene Officer.

EHSs shall be used only in designated areas and in fume hoods as directed by the instructor.

The use of EHSs shall require removal of contaminated waste and the decontamination of contaminated areas.

1. Highly Toxic Chemicals
   Examples of highly toxic chemicals (acute or chronic) that were commonly used in the past are benzene, chloroform, formaldehyde, bromine, carbon disulfide, carbon tetrachloride, cyanide salts, and hydrofluoric acid.

a. When a PEL or TLV value is less than 50 ppm or 100 mg/m3, the user should use it in an operating fume hood, glove box, vacuum line, or other device equipped with appropriate traps. If none is available, no work should be performed using the chemical.
b. If a PEL, TLV or comparable value is not available, the animal or human median inhalation lethal concentration information, LC 50, should be used as a guideline. If that value is less than 200 ppm or 2000 mg/m3 when administered continuously for one hour or less, then the chemical should be used in an operating fume hood, glove box, vacuum line or other device equipped with appropriate traps. If none are available, no work should be performed using that chemical.

Commonly Used Term	LD_{50} Single Oral Dose for Rats (g/kg)	4-hr Vapor Exposure Causing 2-4 Deaths in 6-rat Groups (ppm)	LD_{50} Skin for Rabbits (g/kg)	Probable Lethal Dose for Humans
Extremely toxic	≤0.001	<10	≤0.005	Taste (1 grain)
Highly toxic	0.001-0.05	10-100	0.005-0.043	1 tsp (4 cc)
Moderately toxic	0.05-0.5	100-1,000	0.044-0.340	1 oz (30 cc)
Slightly toxic	0.5-5.0	1,000-10,000	0.35-2.81	1 pint (250 gm)
Practically nontoxic	5.0-15.0	10,000-100,000	2.82-22.6	1 quart
Relatively harmless	>15.0	>100,000	>22.6	>1 quart

2. Highly Flammable Chemicals
Class 1A liquids are highly flammable chemicals with a flashpoint of less than 100° F. Examples of highly flammable chemicals are diethyl ether, acetone, pentane, petroleum ether, acetaldehyde and ligroines.

3. Highly Reactive Chemicals
   Reactivity information is often located in a manufacturer's MSDS and on chemical labels.

   A reactive chemical is one that:
   - Is described as such on the label or in the SDS.
   - Is ranked by the NFPA as 3 or 4 for reactivity.
   - Is identified by the Department of Transportation (DOT) as an oxidizer, an organic peroxide, or an explosive (Class A, B, or C).
   - Fits the Environmental Protection Agency definition of reactive in 0 CFR 261.23.
   - Is known or found to be reactive with other substances.

     a. Reactive chemicals should be handled with all proper safety precautions including segregation in storage and prohibition of mixing even small quantities with other chemicals without prior approval and appropriate personal protection and precaution.
     b. Examples of commonly encountered highly reactive chemicals are ammonium dichromate, nitric acid, perchloric acid, hydrogen peroxide, and potassium chlorate, azides, organic nitrates and acetylides.

4. Highly Corrosive and Contact Hazard Chemicals
   Corrosively, allergen, and sensitizer information is provided in manufacturers' MSDS and on labels.

   A corrosive chemical is one that:
   - Fits the OSHA definition of corrosive in 29 CFR 1910. 1200
   - Fits the EPA definition of corrosive in 40 CFR 261.22 (has a pH greater than or equal to 12.5 or a pH less than 2.5)
   - Is known to be reactive to living tissue, causing visible destruction or irreversible alterations of the tissue at the site of contact.

A contact hazard chemical is an allergen or sensitizer that:
- Is so identified or described in the SDS or on the label.
- Is so identified or described in medical or industrial hygiene literature.
- Is known to be an allergen or sensitizer.

  a. Corrosive and contact hazard chemicals should be handled with all proper safety precautions including wearing safety goggles, a laboratory apron or laboratory coat, using gloves tested for the absence of pinholes and known to be resistant to permeation or penetration by the chemical.

b. Examples of highly corrosive chemicals are hydrochloric, sulfuric, nitric, phosphoric, and perchloric acids (all acids in greater than 1 Molar concentration), and potassium hydroxide (either solid or in aqueous solution greater than 1 Molar concentration).

5. Reproductive Toxins

A reproductive toxin refers to chemicals which affect reproductive capabilities including chromosomal damage (mutations) and which effect fetuses (teratogenesis). No reproductive toxins should be allowed in Randolph Community College laboratories without written authorization from the Chemical Hygiene Officer.

A reproductive toxin is a compound that:

- Is described as such in the applicable SDS or label.
- Is identified as such by the Oak Ridge Toxicology Information Resource Center (TIRC), (615) 576-1746.

Examples of reproductive toxins are organomercurial compounds and ethidium bromide, carbon disulfide, xylene, toluene, benzene, mercury, lead compounds, ethyl ethers, vinyl chloride.

If such chemicals are used:

a. They should be handled only in a hood and when satisfactory performance of the hood has been confirmed.
b. Skin contact should be avoided by using gloves and wearing protective apparel.
c. Persons using such substances should always wash hands and arms immediately after working with these materials.
d. Unbreakable containers of these substances should be stored in a well ventilated area and will be labeled properly.

6. Carcinogens

Carcinogen means any substance regulated by OSHA as a carcinogen or suspect carcinogen.

a) All work with these substances should be conducted in a designated area, such as a fume hood, glove box or a portion of a laboratory designated for use of chronically toxic substances. Such a designated area should be clearly marked with warning and restricted access signs.
b) Any procedure that may result in a generation of aerosols or vapors should be performed in a hood whose performance is known to be satisfactory.
c) Skin contact should be avoided by using gloves and other protective apparel as appropriate. Any protective clothing should be removed before leaving the designated area and placed in a labeled container. Hands, arms, and neck should be washed after working with these materials.

d) Carcinogens should be stored in unbreakable containers in a ventilated area with controlled access. All containers should be labeled with the identity and hazard of the substance. Immediately upon completion of the project, all unused reproductive toxin should be disposed of following standard hazardous waste disposal procedures.
e) No carcinogens are allowed in Randolph Community College laboratories without written authorization from the Chemical Hygiene Officer.
f) Examples of select carcinogens are benzene, nickel metal dust, vinyl chloride, and formaldehyde.