COUNTY OF RIVERSIDE
STANDARD SAFETY OPERATIONS MANUAL

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SUBJECT:	LABORATORY SAFETY & CHEMICAL HYGIENE PLAN	**EFFECTIVE DATE:**	02/01/95
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PURPOSE: The purpose of this plan is to protect employees from health hazards associated with hazards associated with hazardous chemicals in the laboratory and keep exposures below the limits specified by Cal/OSHA.

POLICY: All County Departments/Agencies/Districts engaged in laboratory use of hazardous chemicals will develop and implement a written Chemical Hygiene Plan (CHP) as needed, specific to their departments and facilities, to assure that occupational exposure to hazardous chemicals is minimized.

OBJECTIVE: Maintain employee safety and health, define the guidelines for the chemical hygiene plan, and assure compliance with regulatory requirements.

SCOPE: There may be facilities throughout the County referred to as "labs" but not all of them fall under the Scope of the Laboratory Standard 29 CFR 1910.1450. The Laboratory Standard applies only to those employees engaged only in the laboratory use of hazardous chemicals.

Laboratory use of hazardous chemicals is defined in 29 CFR 1910.1450 as the use or handling of chemicals in which all of the following conditions are met:

1. Chemical manipulations are carried out on a "laboratory scale" (see Appendix A);
2. Multiple chemical procedures or chemicals are used;
3. The procedures involved are not part of a production process, nor in any way simulate a production process; and
4. "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

This standard does not apply to:

1. Uses of hazardous chemicals which do not meet the definition of laboratory use. In such cases, the department shall comply with relevant regulations in Title 8, California Code of Regulations, even if such use occurs in a laboratory.
2. Laboratory use of hazardous chemicals which provide no potential for employee exposure.

REFERENCES: Code of Federal Regulations (CFR), Title 29, 1910.1450; California Code of Regulations (CCR), Title 8, General Industry Safety Orders (GISO), Sections 5191, 5194.

I. OVERVIEW

The Riverside County Chemical Hygiene Plan provides information and guidance on the handling and use of hazardous chemicals used in a laboratory, and includes guidelines to be used by County organizations in preparing individualized programs.

I. OVERVIEW - continued

This policy also provides procedures for appropriate medical monitoring of employees exposed to hazardous chemicals. The program identifies documentation, communication, and training necessary to ensure the health and safety of County employees.

II. RESPONSIBILITIES

A. The Department/Agency/District Head or his/her designee shall act as the Chemical Hygiene Officer for the laboratories assigned to his or her area of responsibility. The Chemical Hygiene Officer shall:

1. Work with administrators and other employees to develop and implement appropriate chemical hygiene policies and practices;

2. Monitor procurement and use of chemicals in the lab, including determining that facilities and training levels are adequate for the chemicals in use;

3. Perform regular, formal chemical hygiene and housekeeping inspections of emergency equipment;

4. Maintain current knowledge concerning the legal requirements of regulated substances in the laboratory;

5. Help supervisors develop precautions and adequate facilities;

6. Review and improve the Chemical Hygiene Plan on an annual basis; and

7. Monitor the waste disposal program.

B. The laboratory supervisor shall:

1. Maintain overall responsibility for the laboratory operation;

2. Ensure that workers know and follow the chemical hygiene rules;

3. Know the current legal requirements concerning regulated substances;

4. Determine the proper level of personal protective equipment, ensure that such protective equipment is available and in working order;

5. Ensure that appropriate training has been provided to employees; and

6. Ensure that facilities and training for use of any material being ordered are adequate.

C. The laboratory workers are individually responsible for:

1. Planning and conducting each laboratory operation in accordance with the Chemical Hygiene Plan;

II. RESPONSIBILITIES - continued

2. Developing good personal chemical hygiene habits; and

3. Reporting all facts pertaining to every accident and any action or condition that may exist in an accident to the supervisor.

