PALO ALTO COLLEGE

CHEMICAL HYGIENE PLAN

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I. ADMINISTRATIVE

A. Purpose. The purpose of the Chemical Hygiene Plan (CHP) is to reduce the health risks placed on laboratory employees, faculty, staff and students using potentially hazardous chemicals. The CHP is written for Palo Alto College (PAC) to comply with the guidelines established by the U.S. Department of Labor, The Environmental Protection Agency and the Texas Administrative Code.

B. Scope. This CHP is applicable to all operational elements of PAC using hazardous chemicals in the laboratory setting. The procedures and policies set forth in this CHP are mandatory. This plan requires that personnel using potentially hazardous chemicals be trained in safe work practices, and be informed of the risks associated with the use of hazardous chemicals.

C. Responsibilities. Responsibility for the PAC CHP rests at all levels, including:

1. Department Chairperson. The Chairperson has the ultimate responsibility for ensuring health and safety within PAC laboratories and must provide continuing support for the Chemical Hygiene Program. The Chairperson can delegate the authority to implement the Chemical Hygiene Plan to a Chemical Hygiene Officer (CHO).

2. Laboratory Manager. The Laboratory Manager is responsible for monitoring application of the CHP, to include periodic reviews and evaluation of the CHP activities conducted within the Department.

3. Chemical Hygiene Officer. The primary responsibility of the CHO is to develop appropriate chemical hygiene policies and practices for the laboratories under their responsibility. The CHO is also responsible for:

   a. Monitoring procurement, use, and disposal of chemicals used in the laboratory (29 CFR 1910.1450) and ensuring that appropriate audits are conducted and documented.

   b. Advising Laboratory Manager, on CHP issues.

   c. Conducting pre-operational surveys of all new laboratory operations using hazardous chemicals.

   d. Reviewing the CHP at least annually and revising the document as necessary to reflect current regulatory practice. The results of the annual review will be discussed at the Safety Committee Meeting.

   e. Ensuring information is provided to the Alamo Area Community College District's for all areas of the laboratory utilizing hazardous chemicals.

f. Maintaining a list of chemicals that are routinely used in the laboratory which must be updated at least annually or as new chemicals are procured.

g. Ensuring training is provided to all employees on the hazards associated with laboratory operations and maintaining records of such training.

h. Ensuring Material Safety Data Sheets (MSDS) for hazardous chemicals that are used within the laboratories are maintained and available.

i. Ensuring that laboratory personnel receive job-related medical surveillance as directed by the ACCD Environmental Health/Safety Coordinator.

j. Ensuring that personnel receive Hazard Communication Standard training. (29 CFR 1910.1200)

k. Ensuring plans and specifications for all laboratory construction or renovation are reviewed to ensure appropriate design criteria are incorporated.

4. Laboratory Supervisors. Laboratory Supervisors are responsible for executing the CHP within their laboratories and ensuring compliance with all the facets of the CHP to include:

a. Writing of SOPs IAW this CHP with guidance from the CHO on CHP-related work practices within the section.

b. Informing laboratorians of workplace hazards and requirements of the CHP. Information is to be provided to the employee at his/her initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations.

c. Ensuring that workers get appropriate training on work practices and the use of personal protective equipment (PPE).

d. Ensuring that proper engineering controls and PPE are obtained and used.

e. Conducting and maintaining hazardous chemical inventories for all laboratories under their control.

f. Conducting inspections of laboratory areas to monitor compliance with the CHP.

g. Ensuring that laboratorians attend all scheduled training related to the CHP.

5. Laboratorians. Laboratory personnel are responsible for the following:

   a. Conducting laboratory procedures in accordance with the CHP and established SOPs.

   b. Attending scheduled training regarding chemical health and safety.

   c. Informing supervisors of recognized chemical hazards and, where possible, recommending changes to work practices to reduce hazards.

   d. Utilizing PPE as directed by the Safety SOPs, the CHO, and/or the supervisor.

   e. Managing laboratory waste in accordance with the Environmental Protection Agency (EPA) regulatory requirements.

   f. Any proposed change in laboratory procedure or alteration of engineering controls must be approved by the supervisor prior to implementation.

6. Alamo Colleges Environmental Health/Safety Coordinator. The coordinator is responsible for:

   a. Assisting the CHO in investigating reported incidents that resulted in, or could have resulted in, potential exposure to hazardous chemicals.

   b. Providing guidance on hazardous waste handling and disposal.

