

## Foreword

On 31 January, 1990 the Federal Occupational Safety and Health Administration (OSHA) promulgated a final rule for occupational exposure to hazardous chemicals in laboratories. Included in the standard, which became effective on 1 May, 1990 is a requirement for all employers covered by the standard to develop and carry out the provisions of a Chemical Hygiene Plan (CHP). The standard requires that the CHP must be developed and implemented by January 31, 1991.

Likewise, California adopted a similar standard on February 21, 1991 which was approved on March 25, 1991 with an effective date of April 24, 1991 and delayed start-up dated for the written Chemical Hygiene Plan of October 31, 1991.

A CHP is defined as a written program which sets forth procedures, equipment, personal protective equipment and work practices that are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace. Components of the CHP must include standard operating procedures for safety and health, criteria for the implementation of control measures, measures to ensure proper operation of engineering controls, provisions for training and information dissemination, permitting requirements, provisions for medical consultation, designation of responsible personnel, and identification of particularly hazardous substances.

This CHP is maintained in the laboratory manager's office readily available to laboratory employees. All laboratory personnel must know and follow the procedures outlined in this plan. All operations performed in the laboratory must be planned and executed in accordance with the enclosed procedures. In addition, each employee is expected to develop safe personal chemical hygiene habits aimed at the reduction of chemical exposures to themselves and co-workers.

This document was developed to comply with paragraph (e) of the referenced Federal OSHA 1910.1450 standard as well as the California Code of Regulations Title 8, Chapter 4, Subchapter 7, Section 5191. The laboratory manager will maintain the facilities and procedures employed in the laboratory compatible with current knowledge and regulations in laboratory safety. This CHP will be reviewed, evaluated and updated at least annually and is readily available to employees, their representatives and any representative of the Assistant Secretary of Labor for Federal OSHA or CAL/OSHA.

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## **Standard Operating Procedures for Laboratory Chemicals**

### **Chemical Procurement**

The decision to procure a chemical shall be a commitment to handle and use the chemical properly from initial receipt to ultimate disposal.

Requests for procurement of new chemicals shall be submitted to the Chemical Hygiene Officer for approval. The form entitled "New Chemical Purchasing Request". Appendix C to this plan shall be used for this purpose. Information on proper handling, storage and disposal shall be known to all involved personnel prior to the procurement of the chemical. Chemicals utilized in the laboratory shall be those which are appropriate for the ventilation system.

All chemicals shall be received in a central location. Personnel who receive chemical shipments shall be knowledgeable of the proper procedures for receipt. Chemical containers shall not be accepted without accompanying labels, material safety data sheets and packaging in accordance with all appropriate regulations. All chemical shipments should be dated when received and opened.

### **Chemical Storage**

Received chemicals shall be immediately moved to the designated storage area, large glass containers shall be placed in carrying containers or shipping containers during transportation.

The storage area shall be well-illuminated with all storage maintained below eye level. Large bottles shall be stored no more than two feet from ground level.

Chemicals shall be segregated by hazard classification and compatibility in a well-identified area, with local exhaust ventilation.

Mineral acids should be separated from flammable and combustible materials. Separation is defined by NFPA 49 as storage within the same fire area but separated by as much space as practicable of by intervening storage from incompatible materials.

Acid-resistant trays shall be placed under bottles of mineral acids.

Acid-sensitive materials such as cyanides and sulfides shall be separated from acids or protected from contact with acids.

Highly toxic chemicals or other chemicals whose containers have been opened shall be stored in unbreakable secondary containers.

The storage area shall be used as a preparation or repackaging area.

The storage area shall be accessible during normal working hours. The storage area is under the control of the laboratory manager.

When chemicals are taken from the storage area, they shall be placed in an outside container or bucket.

Storage of chemicals at the lab bench or other work areas shall be limited to those amounts necessary for one operation or shift. The container size shall be the minimum convenient. The amounts of chemicals at the lab bench shall be as small as practical. Chemicals in the workplace shall not be exposed to sunlight or heat.

Stored chemicals shall be examined at least annually by the Chemical Hygiene Officer for replacement, deterioration, and container integrity. The inspection should determine whether any corrosion, deterioration, or damage has occurred to the storage facility as a result of leaking chemicals.

Periodic inventories of chemicals outside the storage area shall be conducted by the Chemical Hygiene Officer. Unneeded items shall be properly discarded or returned to the storage area.

### **Chemical Handling**

Each laboratory employee with the training, education and resources provided by supervision, shall develop and implement work habits consistent with this CHP to minimize personal and coworker exposure to the chemicals in the laboratory. Based on the realization that all chemicals inherently present hazards in certain conditions, exposure to all chemicals shall be minimized.

General precautions which shall be followed for the handling and use of all chemicals are:

Skin contact with all chemicals shall be avoided.

All employees shall wash all areas of exposed skin prior to leaving the laboratory.

Mouth suction for pipeting or starting a siphon is prohibited.

