

San Antonio College

Department of
Chemistry/Earth Sciences/Astronomy

Chemical Hygiene Plan

March 2008

*Department of Chemistry/Earth Sciences/Astronomy
Chemistry Geology Building
San Antonio College
1300 San Pedro Ave.
San Antonio, TX 78212*

TABLE OF CONTENTS

Table of Contents	2
Emergency Assistance	4
Chemical Hygiene Officer	5
Introduction	6
A. General Principles.....	8
B. Responsibilities.....	8
C. The Laboratory Facility.....	11
D. Components of the Chemical Hygiene Plan.....	12
1. Basic Rules and Procedures	
2. Chemical Procurement, Distribution, and Storage	
3. Environmental Monitoring	
4. Housekeeping, Maintenance and Inspections	
5. Medical Program	
6. Personal Protective Apparel and Equipment	
7. Records	
8. Signs and Labels	
9. Spills and Accidents	
10. Training and Information	
11. Waste Disposal	
E. General Procedures for Working With Chemicals	15
1. General Rules for all Laboratory Work with Chemicals	
2. Allergens and Embryotoxins	
3. Chemicals of Moderate Chronic or High Acute Toxicity	
4. Chemicals of High Chronic Toxicity	

F. Safety Recommendations20
G. Emergency Procedures21

- 1. Primary Emergency Procedures for Fires, Spills and Accidents:
- 2. Special Procedures for Radioactive Hazards
- 3. Building Evacuation Procedures

APPENDICES

APPENDIX 1. Reference Materials25
APPENDIX 2. Definitions26
APPENDIX 3. Chemical Hygiene Plan General Training Certificate31

DRAFT TWO

Emergency and Non-Emergency Assistance

IN EMERGENCIES DIAL	222-0911
----------------------------------	-----------------

NON-EMERGENCY ASSISTANCE

DISPATCHER	208-8099
San Antonio College Health Center (Nurse) (M-F: 8:00 to 4:30 pm, S: 9:00 to 2:00 pm)	733-2790
Facilities Hotline	733-2222

DRAFT TWO

San Antonio College

Department Name: Chemistry/Earth Sciences/Astronomy

Chemical Hygiene Officer (CHO) Name: Clifton Valley

CHO Address: Building: CG 215

Phone Numbers: (210) 733-2704 / 733-2707

Each department that has laboratories using hazardous chemicals and/or biological agents must designate a Chemical Hygiene Officer (CHO) to carry out the duties and responsibilities of the CHO described in this manual.

The individual identified above has been appointed CHO and has accepted the responsibilities and duties associated with this appointment.

Appointing official:

Chemical Hygiene Officer:

Dean

Signature

Date

Date

A copy of this form shall be placed in the appropriate LABORATORY SAFETY MANUALS, retained in the Dean's Office and by the Department Chair and submitted to the Office of Environmental Health and Safety.

INTRODUCTION

This document describes the Chemical Hygiene Plan for the Department of Chemistry, Earth Sciences and Astronomy at San Antonio College, San Pedro Avenue, San Antonio, Texas-78212. The purpose of this Chemical Hygiene Plan—CHP (referred to as the Plan throughout this document) is to define work practices and procedures to help protect students, laboratory workers, researchers, and supervisors at San Antonio College from health hazards associated with the use of hazardous chemicals. The Chemical Hygiene Plan is consistent with the U.S. Department of Labor Occupational Safety and Health Administration (OSHA) standard entitled "Occupational Exposures to Hazardous Chemicals in Laboratories" (Code of Federal Regulations, 29 CFR 1910.1450) and the Texas Hazard Communication Act (Chapter 502 of the Texas Health and Safety Code).

The health and safety policy of San Antonio College is to take every reasonable precaution to protect the health and safety of faculty, staff, students, and the public. Mandatory safety standards, as interpreted by the requirements and policies stated in this Plan and its supplements apply to faculty, staff and researchers engaged in laboratory operations utilizing chemical products and in performing common laboratory procedures.

OSHA has defined a hazardous chemical as "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." In addition, OSHA defines a laboratory as "a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis." Finally, laboratory workers are defined in the OSHA Lab Standard under the definition of "employee" as "an individual employed in a laboratory workplace that may be exposed to hazardous chemicals in the course of his or her assignments." An example of a laboratory worker would include researchers in laboratories and principal investigators; the students in the academic laboratory would not be considered laboratory workers according to OSHA.

This plan includes information concerning safe laboratory practices, the use of personal protective equipment, emergency procedures, use and storage of chemicals, and the proper methods of waste disposal. This CHP also covers hazard communication and incident response. This information is intended to help those in the laboratory to minimize hazards to themselves and their colleagues. In view of the wide variety of chemical products handled in laboratories, it should not be assumed that the precautions and requirements stated in this manual are all-inclusive.

Throughout this Plan the terms "employee", "laboratory worker", and "laboratory personnel" are used interchangeably. Employees are expected to learn about the hazards of chemical products before handling them.

This Plan does not apply to:

- Uses of hazardous chemicals which do not meet the definition of laboratory use, and in such cases, the employer shall comply with the relevant standard in 29 CFR part 1910, subpart Z, even if such use occurs in a laboratory.
- Laboratory uses of hazardous chemicals which provide no potential for employee exposure. Examples of such conditions might include:
 - Procedures using chemically-impregnated test media such as Dip-and-Read tests where a reagent strip is dipped into the specimen to be tested and the results are interpreted by comparing the color reaction to a color chart supplied by the manufacturer of the test strip; and
 - Commercially prepared kits such as those used in performing pregnancy tests in which all of the reagents needed to conduct the test are contained in the kit.