D. Information and Training Programs.

1. Personnel will be provided with information and training to ensure they are apprised of chemical hazards in the laboratory. The following health and safety information is to be provided (29 CFR 1910.1450).

   a. Contents of the OSHA Laboratory Standard and its appendices.

   b. Location and availability of the Chemical Hygiene Plan.

   c. PELs for OSHA regulated substance or recommended exposure limits for other hazardous chemicals where there is no applicable OSHA standard.

   d. Signs and symptoms associated with exposure to hazardous chemicals used in the laboratory.

   e. Location and availability of reference material, including MSDSs.

2. Personnel handling hazardous chemicals must be trained. Training will include the following (29 CFR 1910.1450):

   a. Methods and observations that may be used to detect the presence or release of a hazardous chemical.

   b. Physical and health hazards of chemicals in the work area.

   c. Laboratorians shall be trained in the details of the CHP, which include:

      (1) Standard Operating Procedures for handling selected carcinogens, reproductive and acute toxins, compressed gasses, combustibles, flammables, oxidants, and hazardous wastes.

      (2) Use of Material Safety Data Sheets (MSDS) and other hazardous chemical hazardous communications procedures.

      (3) General Emergency Procedures.

      (4) Use of common Personal Protective Equipment (PPE), engineering controls and work practices.

E. Laboratory SOPs. All Standard Operating Procedures for non-administrative functions must contain specific instructions on the safety precautions, safe handling procedures, and disposal procedures for all hazardous chemicals used or created in the procedure.

F. Signs and Labels. 29 CFR 1910, Subpart Z, requires employers to identify all devices, structures, and areas where hazardous materials are used or where possible hazardous situations exist. .

1. Post prominent signs and labels identifying the following:

   a. All hazardous chemical containers in the laboratory must have the original manufacturer's label showing the identity of the hazardous chemical(s) contained therein and appropriate hazard warning. Any hazardous chemical that is transferred to an additional container (e.g., stock solutions, buffers, etc.) must be labeled with the contents and any hazard warnings.

   b. Prominently label all safety showers, eyewash stations, other safety and first aid equipment, and exits. Also identify areas where food and beverage consumption and storage are permitted (administrative areas). Eating, drinking, chewing gum, and application of cosmetics or topical medications is prohibited in all laboratory areas except offices.

   c. Prominently label areas where special or unusual hazards exist.

d. Prominently label all refrigerators, dishes, silverware, and other items used for food storage, preparation, or consumption. These items are only permitted in the designated administrative areas. Laboratory containers/reagent containers will not be used to contain food for human consumption; likewise, food containers will not be used to contain chemical materials.

2. Guidelines for safety colors and specifications for accident prevention signs and tags are contained in 29 CFR 1910.1200.

II. PERSONAL PROTECTIVE EQUIPMENT

A. General. Personal Protective Equipment (PPE) and protective clothing ensure protection to personnel when exposed to potentially hazardous chemicals, materials, or working conditions.

1. Suppliers of protective equipment must provide comprehensive instructions as to their proper use, application, maintenance, and storage.

2. Personnel required to use such equipment will be trained in its proper use by the supervisor. The PPE will be inspected regularly. Do not use PPE with defects. Mark such items as unusable and repair or destroy.

3. Protective apparel and equipment for each laboratory shall be compatible with the required degree of protection for the substance being handled.

B. Eye and Face Protection. Employees will be provided access to suitable eye protection. The eye protection will meet the requirements of ANSI Standard Z87.1 (latest edition).

1. Supervisors must ensure that employees use appropriate eye and face protection when they are exposed to eye or face hazards from known hazardous chemicals or potentially injurious light radiation (UV, laser). Safety glasses will be considered the minimum eye protection to be used in the laboratory. Full face protection will be worn during operations where a significant splash hazard exists or where corrosives are used. Face shields will be worn when additional eye/face protection is necessary against splash or projectiles. Face shields will be used in combination with approved eye protection.

2. Laboratorians who wear prescription lenses should wear either eye protection that incorporates the prescription in its design or eye protection goggles that can be worn over prescription lenses without interference to vision.

3. Contact lenses should not be worn in the laboratory because hazardous gases and vapors may be trapped under contact lenses, and prolonged exposure to those gases and vapors may create the potential for increased eye damage.

4. Non-prescription safety goggles must be available to all laboratory workers.

C. Hand and Foot Protection.

1. Open-toe sandals are prohibited in all laboratories. Sturdy shoes with rubber (non-conducting) soles are recommended.

2. Appropriate gloves are to be worn whenever there is danger of an individual's hands being exposed to chemical, thermal, or biological hazards. If in doubt about the type of glove suitable for performing a specific function, consult the first-line supervisor or CHO.