III. CHEMICAL HYGIENE PLAN

A. Where hazardous chemicals are used in workplace laboratories, organizations shall develop and carry out provisions of a written Chemical Hygiene Plan which is:

1. Capable of protecting employees from health hazards associated with hazardous chemicals in that laboratory; and

2. Capable of keeping exposures below limits established by regulation.

B. The Chemical Hygiene Plan shall be readily available to employees and employee representatives. This plan shall include each of the following elements and shall indicate specific measures that departments will take to ensure laboratory employee protection:

1. Standard operating procedures relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals;

2. Criteria that organizations will use to determine and implement control measures to reduce employee exposure to hazardous chemicals including engineering controls, and the use of personal protective equipment and hygiene practices. Particular attention shall be given to the selection of control measures for chemicals that are known to be extremely dangerous;

3. A requirement that fume hoods comply with regulations, that all protective equipment shall function properly and that specific measures shall be taken to ensure proper and adequate performance of such equipment;

4. Provisions for employee information and training;

5. The circumstances under which a particular laboratory operation, procedure or activity shall require prior approval from the management or a designee before implementation;

6. Provisions for medical consultation and medical evaluations;

7. Designation of personnel responsible for implementation of the Chemical Hygiene Plan including the assignment of a Chemical Hygiene Coordinator; and

III. CHEMICAL HYGIENE PLAN - continued

8. Provisions for additional employee protection for work with particularly hazardous substances. These include "carcinogens," reproductive toxins and substances which have a high degree of acute toxicity. Specific consideration shall be given to the following provisions that shall be included where appropriate:

    a. Establishment of a designated area;
    b. Use of containment devices such as fume hoods or glove boxes;
    c. Procedures for safe removal of contaminated waste; and
    d. Decontamination procedures.

C. Organizations shall review and evaluate the effectiveness of their Chemical Hygiene Plan at least annually and update it as necessary.

IV. PRACTICES/PROCEDURES

The following practices will be followed by employees with exposure potential to hazardous chemicals. Other engineering or administrative controls will be implemented as needed to prevent or minimize exposure to hazardous chemicals.

A. **Laboratory Equipment and Glassware.** Each employee shall keep the work area clean and uncluttered. All chemicals and equipment shall be properly labeled. The work area shall be thoroughly cleaned and all equipment properly stored at the completion of each workday or operation.

In addition, the following procedures shall apply to the use of laboratory equipment:

1. All laboratory equipment shall be used only for its intended purpose;

2. All glassware will be handled and stored with care to minimize breakage; all broken glassware will be immediately disposed of in the broken glass container;

3. All evacuated glass apparatus shall be shielded to contain chemicals and glass fragments should implosion occur;

4. Labels shall be attached to all chemical containers, identifying the contents and chemical hazards;

5. Waste receptacles shall be identified as such; and

6. All laboratory equipment shall be inspected on a periodic basis and repaired or replaced as necessary.

B. **Personal Protective Clothing.** Appropriate protective clothing such as, but not limited to, gowns, aprons, lab coats, clinic jackets, or similar outer garments shall be worn in occupational exposure situations. The type and characteristics will depend upon the task and degree of exposure anticipated. Protective clothing is to be changed when soiled or before leaving the work area. If disposable, protective clothing will be discarded as regulated waste/regular trash.

IV. PRACTICES/PROCEDURES - continued

B. Non-disposable protective clothing will not be taken home, but will be laundered on a periodic basis, not to exceed monthly, as arranged by the laboratory supervisor.

C. **Eye-Face Protection.** Safety glasses are required for employees and visitors to the laboratory and will be worn at all times when in the laboratory. Contact lenses are strongly discouraged in the laboratory, except as approved by the Chemical Hygiene Officer and Supervisor.

Chemical goggles and/or a full-face shield shall be worn during chemical transfer and handling operations as procedures dictate.

D. **Safety Shoes.** Safety shoes are required where employees are routinely lifting heavy objects. Sandals, perforated shoes, sneakers, and bare feet are prohibited.

E. **Gloves.** Appropriate chemical resistant gloves shall be worn at all times when there may be skin contact with chemicals. Used gloves shall be inspected and washed prior to re-use. Damaged or deteriorated gloves will be replaced immediately. Gloves shall be washed prior to removal from hands. Hands shall be washed once gloves have been removed.

Thermal-resistant gloves shall be worn for operations involving the handling of heated materials and exothermic reaction vessels. Thermal-resistant gloves shall be non-asbestos and shall be replaced when damaged or deteriorated.

G. **Respirators.** Respirator usage shall comply with the County of Riverside Respiratory Protection Program Guideline - 2004.

H. **Hazard Determination.** Departments shall ensure that labels on containers of hazardous chemicals are not removed or defaced. Material Safety Data Sheets for hazardous chemicals are to be maintained in the workplace and are to be readily accessible to employees.

The following provisions shall apply to chemical substances developed in the laboratory;

1. If the composition of the chemical substance which is produced exclusively for the laboratory's use is known, the department shall determine if it is a hazardous chemical. If the chemical is considered to be hazardous, the department shall provide appropriate training.