A written record stating that each laboratory worker has reviewed the Chemical Hygiene Plan and related health and safety policies and guides shall be kept by the laboratory supervisor (see Appendix 4).

This Plan will be reviewed annually by the Chemical Hygiene Officer and/or the Chemical Safety Committee and updates as necessary. It is expected that the departmental Chemical Hygiene Officer and faculty in charge of research will append to this Plan any supplementary information pertinent to their specific areas.

The assigned Chemical Hygiene Officer is Clifton Valley, Science Lab Tech III, Department of Chemistry/Earth Sciences/Astronomy

A. General Principles for Work with Laboratory Chemicals

1. Minimize all Chemical Exposures. It is prudent to minimize all chemical exposures. Because few laboratory chemicals are without hazards, general precautions for handling all laboratory chemicals should be adopted, rather than specific guidelines for particular chemicals. Skin contact with chemicals should be avoided as a cardinal rule.
2. Avoid Underestimation of Risk. Even for substances of no known significant hazard, exposure should be minimized; for work with substances which present special hazards, special precautions should be taken. One should assume that any mixture will be more toxic than its most toxic component and that all substances of unknown toxicity are toxic.
3. Provide Adequate Ventilation. The best way to prevent exposure to airborne substances is to prevent their escape into the working atmosphere by use of hoods and other ventilation devices.
4. Institute a Chemical Hygiene Program. A mandatory chemical hygiene program designed to minimize exposures is needed; it should be a regular, continuing effort, not merely a standby or short-term activity.
5. Observe the PELs and TLVs. The Permissible Exposure Limits of OSHA and the Threshold Limit Values of the American Conference of Governmental Industrial Hygienists should not be exceeded.

B. Chemical Hygiene Responsibilities

Responsibility for chemical hygiene rests at all levels.

1. **Department Chair** has the responsibility to
 - (a) Oversee chemical (and biological) hygiene within departmental laboratories by ensuring that supervisory personnel reporting to them assume their responsibilities for adhering to all safety policies, regulations and procedures.
 - (b) Complete and update annual inventories of hazardous chemicals as required by the Texas Hazard Communication Act and San Antonio College's Hazard Communication Program.

The Department Chair assumes all the responsibilities of the CHO when there is not a specified Chemical Hygiene Officer.

2. **Chemical Hygiene Officer** has the responsibility to:
 - (a) Advise the Dean, and Department Chair on matters of chemical safety policies and practices.
 - (b) Work with employees to develop and implement the chemical hygiene policies and practices outlined in this manual and those contained in any supplementary information developed in the college in response to specific activities or areas of research.
 - (c) Monitor compliance with policies and procedures for the procurement, safe use, and proper disposal of chemicals.
 - (d) Investigate and retain records of accidents involving hazardous materials.
 - (e) Conduct information and general training sessions.
 - (f) Maintain a resource file of references and publications on safety matters.

- (g) Assist laboratory supervisors and research coordinators in writing Standard Operating Procedures (SOPs) pertinent to their needs.
 - (h) Ensure that action is taken to correct laboratory practices and conditions that may result in the release of hazardous materials.
 - (i) Ensure that action is taken to correct laboratory practices and conditions identified as unacceptable on laboratory safety self evaluations and safety inspections.
3. **Faculty and Staff** in charge of supervising laboratories (referred to as laboratory supervisors throughout this document) have the following responsibilities for implementing the Chemical Hygiene Plan:
- (a) Design and conduct laboratory processes and operations to assure that employee and student exposure to risk conforms to the policies, procedures and objectives contained in this manual and those contained in any supplementary information developed in the college in response to specific activities or areas of research.
 - (b) Monitor the procurement, safe use, and proper disposal of chemicals.
 - (c) Write Standard Operating Procedures and other information relevant to lab processes in their specific areas as needed to supplement those contained in this manual.
 - (d) Instruct employees on the contents of this manual, its appendices, and any supplements, and the location of the manual and related materials within the workplace.
 - (e) Take all reasonable precautions to protect the safety and health of laboratory workers and the environment.
 - (f) Schedule services for hazardous waste disposal and oversee the handling of hazardous waste pending proper disposal.
 - (g) Conduct regular laboratory safety self evaluations.
 - (h) Complete and update annual laboratory chemical inventories in accord with the instructions and schedule provided by the ACCD Office of Risk Management.
 - (i) Inform employees of the permissible exposure limits for the hazardous chemicals listed on inventories and the signs and symptoms associated with exposures to these chemicals.
 - (j) Provide site specific training on laboratory hazards as described in San Antonio College's Hazard Communication Program (see Appendix 2).
 - (k) Obtain pre-approval from the Departmental CHO and provide training and documentation for special procedures, activities or operations.
 - (l) Determine the required levels of personal protective equipment, fire extinguishers, fume hoods, flammable liquid storage cabinets, biological safety cabinets, eye washes, safety showers, and spill cleanup kits. Assure that all required equipment is available and in working order and that appropriate training for each item has been provided.
 - (m) Have readily available a current copy of a Material Safety Data Sheet for all hazardous chemicals in the laboratory.
 - (n) Post emergency telephone numbers on the outside of each laboratory door and by all telephones in the area.
 - (o) Report to ACCD Office of Risk Management if there is reason to believe that exposure levels for a hazardous chemical exceed the action level or the permissible exposure limits and document the incident.
 - (p) Forward documentation on laboratory accidents and exposures to ACCD Office of Risk Management.