D. Protective Clothing. All laboratorians are required to wear appropriate protective clothing when working in the laboratory. The degree of protective clothing needed is dictated by the potential health hazards associated with the type of chemicals required for a specific procedure.

1. The laboratory coats are disposable. The laboratory coat should be disposed of when it appears dirty and/or contaminated or at the discretion of the laboratorian and/or supervisor.

2. Rubber or plastic aprons must be worn for protection against corrosive or irritating chemicals. A laboratory coat and apron must be worn when there is the possibility of Corrosive, Caustic, or Oxidizer spills, splashes, or drips. Plastic aprons can accumulate static electricity and must be avoided in areas where flammable solvents are in use.

III. EMERGENCY PROCEDURES

A. General. The following instructions give guidance on the most common laboratory emergencies: chemical spills and personnel exposure to chemicals (chemical contaminations). In cases of an emergency, *remain calm*, notify your coworkers and emergency personnel, and take appropriate action.

B. Chemical Spills. Chemical spills are classified as either minor (under 1 gallon liquid or 1 kg solid material) or major (greater than 1 gallon liquid or 1 kg solid material). All accidents or near accidents shall be documented and carefully analyzed by the section supervisor, with the results of the investigation submitted to the CHO. Those involving personal injury must be reported in accordance with the Safety SOP. The laboratory supervisor should ensure spill control kits are available for commonly used chemicals in the area.

1. Major Spills. *In the event of a major spill, evacuate the area and contact the facilities. Then notify the supervisor, CHO, and the ACCD Environmental Health/ Environmental Coordinator – 254-0895.*

2. Minor Spills, Solid, Low Toxicity. Verify toxicity using MSDS. If low toxicity, sweep into a dust pan and place in a suitable container. Then notify the CHO. Use appropriate protective equipment and clothing to minimize chemical exposure during any spill clean-up.

3. Minor Spills, Liquid. Contain the spill with absorbents (paper towels, absorbent pads, etc.) then follow the relevant instructions below. If in doubt, call the CHO or check the MSDS. Use appropriate protective equipment and clothing to minimize chemical exposure during any spill clean up. Spill control kits are available commercially for many common types of spills. If a kit is available, use the instructions for clean-up contained in the kit.

    a. Inorganic Acids or Bases. Neutralize with appropriate chemical and place in suitable container for disposal. Then notify the CHO.

    b. Flammable Liquids. Immediately turn off all flames and heat sources. Ventilate area. Absorb liquid with absorbent pad and place in a suitable container for disposal. Then notify the CHO.

C. Personnel Exposure. All laboratory supervisors and the CHO personnel must have first aid training related to the likely chemical exposures in their section. In cases of severe chemical exposure, dial 911 immediately. All accidents or near accidents shall be documented and carefully analyzed by the section supervisor, with the results of the investigation submitted to the CHO. Those involving personal injury must be reported in accordance with the Safety SOP.

1. Routes of exposure. Routes of exposure may occur by:

    a. Inhalation.

        (1) Inhalation of toxic vapors, mists, gases, or dusts can produce poisoning by absorption through the mucous membrane of the mouth, throat, and lungs and can seriously damage these tissues by local action. Inhaled gases or vapors may pass rapidly into the capillaries of the lungs and be carried into the capillary system. This absorption can be extremely rapid. The rate will vary with the concentration of the toxic substance, its solubility in tissue fluids, the depth of respiration, and the amount of blood circulation, which means that it will be much higher when the person is active than when he or she is at rest.

(2) The degree of injury resulting from inhalation of toxic chemicals depends on the toxicity of the material and its solubility in tissue fluids, as well as on its concentration and the duration of the exposure.

b. Ingestion.

(1) Many chemicals may damage the tissues of the mouth, nose, throat, lungs, and gastrointestinal tract and produce systemic poisoning if absorbed through the tissues.

(2) Before eating, smoking, or applying cosmetics, laboratory workers should immediately wash their hands upon leaving the laboratory or working with chemicals to prevent entry of toxic chemicals into the mouth.

c. Skin and Eye Contact.

(3) A common result of skin contact is a localized irritation, but an appreciable number of materials are absorbed through the skin with sufficient rapidity to produce systemic poisoning. The main portals of entry for chemicals through the skin are the hair follicles, sebaceous glands, sweat glands, and cuts or abrasions of the outer layers of the skin. The follicles and glands are abundantly supplied with blood vessels which facilitates the absorption of chemicals into the body.