2. If the chemical produced is a byproduct whose composition is not known, departments shall assume that the substance is hazardous and is covered by the chemical hygiene plan.

3. If the chemical substance is produced for commercial purposes by another user outside of the laboratory, the department shall comply with Hazard Communication regulations including requirement for preparation of Material Safety Data Sheets and labeling.

V. EMPLOYEE EXPOSURE DETERMINATION

A. **Initial Monitoring.** Departments shall measure employee exposure to any substance regulated by a standard if there is reason to believe that exposure to that substance exceeds Action Levels (or in the absence of an Action Level, the Permissible Exposure Limit). The person supervising, directing or evaluating the monitoring shall be competent in industrial hygiene practice.

B. **Periodic Monitoring.** If initial monitoring discloses employee exposure over the Action Level, a department shall immediately comply with the exposure monitoring provisions of relevant regulations.

C. **Notification of Monitoring Results.** Employees are to be notified within 15 working days after receipt of any monitoring results in writing, either individually or by posting results in an appropriate location that is accessible to all employees.

VI. THE LABORATORY FACILITY

A. **Design.** The laboratory facility should have:

1. An appropriate general ventilation system with air intakes and exhausts located so as to avoid intake of contaminated air;

2. Adequate, well ventilated stockrooms/storerooms;

3. Laboratory hoods and sinks;

4. Other safety equipment including eyewash fountains and drench showers; and

5. Arrangements for waste disposal.

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

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

D. **Ventilation.**

1. 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.

VI. THE LABORATORY FACILITY - continued

2. Hoods. A laboratory hood with 2.5 linear feet of hood space per person should be provided for every two 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.

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

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

5. Modifications. Any alteration of the ventilation system should be made only if thorough testing indicates that worker protection from airborne toxic substances becomes inadequate.

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

7. Quality. General airflow 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 measured within 1 inch of the perimeter of the opening. The exhaust system should provide an average face velocity of at least 100 linear feet per minute (lfm) with a minimum of 70 lfm.

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

VII. EMPLOYEE INFORMATION AND TRAINING

Organizations shall provide information and training to ensure that employees are apprised of the hazards of chemicals present in the workplace. Each employee shall receive training at the time of initial assignment to a work area where hazardous chemicals are present, prior to assignments involving new exposure situations, and at a regular frequency as determined by the Chemical Hygiene Officer. Hazard Communication shall be in compliance with Riverside County Hazard Communication Program 6001.

VII. EMPLOYEE INFORMATION AND TRAINING - continued

A. **Information.** Employees shall be informed of:

1. The contents of these standards;

2. The location and availability of the Chemical Hygiene Plan;

3. The exposure limits for regulated substances;

4. Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory; and

5. The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to, Material Safety Data Sheets received from the chemical supplier.

B. **Training.** Employee training shall include:

1. Methods and observations that may be used to detect the presence or release of a hazardous chemical (such as monitoring, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);

2. The physical and health hazards of chemicals in the work area; and

3. The measures employees can take to protect themselves from hazards, including specific procedures implemented to protect employees from exposure to hazardous chemicals - such as appropriate work practices, emergency procedures, and personal protective equipment to be used.

VIII. MEDICAL CONSULTATIONS AND MEDICAL EXAMINATIONS

A. Organizations shall provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations which an examining physician determines to be necessary, under the following circumstances:

1. Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory, the employee shall be provided an opportunity to receive an appropriate medical examination;

2. Where exposure monitoring reveals an exposure level above the Action Level (or in the absence of an Action Level, Permissible Exposure Limit) for a regulated substance, medical surveillance shall be established for the affected employee;

VIII. MEDICAL CONSULTATIONS AND MEDICAL EXAMINATIONS - continued

3. Whenever an event takes place in the work area such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure, affected employees shall be provided an opportunity for a medical consultation. Such consultation shall be for the purpose of determining the need for a medical examination.

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

C. Organizations shall provide the following information to the physician:

1. The identity of the hazardous chemical(s) to which the employee may have been exposed;

2. A description of the conditions under which the exposure occurred including quantitative exposure data, if available, and

3. A description of the signs and symptoms of exposure that the employee is experiencing, if any.

IX. RECORDKEEPING

A. **Accident Investigations.** Accident investigations are to be conducted by the immediate supervisor and CHO with assistance from other personnel as deemed necessary. The Laboratory Supervisor will notify the County Safety Office within 24 hours of any laboratory accident and a copy of the accident report must be forwarded to the County Safety Office within 48 hours. This report is to be retained for a period of thirty (30) years.