- (q) Provide for the safety of visitors.
- (r) Ensure that workers and students know and follow the chemical hygiene rules, that protective equipment is available and in working order, and that appropriate training has been provided;
- (s) Determine the required levels of protective apparel and equipment; and
- (t) Ensure that facilities and training for use of any material being ordered are adequate.
- (u) Inform and train laboratory workers and students concerning chemical safety as required by this Plan and retain training records and all documentation;
- (v) Implement and enforce rules and standards concerning health and safety for laboratories under supervisor's jurisdiction;
- (w) Remain cognizant of chemicals stored and used in labs and their associated hazards;
- (x) Dispose of chemicals no longer needed;
- (y) Request assistance from the ACCD Risk Management Office as needed.

4. **Laboratory Employees'** responsibilities regarding implementation of the Chemical Hygiene Plan are as follows:

- (a) Maintain a thorough understanding of and follow the laboratory policies and procedures in this
- (b) manual and those contained in any supplementary information developed in the college in response to specific activities or areas of research for all processes using chemical materials.
- (c) Use and maintain personal protective equipment (i.e. lab coats, chemical splash goggles, face
- (d) shields, respiratory protection, and gloves) as mandated in this manual for laboratories.
- (e) Use flammable liquid storage cabinets, acid storage cabinets, biological safety cabinets, fume hoods, and other laboratory safety equipment provided.
- (f) Inform supervisor immediately of any laboratory safety equipment that is needed but not available or that is not in good working order .
- (g) Inform supervisor immediately of exposure symptoms, accidents, or chemical releases and document incident.
- (h) Attend Hazard Communication Act and all other applicable training sessions.
- (i) Follow all health and safety policies and procedures;
- (j) Report all hazardous conditions to the supervisor;
- (k) Wear or use prescribed protective equipment;
- (l) Report any job-related injuries or illnesses to the supervisor and seek treatment immediately;
- (m) Refrain from the operation of any equipment or instrumentation without proper instruction and authorization;
- (n) Remain aware of the hazards of the chemicals in the lab and how to handle hazardous chemicals safely; and,
- (o) Request information and training when unsure how to handle a hazardous chemical or procedure.

C. The Laboratory Facility

1. Design. The laboratory facility should have:

- (a) An appropriate general ventilation system with air intakes and exhausts located so as to avoid intake of contaminated air;
- (b) Adequate, well-ventilated stockrooms/storerooms;
- (c) Laboratory hoods and sinks;
- (d) Other safety equipment including eyewash fountains and drench showers; and
- (e) Arrangements for waste disposal.

2. Maintenance. Chemical-hygiene-related equipment (hoods, incinerator, etc.) should undergo continual appraisal and be modified if inadequate.

3. Usage. The work conducted and its scale must be appropriate to the physical facilities available and, especially, to the quality of ventilation.

4. Ventilation –

(a) General laboratory ventilation. This system should provide a source of air for breathing and for input to local ventilation devices. It should not be relied on for protection from toxic substances released into the laboratory. Ensure that laboratory air is continually replaced, preventing increase of air concentrations of toxic substances during the working day. Direct air flow into the laboratory from non-laboratory areas and out to the exterior of the building.

(b) Hoods. A laboratory hood with 2.5 linear feet of hood space per person should be provided for every 2 workers if they spend most of their time working with chemicals; each hood should have a continuous monitoring device to allow convenient confirmation of adequate hood performance before use. If this is not possible, work with substances of unknown toxicity should be avoided or other types of local ventilation devices should be provided.

(c) Other local ventilation devices. Ventilated storage cabinets, canopy hoods, snorkels, etc. should be provided as needed. Each canopy hood and snorkel should have a separate exhaust duct.

(d) Special ventilation areas. Exhaust air from glove boxes and isolation rooms should be passed through scrubbers or other treatment before release into the regular exhaust system. Cold rooms and warm rooms should have provisions for rapid escape and for escape in the event of electrical failure.

(e) Modifications. Any alteration of the ventilation system should be made only if thorough testing indicates that worker protection from airborne toxic substances will continue to be adequate.

(f) Performance Rate: 4-12 room air changes/hour is normally adequate general ventilation if local exhaust systems such as hoods are used as the primary method of control.

(g) Quality. General air flow should not be turbulent and should be relatively uniform throughout the laboratory, with no high velocity or static areas; airflow into and within the hood should not be excessively turbulent; hood face velocity should be adequate (typically 60-100 lfm).

(h) Evaluation. Quality and quantity of ventilation should be evaluated on installation, regularly monitored (at least every 3 months), and re-evaluated whenever a change in local ventilation devices is made.

D. Components of the Chemical Hygiene Plan

1. Basic Rules and Procedures (Recommendations for these are given in section E, below.)

2. Chemical Procurement, Distribution, and Storage

(a) Procurement. 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. Preferably, all substances should be received in a central location.

(b) Stockrooms/storerooms. Toxic substances should be segregated in a well-identified area with local exhaust ventilation. Chemicals which are highly toxic or other chemicals whose containers have been opened should be in unbreakable secondary containers. Stored chemicals should be examined periodically (at least annually) for replacement, deterioration, and container integrity.

Stockrooms/storerooms should not be used as preparation or repackaging areas, should be open during normal working hours, and should be controlled by one person.

(c) Distribution. When chemicals are hand carried, the container should be placed in an outside container or bucket. Freight-only elevators should be used if possible.

(d) Laboratory storage. Amounts permitted should be as small as practical. Storage on bench tops and in hoods is inadvisable. Exposure to heat or direct sunlight should be avoided. Periodic inventories should be conducted, with unneeded items being discarded or returned to the storeroom/stockroom.

3. Environmental Monitoring

Regular instrumental monitoring of airborne concentrations is not usually justified or practical in laboratories but may be appropriate when testing or redesigning hoods or other ventilation devices or when a highly toxic substance is stored or used regularly (e.g., 3 times/week).