(2) Contact of chemicals with the eyes is of particular concern because these organs are so sensitive to irritants. Few substances are innocuous in contact with the eyes; most are painful and irritating, and a considerable number are capable of causing burns and loss of vision. Alkaline materials, phenols, and strong acids are particularly corrosive and can cause permanent loss of vision. Also, eyes are very vascular and provide for rapid absorption of many chemicals.

d. Injection. This route of exposure seldom occurs in the laboratory; however, it can inadvertently occur through mechanical injury from glass or other sharps.

2. Indicators of exposure.

a. Observable by others.

(1) Changes in skin complexion; skin discoloration.

(2) Lack of coordination.

(3) Changes in speech pattern.

(4) Changes in demeanor.

(5) Excessive salivation.

(6) Breathing difficulties.

(7) Coughing.

b. Non-observable by others.

(1) Headaches.

(2) Dizziness.

(3) Blurred vision.

(4) Cramps.

(5) Irritation of eyes, skin, or respiratory tract.

(6) Behavior changes.

3. Emergency Procedures.

a. Eye Contact. Immediately flush the eyes with a copious amount of water for at least 15 minutes. Hold the eye-lids apart to ensure adequate irrigation. Seek prompt medical attention.

b. Skin Contact. Remove contaminated clothing. Immediately flush the affected area with water. Wash the area with hand soap or mild detergent to remove any residual contamination. Seek prompt medical attention.

c. Ingestion. Refer to the MSDS for appropriate first aid procedures. Seek prompt medical attention.

d. Inhalation. Move the employee away from the exposure and into fresh air. Begin artificial respiration if breathing has stopped and use CPR if the heart has stopped if trained to do so. Seek prompt medical assistance.

4. Engineering Controls.

a. General Practice. Engineering controls including hoods, local exhaust ventilation and substitution of less toxic chemicals should be used to minimize exposure to all hazardous chemicals in the laboratory.

b. Laboratory operations which involve chemicals with a PEL or TLV of 100 ppm or less (gas or vapor) or 0.1 mg/m^3 or less (aerosol) will be planned and conducted using appropriate engineering controls. High-risk operations will be conducted inside primary containment, i.e., chemical hoods. Low-risk

operations where the potential for generation of gas, vapor or aerosol contamination is remote may be conducted on the open bench.

c. Chemical Hoods. The following work practice will be used to ensure adequate hood performance:

(1) Work with the hood sash closed as much as possible during the operation. Do not place your head inside the hood.

(2) Keep all apparatus and containers at least 8 inches behind the face of the hood to minimize spillage from the hood.

(3) Keep the slot in front of the lower hood baffle free from obstructions. Elevate all necessary apparatus and equipment.

(4) Minimize the storage of chemicals or hazardous waste inside the hood. Use an approved storage cabinet or satellite storage locations.

(5) Minimize pedestrian traffic past the open face of the hood. This may cause spillage of contaminants if the air turbulence which is created disrupts the flow of air at the hood face and within the hood.

(6) Fans in the immediate area of the hood should be turned off during use of a hood as the airflow may also increase air turbulence sufficiently to cause fume leakage.

IV. CHEMICAL PROCUREMENT, STORAGE, AND DISPOSAL

A. Chemical Procurement. Title 29 CFR 1910.1200 and 1910.1450 require that before a substance is received, information on proper handling, storage, and disposal should be known to those who will be involved. No container should be accepted without an adequate identifying label.

1. Material Safety Data Sheets (MSDS) must be on file for all chemicals on hand. One copy of the MSDS must be placed in the work area for easy access by employees. MSDSs should be obtained directly from the manufacturer of the chemical.

2. New Chemicals. Newly acquired chemicals must be recorded on the workplace chemical list. Receipt of an MSDS will be verified and a copy placed in the MSDS library.

3. Supervisors are reminded to practice good hazardous waste management by reducing the amount of hazardous chemicals procured and stored at PAC. Reduced levels of chemical procurement and storage minimizes the amount of hazardous waste generated, and lessens the possibility of a serious accident involving chemicals.

B. Chemical Storage.

1. General. Storage of chemicals at PAC should be minimized. Do not order large quantities of chemicals in advance. The following guidelines will be observed.

a. Chemical Inventory. All chemicals will be inventoried to the Workplace Chemical List (Appendix D). Each workplace is responsible for their inventory.

(1) Each laboratory shall inventory all its chemicals on an annual basis or as new chemicals are brought into the laboratory. The supervisors are responsible for this inventory and copies will be provided to the CHO.

(2) The inventory will list the chemical name (not just the Vendor's name, but the actual chemical's name), quantity on hand, and storage locations (include building and room numbers) within the laboratory.