Exposure records and Material Safety Data Sheets for hazardous chemicals and harmful physical agents will be maintained for thirty (30) years.

B. **Medical Records.** Medical records for employees exposed to hazardous chemicals and harmful physical agents will be maintained for the duration of employment plus thirty (30) years.

C. **Training Records.** Training records will be maintained for a period of 3 years.

APPENDIX A
DEFINITIONS

X. APPENDIX A: DEFINITIONS

Action Level: A concentration designated for a specific substance. Action levels are calculated as an eight (8)-hour time weighted average, and when reached, initiates activities such as medical surveillance and exposure monitoring.

Carcinogen: Any substance that meets one of the following criteria:

1. It is regulated by Cal-OSHA as a carcinogen; or

2. It is listed under the category "known to be carcinogens" in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (1985 edition); or

3. It is listed under group 1 ("carcinogenic to humans") by the International Agency for Research on Cancer Monographs (IARC) (Volumes 1-48 and Supplements 1-8); or

4. It is listed in either group 2A or 2B by IARC or under the category "reasonably considered 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 applications of less than 300mg/kg of body weight per week; or

    c. After oral dosages of less than 50 mg/kg of body weight per day.

Chemical Hygiene Coordinator: An employee designated by the organization, who is qualified by training or experience to provide technical guidance in the development and implementation of the Chemical Hygiene Plan.

Chemical Hygiene Plan: A written program developed and implemented by the organization which sets forth procedures, equipment, personal protective equipment, and work practices that are capable of protecting employees from health hazards presented by hazardous chemicals used in a particular workplace.

Combustible Liquid: Any liquid having a flashpoint at or above 100□F (37.8□C), or components with flashpoints of 200□F (93.3□C) or higher, the total volume of which make up 99% or more of the total volume of the mixture.

Compressed Gas: (1) A gas or mixture of gasses having, in a container, an absolute pressure exceeding 40 psi at 70□F (21.1□C); or (2) A gas or mixture of gasses having, in a container, an absolute pressure exceeding 104 psi at 130□F (54.4□C); or (3) A liquid having a vapor pressure exceeding 40 psi at 100□F (37.8□C).

Designated Area: Any area which may be used for work with "carcinogens," reproductive toxins, or substances that 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.

X. APPENDIX A: DEFINITIONS - continued

Emergency: 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.

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

Flammable: A chemical that falls into one of the following categories:

1. "Aerosol, flammable" means an aerosol that yields a flame projection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;

2. "Gas, flammable" means:

   a. A gas that, at ambient temperature and pressure, forms a flammable mixture of 13% by volume or less; or

   b. A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air greater than 12% by volume, regardless of the Lower Explosive Limit.

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

4. "Solid, flammable" means a solid, other than a blasting agent or explosive, 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 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: The minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite.

Hazardous Chemical: 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. (Reference: Title 8, CCR, Section 5194, Appendices A and B).

Laboratory: A facility where "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: 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 workplaces whose function is to produce commercial quantities of materials.

APPENDIX A: DEFINITIONS - continued

Laboratory-type Hood: A device located in a laboratory, enclosed on five sides with a movable sash or fixed partial enclosure 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 and air are compromised and employees do not work inside the enclosure during the release of airborne hazardous chemicals.

Medical Consultation: 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.

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

Protective Laboratory Practices and Equipment: Those laboratory practices, procedures, and equipment accepted by laboratory health and safety experts as effective, or that the organization can show to be effective, in minimizing the potential for employee exposure to hazardous chemicals.

Reproductive Toxins: Chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

Unstable (reactive): A chemical which is the pure state, or as produced or transported, will , decompose, condense, or will become self-reactive under conditions of shock, pressure, or temperature.

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

APPENDIX B
COMPONENTS OF THE CHEMICAL HYGIENE PLAN

XI. APPENDIX B: COMPONENTS OF THE CHEMICAL HYGIENE PLAN

A. CHEMICAL PROCUREMENT, DISTRIBUTION, AND STORAGE

1. **Procurement.** Before a substance is received, information on proper handling, storage, and disposal should be known to those who will be involved. No container shall be accepted without an adequate identifying label. Preferably, all substances shall be received in a central location.

2. **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 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.

3. **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.

4. **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.

B. 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.

C. HOUSEKEEPING, MAINTENANCE, AND INSPECTIONS.

1. **Cleaning.** Floors should be cleaned regularly. All spills shall be cleaned immediately and disposed of in the proper manner. Lab benches shall be kept clear of equipment and chemicals except those necessary for the work being performed. The work area and any equipment utilized shall be cleaned at the end of each operation and each shift. All chemical waste shall be disposed of in accordance with all Federal, State, and local laws.