4. Housekeeping, Maintenance, and Inspections

(a) Cleaning. Floors should be cleaned regularly.

(b) Inspections. Formal housekeeping and chemical hygiene inspections should be held at least quarterly for units which have frequent personnel changes and semiannually for others; informal inspections should be continual.

(c) Maintenance. Eye wash fountains should be inspected at intervals of not less than 3 months. Safety equipment should be inspected regularly. (e.g., every 3-6 months). Procedures to prevent restarting of out-of-service equipment should be established.

(d) Passageways. Stairways and hallways should not be used as storage areas. Access to exits, emergency equipment, and utility controls should never be blocked.

5. Medical Program

(a) Compliance with regulations. Regular medical surveillance should be established to the extent required by regulations.

(b) Routine surveillance. Anyone whose work involves regular and frequent handling of toxicologically significant quantities of a chemical should consult a qualified physician to determine on an individual basis whether a regular schedule of medical surveillance is desirable.

(c) First aid. Personnel trained in first aid should be available during working hours and an emergency room with medical personnel should be nearby.

6. Protective Apparel and Equipment

These should include for each laboratory:

(a) Protective apparel compatible with the required degree of protection for substances being handled;

(b) An easily accessible drench-type safety shower;

(c) An eyewash fountain

(d) A fire extinguisher;

(e) Respiratory protection, fire alarm and telephone for emergency use should be available nearby; and

(f) Other items designated by the laboratory supervisor.

7. Records

(a) Accident records should be written and retained.

(b) Chemical Hygiene Plan records should document that the facilities and precautions were compatible with current knowledge and regulations.

(c) Inventory and usage records for high-risk substances should be kept as specified in sections E3e below.

(d) Medical records should be retained by the institution in accordance with the requirements of state and federal regulations.

8. Signs and Labels

Prominent signs and labels of the following types should be posted:

- (a) Emergency telephone numbers of emergency personnel/facilities, supervisors, and laboratory workers;
- (b) Identity labels, showing contents of containers (including waste receptacles) and associated hazards;
- (c) Location signs for safety showers, eyewash stations, other safety and first aid equipment, exits and areas where food and beverage consumption and storage are permitted; and
- (d) Warnings at areas or equipment where special or unusual hazards exist .

9. Spills and Accidents

- (a) A written emergency plan should be established and communicated to all personnel; it should include procedures for ventilation failure, evacuation, medical care, reporting, and drills.
- (b) There should be an alarm system to alert people in all parts of the facility including isolation areas such as cold rooms.
- (c) A spill control policy should be developed and should include consideration of prevention, containment, cleanup, and reporting.
- (d) All accidents or near accidents should be carefully analyzed with the results distributed to all who might benefit.

10. Information and Training Program

- (a) Aim: To assure that all individuals at risk are adequately informed about the work in the laboratory, its risks, and what to do if an accident occurs.
- (b) Emergency and Personal Protection Training: Every laboratory worker should know the location and proper use of available protective apparel and equipment.

Some of the full-time personnel of the laboratory should be trained in the proper use of emergency equipment and procedures.

Such training as well as first aid instruction should be available to and encouraged for everyone who might need it.

- (c) Receiving and stockroom/storeroom personnel should know about hazards, handling equipment, protective apparel, and relevant regulations.
- (d) Frequency of Training: The training and education program should be a regular, continuing activity - not simply an annual presentation.

(e) Literature/Consultation: Literature and consulting advice concerning chemical hygiene should be readily available to laboratory personnel, who should be encouraged to use these information resources.

11. Waste Disposal Program.

(a) Aim: To assure that minimal harm to people, other organisms, and the environment will result from the disposal of waste laboratory chemicals.

(b) Content: The waste disposal program should specify how waste is to be collected, segregated, stored, and transported and include consideration of what materials can be incinerated. Transport from the institution must be in accordance with DOT regulations .

(c) Discarding Chemical Stocks: Unlabeled containers of chemicals and solutions should undergo prompt disposal; if partially used, they should not be opened .

Before a worker's employment in the laboratory ends, chemicals for which that person was responsible should be discarded or returned to storage.

(d) Frequency of Disposal: Waste should be removed from laboratories to a central waste storage area at least once per week and from the central waste storage area at regular intervals.

(e) Method of Disposal: Incineration in an environmentally acceptable manner is the most practical disposal method for combustible laboratory waste.

Indiscriminate disposal by pouring waste chemicals down the drain or adding them to mixed refuse for landfill burial is unacceptable

Hoods should not be used as a means of disposal for volatile chemicals.

Disposal by recycling or chemical decontamination should be used when possible.

E. Basic Rules and Procedures for Working with Chemicals

The Chemical Hygiene Plan should require that laboratory workers know and follow its rules and procedures. In addition to the procedures of the sub programs mentioned above, these should include the rules listed below.

1. General Rules

The following should be used for essentially all laboratory work with chemicals:

(a) Accidents and spills - Eye Contact: Promptly flush eyes with water for a prolonged period (15 minutes) and seek medical attention.

Ingestion: Encourage the victim to drink large amounts of water.

Skin Contact: Promptly flush the affected area with water and remove any contaminated clothing. If symptoms persist after washing, seek medical attention.

Clean-up. Promptly clean up spills, using appropriate protective apparel and equipment and proper disposal.

(b) Avoidance of "routine" exposure: Develop and encourage safe habits; avoid unnecessary exposure to chemicals by any route.

Do not smell or taste chemicals. Vent apparatus which may discharge toxic chemicals (vacuum pumps, distillation columns, etc.) into local exhaust devices.

Inspect gloves and test glove boxes before use.