(3) Copies of the inventories for each laboratory shall be maintained by the building CHO and made accessible to fire fighters or other response personnel in the event of an emergency.

b. Every chemical must be clearly labeled with its chemical name and any hazards which it presents (flammable, corrosive, etc.) to include the

National Fire Protection Association (NFPA) label. The NFPA label will include the chemical's flammability, reactivity, and biohazard rating.

c. Chemical storage on bench tops or in hoods is not permitted. This does not include properly labeled working quantities.

d. The CHO and laboratory personnel will routinely check all chemical containers and properly dispose of all excess chemicals, corroded containers, and any that have exceeded their specified expiration dates.

e. Place the chemical container into a secondary container when hand carrying reagents between laboratory areas or to the laboratory areas from storage facilities.

f. Stockrooms/storerooms shall not be used for preparing or repackaging chemicals.

g. All chemicals must be stored away from direct sunlight.

h. Always place compatible chemicals together in the storage area. See MSDS for chemical incompatibilities.

i. Store chemicals that are highly corrosive, toxic, or other chemicals whose spillage could cause a serious hazard or difficult cleanup~~,~~ in unbreakable secondary containers or in an appropriate spill pan with absorbent material.

2. Flammable and Combustibles. CAUTION: Use heating mantles, not Bunsen burners, for heating flammable and combustible chemicals.

a. All flammable and combustible liquids must be stored in a flammable storage cabinet.

b. Supervisors are advised not to store more than a two week supply of flammable or combustible liquids in a laboratory room.

c. Store all flammable and combustible liquids in glass, metal or plastic containers.

d. Store flammable (Class I) and combustible (Class II) liquids in approved safety cans when the container quantity exceeds 2 gallons in a safety cabinet.

e. Bulk quantities of flammable or combustible liquids will be stored in the flammable storage area. Transfer Class I liquids to smaller containers (not exceeding 2 gallons in capacity) from bulk containers under a chemical

hood or in an approved inside storage room. The transfer of Class I liquids from bulk containers exceeding 2 gallons shall be conducted in an approved inside storage room or outdoors. Do not transfer Class I liquids between metal containers unless the containers are electrically grounded.

f. Store refrigerated flammable liquids in explosion-proof or "laboratory safe" refrigerators and freezers.

g. Ethers must be used only in a working explosion proof fume hood from which all possible ignition sources have been removed.

h. Automated equipment shall be operated at least five (5) feet from storage of flammable and combustible materials, unless separated by a fire wall.

3. Storage and Distribution of Acutely Toxic Chemicals, Carcinogens, and Reproductive Toxins.

a. Acutely toxic compounds, carcinogens, and reproductive toxins should be segregated from other chemicals and stored in a well-ventilated area. When available, ventilated cabinets will be used for storage.

b. Cabinets will be posted “DANGER – CHEMICAL CARCINOGEN”, “CAUTION – CANCER SUSPECT AGENT’ or “CAUTION – TOXIC AGENTS” as appropriate.

c. The storage of sealed, unopened containers presents no unusual hazards. Seal opened containers with parafilm or tape or overpack in an unbreakable container.

d. Acutely toxic compounds, carcinogens, or reproductive toxins will be placed in an unbreakable secondary container prior to transport through the laboratory. The secondary container should contain absorbent material to cushion the primary container and absorb the contents in the event of a spill. Secondary containers will be appropriately labeled.

4. Compressed Gases.

a. CAUTION: A compressed gas cylinder that falls over and breaks off its valve becomes a rocket that can penetrate cement walls. The protective valve cap must be kept on the cylinder whenever the cylinder is not in service or whenever it is moved
b. Move compressed gas cylinders using a suitable hand truck. Strap the gas cylinder in place on the truck with the valve protector cap installed. Move only one cylinder at a time unless the hand truck is designed for multiple cylinders.

c. Secure all gas cylinders in the upright position by a chain, strap, or cylinder stand. Do not bring gas cylinders into the laboratory until they are to be used. Clearly label or identify on a tag the contents of each cylinder. Turn off cylinder valves when gas is not being used. Use the regulator valve only to adjust the flow rate or pressure during use. Use only recommended regulators fittings and tubing; never use an adapter to connect a regulator designed for another gas. Keep regulators clean. Never permit oil, grease, or other petroleum products to contaminate any cylinder regulator.

d. Do not expose gas cylinders to temperatures above 125^{o} F. Do not store gas cylinders near sources of ignition/heat or open flames. If gas cylinders are stored outdoors, locate them in a sheltered area protected from the elements.

e. Post areas where hydrogen or other flammable gases are stored: "DANGER--FLAMMABLE GAS. NO SMOKING OR OPEN FLAMES WITHIN 50 FEET."

f. Segregate gas cylinders by their classification (i.e., flammable, toxic or oxidizer). Separate oxidizers from flammable gases by at least 50 feet unless a 1/2-hour fire-rated partition is used to separate them.

g. Label gas cylinders, when empty, with a tag or a piece of tape marked "Empty." Store full and empty gas cylinders in separate locations of the storage area.