2. **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.

3. **Maintenance.** Safety deluge showers and eye wash fountains shall be activated at least monthly to flush the line and to verify proper operation. Respirators for routine use should be inspected periodically by the laboratory supervisor. Procedures to prevent restarting of out-of-service equipment should be implemented.

XI. APPENDIX B: COMPONENTS OF THE CHEMICAL HYGIENE PLAN - continued

4. **Passageways.** All floors, aisles, exits, fire extinguishing equipment, eyewashes, showers, electrical disconnects, and other emergency equipment shall remain unobstructed. Stairways and hallways should not be used as storage areas.

D. MEDICAL PROGRAM

1. **Compliance with Regulations.** Regular medical surveillance should be established to the extent required by regulations.

2. **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.

3. **First Aid.** Personnel trained in first aid should be available during working hours and an emergency room with medical personnel should be nearby.

E. PROTECTIVE APPAREL AND EQUIPMENT

These should include for each laboratory:

1. Protective apparel compatible with the required degree of protection for substances being handled;

2. An easily accessible drench-type safety shower;

3. An eyewash fountain;

4. A fire extinguisher;

5. Respiratory protection, fire alarm, and telephone for emergency use should be available; and

6. Other items designated by the laboratory supervisor.

F. RECORDS

1. Accident records should be written and retained.

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

3. Inventory and usage records for high-risk substances should be kept as specified below.

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

XI. APPENDIX B: COMPONENTS OF THE CHEMICAL HYGIENE PLAN - continued

G. SIGNS AND LABELS

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

1. Emergency telephone numbers of emergency personnel/facilities, supervisors, and laboratory workers;

2. Identity labels, showing contents of containers (including waste receptacles) and associated hazards;

3. 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

4. Warnings at areas or equipment where special or unusual hazards exist.

H. SPILLS AND ACCIDENTS

1. A written emergency plan should be established and communicated to all personnel. This plan should include procedures for ventilation failure, evacuation, medical care, reporting, and drills.

2. There should be an alarm system to alert people in all parts of the facility including isolation areas such as cold rooms.

3. A spill control policy should be developed and should include consideration of prevention, containment, cleanup, and reporting.

4. All accidents or near accidents should be carefully analyzed with the results distributed to all who might benefit.

I. INFORMATION AND TRAINING

1. **Aim.** To ensure that all individuals at risk are adequately informed about the work in the laboratory, its risks, and what to do if an accident occurs.

2. **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.

   Receiving and stockroom/storeroom personnel should know about hazards, handling equipment, protective apparel, and relevant regulations.

3. **Frequency of Training.** The training and education program should be a regular, continuing activity - not simply an annual presentation.

XI. APPENDIX B: COMPONENTS OF THE CHEMICAL HYGIENE PLAN - continued

4. **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.

J. WASTE DISPOSAL PROGRAM

1. **Aim.** To ensure that minimal harm to people, other organisms, and the environment will result from the disposal of waste laboratory chemicals.

2. **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 Department of Transportation (DOT) regulations.

3. **Discarding Chemical Stock.** 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.

4. **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.

5. **Method of Disposal.** Incineration in an environmentally acceptable manner is the most practical disposal method for combustible laboratory waste.

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

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

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

K. BASIC RULES AND PROCEDURES FOR WORKING WITH CHEMICALS

General Rules **-** The following should be used for essentially all laboratory work with chemicals:

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

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

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

XI. APPENDIX B: COMPONENTS OF THE CHEMICAL HYGIENE PLAN - continued

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

2. **Avoidance of "routine" exposure.** Develop and encourage safe habits; avoid unnecessary exposure to chemicals by any route.

   a. Do not test or smell chemicals.

   b. Inspect gloves and test glove boxes before use.

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

3. **Choice of chemicals.** Use only those chemicals for which the quality of the available ventilation system is appropriate.

4. **Eating, smoking, etc.** Avoid eating, drinking, smoking, gum chewing, or application 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.

5. **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. Use equipment only for its designed purpose.

6. **Exiting.** Wash areas of exposed skin well before leaving the laboratory.

7. **Horseplay.** Avoid practical jokes or other behavior which might confuse, startle or distract another worker.

8. **Mouth suction.** Do not use mouth suction for pipeting or starting a siphon.

9. **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.