Do not allow release of toxic substances in cold rooms and warm rooms, since these have contained recirculated atmospheres.

(c) Choice of chemicals: Use only those chemicals for which the quality of the available ventilation system is appropriate.

(d) Eating, smoking, etc.: Avoid eating, drinking, smoking, gum chewing, or application of cosmetics in areas where laboratory chemicals are present; wash hands before conducting these activities.

Avoid storage, handling, or consumption of food or beverages in storage areas, refrigerators, glassware or utensils which are also used for laboratory operations.

(e) Equipment and glassware: Handle and store laboratory glassware with care to avoid damage; do not use damaged glassware. Use extra care with Dewar flasks and other evacuated glass apparatus; shield or wrap them to contain chemicals and fragments should implosion occur (25). Use equipment only for its designed purpose.

(f) Exiting: Wash areas of exposed skin well before leaving the laboratory.

(g) Horseplay: Avoid practical jokes or other behavior which might confuse, startle or distract another worker.

(h) Mouth suction: Do not use mouth suction for pipeting or starting a siphon.

(i) Personal apparel: Confine long hair and loose clothing. Wear shoes at all times in the laboratory but do not wear sandals, perforated shoes, or sneakers.

(j) Personal housekeeping: Keep the work area clean and uncluttered, with chemicals and equipment being properly labeled and stored; clean up the work area on completion of an operation or at the end of each day.

(k) Personal protection: Assure that appropriate eye protection is worn by all persons, including visitors, where chemicals are stored or handled.

Wear appropriate gloves when the potential for contact with toxic materials exists; inspect the gloves before each use, wash them before removal, and replace them periodically. (A table of resistance to chemicals of common glove materials is given in Appendix 5).

Use appropriate respiratory equipment when air contaminant concentrations are not sufficiently restricted by engineering controls, inspecting the respirator before use.

Use any other protective and emergency apparel and equipment as appropriate.

Avoid use of contact lenses in the laboratory unless necessary; if they are used, inform supervisor so special precautions can be taken.

Remove laboratory coats immediately on significant contamination.

(l) Planning: Seek information and advice about hazards, plan appropriate protective procedures, and plan positioning of equipment before beginning any new operation.

(m) Unattended operations: Leave lights on, place an appropriate sign on the door, and provide for containment of toxic substances in the event of failure of a utility service (such as cooling water) to an unattended operation.

(n) Use of hood: Use the hood for operations which might result in release of toxic chemical vapors or dust.

As a rule of thumb, use a hood or other local ventilation device when working with any appreciably volatile substance with a TLV of less than 50 ppm.

Confirm adequate hood performance before use; keep hood closed at all times except when adjustments within the hood are being made; keep materials stored in hoods to a minimum and do not allow them to block vents or air flow.

Leave the hood "on" when it is not in active use if toxic substances are stored in it or if it is uncertain whether adequate general laboratory ventilation will be maintained when it is "off".

(o) Vigilance: Be alert to unsafe conditions and see that they are corrected when detected.

(p) Waste disposal: Assure that the plan for each laboratory operation includes plans and training for waste disposal.

Deposit chemical waste in appropriately labeled receptacles and follow all other waste disposal procedures of the Chemical Hygiene Plan.

Do not discharge to the sewer concentrated acids or bases; highly toxic, malodorous, or lachrymatory substances; or any substances which might interfere with the biological activity of waste water treatment plants, create fire or explosion hazards, cause structural damage or obstruct flow.

(q) Working alone: Avoid working alone in a building; do not work alone in a laboratory if the procedures being conducted are hazardous.

2. Working with Allergens and Embryotoxins

(a) Allergens (examples: diazomethane, isocyanates, bichromates): Wear suitable gloves to prevent hand contact with allergens or substances of unknown allergenic activity.

(b) Embryotoxins (examples: organomercurials, lead compounds, formamide): If you are a woman of childbearing age, handle these substances only in a hood whose satisfactory performance has been confirmed, using appropriate protective apparel (especially gloves) to prevent skin contact.

Review each use of these materials with the research supervisor and review continuing uses annually or whenever a procedural change is made.

Store these substances, properly labeled, in an adequately ventilated area in an unbreakable secondary container.

Notify supervisors of all incidents of exposure or spills; consult a qualified physician when appropriate.

3. Work with Chemicals of Moderate Chronic or High Acute Toxicity

Examples: diisopropylfluorophosphate, hydrofluoric acid, hydrogen cyanide.

Supplemental rules to be followed in addition to those mentioned above (Procedure B of "Prudent Practices", pp. 39-41):

(a) Aim: To minimize exposure to these toxic substances by any route using all reasonable precautions.

(b) Applicability: These precautions are appropriate for substances with moderate chronic or high acute toxicity used in significant quantities.

(c) Location: Use and store these substances only in areas of restricted access with special warning signs.

Always use a hood (previously evaluated to confirm adequate performance with a face velocity of at least 60 linear feet per minute) or other containment device for procedures which may result in the generation of aerosols or vapors containing the substance; trap released vapors to prevent their discharge with the hood exhaust.

(d) Personal protection: Always avoid skin contact by use of gloves and long sleeves (and other protective apparel as appropriate). Always wash hands and arms immediately after working with these materials.

(e) Records: Maintain records of the amounts of these materials on hand, amounts used, and the names of the workers involved.

(f) Prevention of spills and accidents: Be prepared for accidents and spills.

Assure that at least 2 people are present at all times if a compound in use is highly toxic or of unknown toxicity.

Store breakable containers of these substances in chemically resistant trays; also work and mount apparatus above such trays or cover work and storage surfaces with removable, absorbent, plastic backed paper.