5. Special.

a. Store chemicals which are highly corrosive or whose spillage could result in a serious hazard and/or difficult cleanup in unbreakable secondary containers. Alternatively, use an appropriate spill pan with absorbent material.

b. Shock Sensitive Chemicals. Unless the manufacturer has added an inhibitor, unopened containers of shock sensitive chemicals must be turned in after 12 months of storage to be disposed of as a hazardous chemical. Opened containers must be turned in after 6 months of storage. Shock sensitive chemicals must also be prominently noted on the chemical inventory.

C. Chemical Disposal.

1. Guidelines for the identification of hazardous chemical wastes are listed in Title 40, CFR, Part 261. If in doubt, contact the Chemical Hygiene Officer. Segregate all laboratory chemical waste and hazardous material into the following classifications if known:

Corrosive	Acid (less than 2 pH)
Corrosive	Base (greater than 12.5 pH)
Flammable	Solid
Flammable	Liquid (flash point less than 100° F)
Combustible	Liquid (flash point been 100° and 200° F)
Oxidizer	
Organic peroxide	
Poison	
Irritant	

2. Mixed or inseparable waste streams should be segregated into organic, inorganic or halogenated classifications as appropriate.

3. The supervisor of each laboratory generating hazardous chemical waste will manage its storage until disposal can be arranged.

    a. Collect the hazardous waste in a leak-proof primary container. The container must be marked with the words “Hazardous Waste” or other words that identify its contents.

    b. Some chemicals may be rendered harmless and disposed of in the laboratory. Render laboratory wastes and hazardous materials containing reducing agents, oxidizing agents, acids, and bases innocuous prior to discharge into the sanitary sewer.

    c. The Chemical Hygiene Officer will coordinate with the ACCD Environmental Health/Safety Coordinator for the removal of hazardous chemical waste from the laboratory.

V. PREVENTIVE MEDICINE PROGRAMS

A. Medical Surveillance. The ACCD Environmental Health/Safety Coordinator will determine if medical surveillance is required and must be notified immediately in the following circumstances:

1. Whenever an employee develops signs or symptoms associated with a hazardous chemical exposure in the laboratory.

2. Whenever there is reason to suspect a potentially hazardous chemical exposure (i.e. poor ventilation in an area where chemicals are used).

3. In the event of a chemical spill which could possibly involve exposure of PAC personnel or students.

4. When exposure monitoring reveals an exposure level routinely above the action level or PEL for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements.

5. Reproductive Hazards. Reproductive hazards should not be routinely used and only by exception in writing from the ACCD Environmental Health/Safety Coordinator.

   a. Male and female employees of child-bearing age will be informed about reproductive hazards in the laboratory. A pregnant employee and her unborn child will not be endangered by the work assignment.

   b. Pregnant employees will notify their supervisor as soon as the pregnancy is verified by a positive pregnancy test. The supervisor will notify the Chemical Hygiene Officer, who will ensure the ACCD Environmental Health/Safety Coordinator is notified in writing. If the employee requests a change in her work assignment, after consulting her own physician, then every reasonable effort will be made to accommodate her request.

   c. The supervisor may request medical certification as to the nature of the limitations recommended by her physician.

B. Ventilation. The ventilation system is one of the most important design features of any laboratory. The movement of air must be from areas of lower contamination potential (i.e., corridors) to areas of higher contamination potential (laboratories). Exhaust air from the laboratory hoods and work areas shall be discharged outdoors in such a manner as to prevent re-entrance of contaminants into the building's air supply.

1. The facilities section provides all required maintenance of the ventilation systems.

2. Operators are required to verify operation of the hoods before beginning work; therefore, a visual device must be present on all hoods.

3. The hoods are to be kept closed except when in use. It is advisable to leave the hood "on" when it is in active use, if toxic substances are stored in it, or if it is uncertain as to whether or not adequate general laboratory ventilation will be maintained if turned "off".