10. **Personal housekeeping.** Keep the area clean and uncluttered, with chemicals and equipment being properly labeled and stored; clean the work area on completion of an operation or at the end of each workday.

11. **Personal protection.** Assure that appropriate eye protection is worn by all persons, including visitors, where chemicals are stored or handled.

    a. 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.

XI. APPENDIX B: COMPONENTS OF THE CHEMICAL HYGIENE PLAN - continued

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

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

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

e. Remove laboratory coat immediately on significant contamination.

12. **Planning.** Seek information and advice about hazards, plan appropriate protective procedures, and plan positioning of equipment before beginning a new operation.

13. **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.

14. **Use of hood.** Use the hood for operations which might result in release of toxic chemical vapors or dust.

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

b. 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 airflow.

c. 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 if it is "off".

15. **Vigilance.** Be alert to unsafe conditions and see that they are corrected when detected.

16. **Waste disposal.** Assure that the plan for each laboratory operation includes plans and training for waste disposal.

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

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

XI. APPENDIX B: COMPONENTS OF THE CHEMICAL HYGIENE PLAN - continued

17. **Working alone.** Avoid working alone in a building; do not work alone in a laboratory if the procedures being conducted are hazardous.

L. WORKING WITH ALLERGENS AND EMBRYOTOXINS

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

2. **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.

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

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

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

M. WORK WITH CHEMICALS OF MODERATE CHRONIC OR HIGH ACUTE TOXICITY

Examples: Di-isopropyl fluorophosphate, hydrofluoric acid, hydrogen cyanide. Supplemental rules to be followed in addition to those mentioned above.

1. **Aim.** To minimize exposure to these toxic substances by any route using all reasonable precautions.

2. **Applicability.** These precautions are appropriate for substances by any route using all reasonable precautions and for substances with moderate chronic or high acute toxicity used in significant quantities.

3. **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 70 linear feet per minute) or other contaminant 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.

4. **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.

XI. APPENDIX B: COMPONENTS OF THE CHEMICAL HYGIENE PLAN - continued

5. **Records.** Maintain records of the amounts of these materials on hand, amounts used, and the names of the workers involved.

6. **Prevention of spills and accidents.** Be prepared for accidents and spills. Ensure that at least 2 people are present at all times if 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.

7. **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).

N. WORK WITH CHEMICALS OF HIGH CHRONIC TOXICITY

Examples: Dimethlymercury 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 those 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).

1. **Access.** Conduct all transfer and work with these substances in a "controlled area"; a restricted recess 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.

2. **Approvals.** Prepare a plan for use and disposal of these materials and obtain the approval of the laboratory supervisor.

3. **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.

4. **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.

5. **Housekeeeping.** Use a wet mop or vacuum equipped with a HEPA filter instead of dry sweeping if the toxic substance was a dry powder.

XI. APPENDIX B: COMPONENTS OF THE CHEMICAL HYGIENE PLAN - continued

6. **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.

7. **Records.** Keep accurate records of the amounts of these substances stored and used, the dates of use, and the names of users.

8. **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.

9. **Spills.** Assure that contingency plans, equipment, and materials to minimize exposures of people and property in case of accident are available.

10. **Storage.** Store containers of these chemicals only in a ventilated, limited access area in appropriately labeled, unbreakable, chemically resistant, secondary containers.

11. **Glove boxes.** For a negative pressure glove box, ventilation rate must be at least 2 volume changes per 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.

12. **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.

APPENDIX C
EMPLOYEE TRAINING DOCUMENTATION

INDIVIDUAL EMPLOYEE TRAINING DOCUMENTATION

NAME OF TRAINER/INSTRUCTOR: _____

TRAINING SUBJECT: Laboratory Safety Program Guidelines

TRAINING MATERIALS USED: _____
_____

NAME OF EMPLOYEE: _____

DATE OF HIRE/ASSIGNMENT: _____

I, _____ , hereby certify that I received training as described above in the following areas:

[ ] The location and contents of the Chemical Hygiene Plan.

[ ] The location and contents of the Material Safety Data Sheet book.

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

[ ] The physical and health hazards of chemicals in the work area.

[ ] Instruction on the need, use, and limitations of appropriate work practices, emergency procedures, and personal protective equipment.

[ ] Signs and symptoms associated with exposure to hazardous chemicals.

I fully understand this training, agree to comply with the instructions received, and the Laboratory Safety & Chemical Hygiene Plan.

_____ _____
Employee Signature Date

_____ _____
Trainer/Instructor Signature Date