If a major spill occurs outside the hood, evacuate the area; assure that cleanup personnel wear suitable protective apparel and equipment.

(g) Waste: Thoroughly decontaminate or incinerate contaminated clothing or shoes. If possible, chemically decontaminate by chemical conversion.

Store contaminated waste in closed, suitably labeled, impervious containers (for liquids, in glass or plastic bottles half-filled with vermiculite).

4. Work with Chemicals of High Chronic Toxicity

(Examples: dimethylmercury and nickel carbonyl, benzo-a-pyrene, N-nitrosodiethylamine, other human carcinogens or substances with high carcinogenic potency in animals.)

Further supplemental rules to be followed, in addition to all these mentioned above, for work with substances of known high chronic toxicity (in quantities above a few milligrams to a few grams, depending on the substance). (Procedure A of "Prudent Practices" pp. 47-50).

(a) Access: Conduct all transfers and work with these substances in a "controlled area": a restricted access hood, glove box, or portion of a lab, designated for use of highly toxic substances, for which all people with access are aware of the substances being used and necessary precautions.

(b) Approvals: Prepare a plan for use and disposal of these materials and obtain the approval of the laboratory supervisor.

(c) Non-contamination/Decontamination: Protect vacuum pumps against contamination by scrubbers or HEPA filters and vent them into the hood. Decontaminate vacuum pumps or other contaminated equipment, including glassware, in the hood before removing them from the controlled area.

Decontaminate the controlled area before normal work is resumed there.

(d) Exiting: On leaving a controlled area, remove any protective apparel (placing it in an appropriate, labeled container) and thoroughly wash hands, forearms, face, and neck.

(e) Housekeeping: Use a wet mop or a vacuum cleaner equipped with a HEPA filter instead of dry sweeping if the toxic substance was a dry powder.

(f) Medical surveillance: If using toxicologically significant quantities of such a substance on a regular basis (e.g., 3 times per week), consult a qualified physician concerning desirability of regular medical surveillance.

(g) Records: Keep accurate records of the amounts of these substances stored and used, the dates of use, and names of users.

(h) Signs and labels: Assure that the controlled area is conspicuously marked with warning and restricted access signs and that all containers of these substances are appropriately labeled with identity and warning labels.

(i) Spills: Assure that contingency plans, equipment, and materials to minimize exposures of people and property in case of accident are available.

(j) Storage: Store containers of these chemicals only in a ventilated, limited access area in appropriately labeled, unbreakable, chemically resistant, secondary containers.

(k) Glove boxes: For a negative pressure glove box, ventilation rate must be at least 2 volume changes/hour and pressure at least 0.5 inches of water. For a positive pressure glove box, thoroughly check for leaks before each use. In either case, trap the exit gases or filter them through a HEPA filter and then release them into the hood.

(l) Waste: Use chemical decontamination whenever possible; ensure that containers of contaminated waste (including washings from contaminated flasks) are transferred from the controlled area in a secondary container under the supervision of authorized personnel.

F. Safety Recommendations

The above recommendations from "Prudent Practices" do not include those which are directed primarily toward prevention of physical injury rather than toxic exposure. However, failure of precautions against injury will often have the secondary effect of causing toxic exposures.

G. Material Safety Data Sheets

DRAFT TWO

H. Emergency Procedures

All accidents, hazardous materials spills or other dangerous incidents should be reported. A list of telephone numbers must be posted near entrances to each laboratory and storeroom and beside every telephone in the labs. Telephone numbers must include the Laboratory Supervisor, Emergency Medical Services, SAC Police Department, and the Office of Risk Management and Environmental Health and Safety. Callers should explain any emergency situation clearly, calmly, and in detail.

1. Primary Emergency Procedures for Fires, Spills and Accidents:

1. In the event of a fire, pull the nearest fire alarm. If you are unable to control or extinguish a fire, follow the building evacuation procedures.
2. Attend to any person(s) who may have been contaminated and/or injured if it is safe to reach them. Use safety showers and eyewashes as appropriate. In the case of eye contact, promptly flush eyes with water for a minimum 15-minute period and seek medical attention immediately. For ingestion cases, contact the Poison Control Center at 1-800-POISON1. In case of skin contact, promptly flush the affected area with water and remove any contaminated clothing or jewelry. If symptoms persist after washing, seek medical attention.
3. Notify persons in the immediate area about the spill, evacuating all non-essential personnel from the spill area and adjoining areas that may be impacted by vapors or a potential fire.
4. If the spilled material is flammable, turn off all potential ignition sources. Avoid breathing vapors of the spilled materials. Be aware that some materials either have no odors or create olfactory fatigue, so that you stop smelling the odor very quickly.
5. Leave on or establish exhaust ventilation if it is safe to do so. Close doors to slow down the spread of odors.
6. Notify the Campus Police.

If there is an immediate threat to life or health:

Call City of San Antonio Emergency Services at 9-911 (campus phone) for assistance with injured, in case of fire, or for performing rescues. Give the nature and the extent of the emergency; be as specific and detailed as possible. An ambulance, fire truck, or police vehicle will respond upon your request.

Notify the SAC Police Department (911 on campus) if you have dispatched any City of San Antonio Emergency Services that will be entering the campus.

If the spill is minor:

7. Use a spill control kit appropriate to control material spilled, if appropriately trained to respond.
8. If the spill is minor and of known limited danger, clean up immediately. Determine the appropriate cleaning method by referring to the MSDS. During cleanup, wear appropriate protective apparel. The protective clothing required will depend upon the material spilled, the amount, and the airborne concentration. At a minimum, chemical resistant gloves and goggles should be worn.
9. Cover liquid spills with compatible absorbent material such as spill pillows or a kitty litter/vermiculite mix. Be sure to check compatibility. Powdered materials should be covered with wet paper towels (if compatible) to avoid dispersal. If appropriate materials are available,

corrosives should be neutralized prior to absorption. Clean spills from the outer areas first, cleaning towards the center.