4. Ventilation Failure.

   a. Terminate operations in a safe manner, to include the closing of compressed gas cylinders, the closing of volatile/flammable/combustible chemicals, and the closing of all hood sashes.

   b. Evacuate the laboratory room, closing all doors behind you.

   c. Do not re-enter the laboratory until ventilation has been restored for 30 minutes. In cases where the operation could not be terminated and there is a reasonable probability that the laboratory atmosphere is unsafe, air monitoring may be necessary before reentry. The CHO and the ACCD Environmental Health/Safety Coordinator shall be contacted for guidance.

Appendix A

References

1. ANSI Standard Z87.1: Practices for Occupational and Educational Eye and Face Protection.

2. ANSI Standard Z358.1: Emergency Eyewash and Shower Equipment.

3. NFPA 30, Flammable Liquids Code.

4. NFPA 45, Standard for Fire Protection for Laboratories Using Chemicals.

5. Texas Administrative Code, Title 25, Part 1, Chapter 295, Occupational Health.

6. Title 29, CFR, Part 1910.106, Flammable and Combustible Liquids.

7. Title 29, CFR, Part 1910.1200, Hazard Communications.

8. Title 29, CFR, Part 1910.1450, Occupational Exposure to Hazardous Chemicals in Laboratories.

9. Title 40, CFR, Part 261, Identification and Listing of Hazardous Waste.

10. Title 40, CFR, Part 262, Standards Applicable to Generators of Hazardous Waste.

Appendix B

Definition of Terms

1. Action Level. A concentration designated in 29 CFR, Part 1910, for a specific substance, calculated as an 8-hour time-weighted average (TWA). For other hazards, it is designated as one half of the PEL or TLV. This is the level at which certain required interventions, such as exposure monitoring and medical surveillance, are generally recommended.

2. Acutely Toxic. A chemical falling within any of the following toxicity categories:

    a. A median lethal dose (LD_{50}) of 50 milligrams per kilogram (mg/kg) of body weight or less when administered orally to rats

    b. An LD_{50} of 200 mg/kg of body weight or less when administered to the skin of rabbits.

    c. A median lethal concentration (LC_{50}) in air of 200 parts per million (ppm) or less of gas or vapor or 2 mg/liter or less of mist, fume, or dust when administered by inhalation to rats.

3. Carcinogen. An undiluted chemical or mixture of chemicals which contains at least 1 percent of a chemical which meets one of the following criteria:

    a. It is regulated by OSHA as a carcinogen.

    b. It is a human carcinogen listed under the category "KNOWN TO BE CARCINOGENS," in the latest edition of the Annual Report on Carcinogens by the National Toxicology Program (NTP).

    c. It is listed under Group I, "CARCINOGENIC TO HUMANS," by the latest edition of the International Agency for Research on Cancer (IARC).

    d. It is listed in either Group 2A or 2B by IARC or under the category "reasonably anticipated to be carcinogens" by NTP.

    e. It is a military-unique compound classified as a carcinogen by USAEHA or the Office of the Surgeon General (OTSG).

4. Combustible Liquid. Any liquid having a flash point at or above 100 degrees Fahrenheit (F) but below 200 degrees F, except mixtures having components with flash points of 200 degrees F or higher, the total volume of which makes up 99 percent or more of the mixture.

5. Compressed Gas. A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 pounds per square inch (psi) at 70 degrees F, or a gas or mixture of gases

having, in a container, an absolute pressure exceeding 104 psi at 130 degrees F regardless of the pressure at 70 degrees F.

6. Explosive. A chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

7. Flammable Aerosol. An aerosol that, when tested by the method prescribed in 16 CFR 1500.45, yields flame projection exceeding 18 inches at full valve opening or a flashback at any degree of valve opening.

8. Flammable Gas. A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13 percent by volume or less; or a gas that at ambient temperature and pressure forms a range of flammable mixtures with air wider than 12 percent by volume, regardless of the lower limit.

9. Flammable Liquid. A liquid having a flash point below 100 degrees F, except any mixture having components with flash points of 100 F or higher, the total of which make up 99 percent or more of the total volume of the mixture. Also known as a Class I liquid. These are further divided into:

    a. Class 1A, which includes liquids having flash points below 73 degrees F and boiling points below 100 degrees F.

    b. Class 1B, which includes liquids having flash points below 73 degrees F and boiling points at or above 100 degrees F.

    c. Class 1C, which includes liquids having flash points at or above 73 degrees F but below 100 degrees F.

10. Flash Point. The minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested using the Tagliabue Closed Tester, the Pensky-Martens Closed Tester, or the Setaflash Closed Tester.

11. Hazardous Chemical. Any chemical which is a physical hazard or health hazard.

12. Hazardous Waste. A substance regulated by the Resource Conservation and Recovery Act (RCRA) and defined in 40 CFR 261.3.

13. Health Hazard. A chemical for which there is statistically significant evidence, based on at least one study conducted in accordance with established scientific principles, that acute or chronic health effects may occur in exposed employees. The term includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive damaging toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin, eyes, or mucous membranes. Also included are any unique or proprietary formulation for which there is

insufficient data available to determine its health effects should be considered to have similar health effects as other members of the same generic chemical class.

14. Laboratory Scale. Laboratory scale means work with substances in which the container used for reactions, are designed to be easily and safely manipulated by one person. "Laboratory scale" excludes those workplaces whose function is to produce commercial quantities of materials-

15. Oxidizer. A chemical, other than a blasting agent or explosive as defined in 29 CFR 1910.109(a), that initiates or promotes combustion in their material, thereby causing fire either by itself or through the release of oxygen or other gases.

16. Permissible Exposure Limit. An occupational standard promulgated by OSHA as a regulatory requirement. The PEL can be an 8-hour TWA, a ceiling value, or a 15-minute short time exposure limit (STEL) .

17. Physical Hazard. A chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, a flammable compound, an organic peroxide, an oxidizer, a pyrophoric substance, an unstable (reactive) substance, or a water-reactive substance.

18. Reproductive Toxin. A chemical which affects the reproductive system and/or may produce chromosomal damage (mutations) and/or adverse effects on the fetus (teratogenesis) . For the purposes of this guidance, any chemical with a mutagenic or teratogenic quotation in the Registry of Toxic Effects of Chemical Substances (RTECS) shall be considered a reproductive hazard.

19. Short Term Exposure Limit. This value is the maximum concentration to which workers can be continuously exposed for a period up to 15 minutes without suffering from: irritation, chronic or irreversible tissue change, or narcosis of sufficient degree to increase accident proneness, impair self-rescue, or materially reduce work efficiency.

20. Threshold Limit Value. Airborne concentrations of substances, published by American Conference of Governmental Industrial Hygienists (ACGIH), to which workers may be exposed day after day with no adverse effect. The TLV's are advisory in nature; however, Department of the Army (DA) policy uses the TLV as regulatory policy when the TLV is more stringent than the PEL for a specific chemical.

21. Toxic Chemical. Element, compound, or mixture that can cause injuries by direct chemical action on body cells, tissues, and organs. A chemical falling within any of the following toxicity categories:

    a. An LD_{50} of more than 50 mg/kg, but not more than 500 mg/kg, of body weight when administered orally to rats.

b. An LD_{50} of more than 200 mg/kg, but not more than 1000 mg/kg, of body weight when administered to the skin of rabbits.

c. An LC_{50} in air of more than 200 ppm but not more than 2,000 ppm, of gas or vapor or more than 2 mg/liter, but not more than 20 mg/liter, of mist, fume, or dust when administered by inhalation to rats.

Appendix C

Known or Suspected Carcinogens

Chemical	Standard	PEL (TWA)
Asbestos	1910.1001	0.2 fibers/cc
Benzene	1910.1028	1 ppm
4-Nitrcphenyl	1910.1003	No exposure permitted by any route.
1-Naphthylamine	1910.1004	No exposure permitted by any route.
Methyl Chloromethyl ether	1910.1006	No exposure permitted by any route.
3, 3'-Dichlorobenzidine (and salts)	1910.1007	No exposure permitted by any route.
bis-Chloromethyl ether	1910.1008	No exposure permitted by any route.
2-Naphthylamine	1910.1009	No exposure permitted by any route.
Benzidine	1910.1010	No exposure permitted by any route.
4-Aminodiphenyl	1910.1011	No exposure permitted by any route.
Ethyleneimine	1910.1012	No exposure permitted by any route.
beta-Propiolactone	1910.1013	No exposure permitted by any route.
2-Acetylaminofluozene	1910.1014	No exposure permitted by any route.
4-Dimethylaminoazobenzene	1910.1015	No exposure permitted by any route.
N-Nitrosodimethylamine	1910.1016	No exposure permitted by any route.
Vinyl chloride	1910.1017	1 ppm
inorganic Arsenic	1910.1018	10 ug/m^3
Coke oven emissions	1910.1029	150 ug/m^3
1, 2-Dibromo-3-chloro-propane	1910.1044	1 ppb
Acrylonitrile	1910.1045	2 ppm
Ethylene oxide	1910.1047	1 ppm
Formaldehyde	1910.1048	1 ppm

Appendix D

Chemical Inventory

Chemical Name	Manufacturer	MSDS Date	Location	Quantity