10. Place the spilled material into an impervious container, seal, and contact OEHS for disposal.

11. If appropriate, wash the affected surface with soap and water. Mop up the residues and containerize for disposal.

12. A solvent, e.g. xylene, may be necessary to clean surfaces contaminated with a non-water soluble chemical. Be sure to check the solubility of the spilled material and use the least toxic effective solvent available. Be sure to wear appropriate protective equipment.

Supplies and equipment must be assembled and kept on hand to deal with any potential spill.

2. Special Procedures for Radioactive Hazards

(In addition to these guidelines, refer to The College's Radiation Safety Manual.)

1. Do not take any action unless you have been trained to respond, except to summon assistance.

2. If it is safe to do so, attend to anyone who may have been contaminated and/or injured. Use safety showers and eyewashes as appropriate. Notify OEHS and obtain appropriate radiation meters and assistance. Call City of San Antonio Emergency Services at 9-911 (on campus) for assistance with injured, in case of fire, or for performing rescues. Describe the nature and the extent of the emergency; be as specific and detailed as possible. An ambulance, fire truck, or police vehicle will respond upon your request.

3. Notify the SAC Police Department (911 on campus) if you have dispatched any City of San Antonio Emergency Services that will be entering campus.

4. Remove all personnel from the immediate spill area to a safe meeting location in or near the lab.

5. Shut off ventilation, close windows and doors, and turn off hoods if possible. Do not do this if radioactive gas is involved, as release to the environment is preferable in that case.

6. With the assistance of the OEHS, check all personnel for skin and clothing contamination.

7. Under the guidance of the OEHS, decontaminate personnel and re-survey until radiation levels are at background.

3. Building Evacuation Procedures

1. Building evacuation may be necessary if there is a chemical release, fire, explosion, natural disaster, or medical emergency.

2. Be aware of the marked exits from your area and building.

3. The evacuation alarm is a loud continuous siren or horn.

4. To activate the building alarm system, pull the handle on one of the red boxes located in the hallway. If there is a fire, call Campus Police, give your name, and describe the exact location (building name, building location, and room number) and size of the fire.

5. Whenever the building evacuation alarm is sounded or when you are ordered to leave by the Campus Police, OEHS, or emergency response personnel, walk quickly to the nearest marked exit and ask others to do the same.

6. Outside, proceed to a clear reassembly area that is at least 150 feet from the affected building. Keep walkways clear for emergency vehicles.

7. To the best of your ability and without reentering the building, be available to assist Campus Police and OEHS in their attempts to determine that everyone has been evacuated safely.

8. An Emergency Command Post will be set up near the emergency site by the

emergency responders. Keep clear of the post unless you have important information to report.

9. Do not return to the building until you are told to do so by the Campus Police, OEHS, or City of San Antonio responders.

DRAFT TWO

APPENDIX 1

REFERENCE MATERIALS

Dangerous Properties of Industrial Materials, 8th ed., Irving Sax and Richard J. Lewis, Sr., Van Nostrand Reinhold Company, 1992.

Handbook of Compressed Gases, 3rd ed., Compressed Gas Association, Arlington, Virginia, 1990.

Handbook of Laboratory Safety, 3rd ed., edited by A. Keith Furr, CRC Press, 1990.

Hawley's Condensed Chemical Dictionary, 11th ed., Irving Sax and Richard J. Lewis, Sr., Van Nostrand Reinhold Company, 1978.

Industrial Ventilation, 20th ed., American Conference of Governmental Industrial Hygienists, 1992.

NIOSH Pocket Guide to Chemical Hazards, DHHS (NIOSH), June 1997, DHHS (NIOSH) Publication No. 97-140.

OSHA Safety and Health Standards, (29 CFR 1910), United States Department of Labor, U.S. Government Printing Office, 1995.

Patty's Industrial Hygiene and Toxicology, 3rd ed., Patty, F.A., Volumes 1,2(A,B,C),and 3(A,B), Wiley-Interscience, 1978.

Prudent Practices for Disposal of Chemicals from Laboratories, National Research Council, National Academy Press, 1983.

Prudent Practices for Handling Hazardous Chemicals in Laboratories, National Research Council, National Academy Press, 1981.

Safety in Academic Chemistry Laboratories, 5th ed., Committee on Chemical Safety, American Chemical Society: Washington, D.C., 1990.

Threshold Limit Values for Chemical Substances and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, 1999.

APPENDIX 2

DEFINITIONS

Action level means a concentration designated in 29 CFR part 1910 for a specific substance, calculated as an eight (8)-hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.

Assistant Secretary means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

Carcinogen (*see select carcinogen*).

Chemical Hygiene Officer means an employee who is designated by the employer, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan. This definition is not intended to place limitations on the position description or job classification that the designated individual shall hold within the employer's organizational structure.

Chemical Hygiene Plan means a written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment and work practices that (i) are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace and (ii) meets the requirements of paragraph (e) of this section.

Combustible liquid means any liquid having a flashpoint at or above 100 deg. F (37.8 deg. C), but below 200 deg. F (93.3 deg. C), except any mixture having components with flashpoints of 200 deg. F (93.3 deg. C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

Compressed gas means:

- (i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70 deg. F (21.1 deg. C); or
- (ii) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130 deg. F (54.4 deg. C) regardless of the pressure at 70 deg. F (21.1 deg. C); or
- (iii) A liquid having a vapor pressure exceeding 40 psi at 100 deg. F (37.8 C) as determined by ASTM D-323-72.

Designated area means an area which may be used for work with "select carcinogens," reproductive toxins or substances which have a high degree of acute toxicity. A designated area may be the entire laboratory, an area of a laboratory or a device such as a laboratory hood.

Emergency means any occurrence such as, but not limited to, equipment failure, rupture of containers or failure of control equipment which results in an uncontrolled release of a hazardous chemical into the workplace.

Employee means an individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments.

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

Flammable means a chemical that falls into one of the following categories:

(i) **Aerosol, flammable** means an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame protection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;

(ii) **Gas, flammable** means:

(A) 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

(B) 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.

(iii) **Liquid, flammable** means any liquid having a flashpoint below 100 deg F (37.8 deg. C), except any mixture having components with flashpoints of 100 deg. C) or higher, the total of which make up 99 percent or more of the total volume of the mixture.

(iv) **Solid, flammable** means a solid, other than a blasting agent or explosive as defined in § 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

Flashpoint means the minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows:

(i) Tagliabue Closed Tester (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24 - 1979 (ASTM D 56-79)) - for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100 deg. F (37.8 deg. C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or

(ii) Pensky-Martens Closed Tester (See American National Standard Method of Test for Flashpoint by Pensky-Martens Closed Tester, Z11.7 - 1979 (ASTM D 93-79)) - for liquids with a viscosity equal to or greater than 45 SUS at 100 deg. F (37.8 deg. C), or that contain suspended

solids, or that have a tendency to form a surface film under test; or
(iii) Setaflash Closed Tester (see American National Standard Method of test for Flash Point by Setaflash Closed Tester (ASTM D 3278-78)).

Organic peroxides, which undergo auto accelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above.

Hazardous chemical means 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 "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive 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.

The Hazard Communication Standard provides further guidance in defining the scope of health hazards and determining whether or not a chemical is to be considered hazardous for purposes of this standard.

Laboratory means a facility where the "laboratory use of hazardous chemicals" occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

Laboratory scale means work with substances in which the containers used for reactions, transfers, and other handling of substances 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.

Laboratory-type hood means a device located in a laboratory, enclosure on five sides with a movable sash or fixed partial enclosed on the remaining side; constructed and maintained to draw air from the laboratory and to prevent or minimize the escape of air contaminants into the laboratory; and allows chemical manipulations to be conducted in the enclosure without insertion of any portion of the employee's body other than hands and arms.

Walk-in hoods with adjustable sashes meet the above definition provided that the sashes are adjusted during use so that the airflow and the exhaust of air contaminants are not compromised and employees do not work inside the enclosure during the release of airborne hazardous chemicals.

Laboratory use of hazardous chemicals means handling or use of such chemicals in which all of the following conditions are met:

- (i) Chemical manipulations are carried out on a "laboratory scale;"
- (ii) Multiple chemical procedures or chemicals are used;
- (iii) The procedures involved are not part of a production process, nor in any way simulate a

production process; and

(iv) "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

Medical consultation means a consultation which takes place between an employee and a licensed physician for the purpose of determining what medical examinations or procedures, if any, are appropriate in cases where a significant exposure to a hazardous chemical may have taken place.

Organic peroxide means an organic compound that contains the bivalent -O-O- structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

Oxidizer means a chemical other than a blasting agent or explosive as defined in § 1910.109(a), that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

Physical hazard means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

Protective laboratory practices and equipment means those laboratory procedures, practices and equipment accepted by laboratory health and safety experts as effective, or that the employer can show to be effective, in minimizing the potential for employee exposure to hazardous chemicals.

Reproductive toxins means chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

Select carcinogen means any substance which meets one of the following criteria:

(i) It is regulated by OSHA as a carcinogen; or

(ii) It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP)(latest edition); or

(iii) It is listed under Group 1 ("carcinogenic to humans") by the International Agency for research on Cancer Monographs (IARC)(latest editions); or

(iv) It is listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:

(A) After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m³;

- (B) After repeated skin application of less than 300 (mg/kg of body weight) per week; or
- (C) After oral dosages of less than 50 mg/kg of body weight per day.

Unstable (reactive) means a chemical which is the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature.

Water-reactive means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

DRAFT TWO

APPENDIX 3

SAC CHEMICAL HYGIENE PLAN GENERAL TRAINING CERTIFICATE

Name: _____ Date: _____

Building/Room: _____ Phone: _____ Department _____

I certify that I have read the Chemical Hygiene Plan for San Antonio College and that I have received the general training related to the Chemical Hygiene Plan, which included the following:

1. Location of the potentially hazardous chemicals in the workplace.
2. Recognition of the chemical labeling and its meaning.
3. Location of the MSDS's in the workplace.
4. Location of the health hazard, physical hazard, environmental protection, and special protection sections of the MSDS and an explanation of their use.
5. Identification of the Chemical Hygiene Officer by name and title.
6. The major components of the laboratory's standard labeling system.
7. The appropriate protective clothing for the area and its proper usage.
8. Emergency procedures in the events of a hazardous chemical spill.
9. The environmental monitoring protocol for the laboratory.
10. Location and safety precautions for potentially hazardous equipment.
11. Physical and health effects of hazardous chemicals associated with task assignments.
12. Methods and observation techniques used to determine the presence or release of hazardous chemicals in the laboratory.
13. How to lessen or prevent exposure to hazardous chemicals through controlled work practices and personal protective equipment.
14. Emergency and first-aid procedures to follow if employees are exposed to hazardous chemicals.

In addition, I understand that I have the responsibility to read the MSDS's for any chemical that I will work with in the laboratory.

Laboratory User Signature