Eating, drinking, smoking, gum chewing, or application of cosmetics in areas where laboratory chemicals are present shall be avoided. These areas have been posted. Hands shall be thoroughly washed prior to performing these activities.

Storage, handling and consumption of food or beverages shall not occur in storage areas, refrigerators, glassware or utensils also used for laboratory operations.

Risk determinations shall be conservative in nature.

Any chemical mixture shall be assumed to be as toxic as its most toxic component.

Substances of unknown toxicity shall be assumed to be toxic. Laboratory employees shall be familiar with the symptoms of exposure for the chemicals with which they work and the precautions necessary to prevent exposure.

The intent and procedures of this Chemical Hygiene Plan shall be continuously adhered to.

In all cases of chemical exposure, neither the Permissible Exposure Limits (PELs) of OSHA or the Threshold Limit Values (TLVs) of the American Conference of Governmental Industrial Hygienists (ACGIH) shall be exceeded.

The engineering controls and safety equipment in the laboratory shall be utilized and inspected in accordance with Appendix A of this plan.

Specific precautions based on the toxicological characteristics of individual chemicals shall be implemented as deemed necessary by the Chemical Hygiene Officer (see \_\_\_\_). These special precautions are listed in Section \_\_\_\_.

### **Laboratory Equipment and Glassware**

Each employee shall keep the work area clean and uncluttered. All chemicals and equipment shall be properly labeled in accordance with Section \_\_\_\_\_. At the completion of each work day or operation, the work area shall be thoroughly cleaned and all equipment properly cleaned and stored.

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

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

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.

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

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

Waste receptacles shall be identified as such.

All laboratory equipment shall be inspected on a periodic basis as specified in Appendix A, and replaced or repaired as necessary.

## **Personal Protective Equipment**

Safety glasses meeting ANSI Z87.1 are required for employees and visitors to the laboratory and will be worn at all times when in the laboratory. Contact lenses are prohibited 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.

Sandals, perforated shoes, sneakers and bare feet are prohibited. Safety shoes, per ANSI 47 are required where employees routinely lift heavy objects.

Lab coats are provided and must be worn in the laboratory. Laboratory coats will be laundered on a periodic basis, not to exceed monthly. Laboratory coats shall be removed immediately upon discovery of significant contamination.

Appropriate chemical-resistant gloves based on the Table in Appendix B 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 immediately replaced. Gloves shall be washed prior to removal from the hands.

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.

Respirator usage shall comply with the OSHA Respiratory Protection Standard, 29 CFR 1910.134, and GISO 5144 and the company's Respiratory Program.

## **Personal Work Practices**

Laboratory supervision must ensure that each employee knows and follows the rules and procedures established in this plan.

All employees shall remain vigilant to unsafe practices and conditions in the laboratory and shall immediately report such practices and/or conditions to the laboratory supervisor. The supervisor must correct unsafe practices and or conditions promptly.

Long hair and loose-fitting clothing shall be confined close to the body to avoid being caught in moving machine/equipment parts.

Use only those chemicals appropriate for the ventilation system.

Avoid unnecessary exposure to all chemicals by any route.



Do not smell or taste any chemicals.

Encourage safe work practices in coworkers by setting the proper example. Horseplay is strictly forbidden.

Seek information and advice from knowledgeable persons, standards and codes about the hazards present in the laboratory. Plan operations, equipment and protective measures accordingly.

Use engineering controls in accordance with Section 3.0.

Inspect personal protective equipment prior to use, and wear appropriate protective equipment as procedures dictate and when necessary to avoid exposure.

### **Labeling**

All containers in the laboratory shall be labeled. This includes chemicals containers and waste containers. The label shall be informative and durable, and at a minimum, will identify contents, source, and date of acquisition, storage location and indication of hazard.

Portable containers shall be labeled by the individual using the container.

Exemptions for labeling requirements shall be made for chemical transfers from a labeled container into a container which is intended only for the immediate use of the employee who performed the transfer.

The labeling program shall be periodically inspected by the Chemical Hygiene Officer to ensure that labels have not been defaced or removed. The form entitled "Chemical Hazard Audit Checklist", Appendix D to this plan, shall be used for this purpose.

### **Criteria for Implementation of Control Measures**

#### **Air Sampling**

Air sampling for evaluating employee exposure to chemical substances shall be conducted periodically or as specified by specific codes or regulations.

Upon addition of new chemical or changes in control procedures, additional air sampling will be considered to determine the exposure. Conduct air sampling if there is reason to believe that exposure levels for regulated substances that require sampling routinely exceed the action level, the PEL. Air sampling will be implemented when usage of highly toxic substances exceeds three times per week.

The results of air sampling studies performed in the laboratory are maintained and recorded on the form shown in Appendix E to this plan.

## **Housekeeping**

Each laboratory worker is directly responsible for the cleanliness of his or her work space, and jointly responsible for common areas of the laboratory. Laboratory management shall insist on the maintenance of housekeeping standards.

The following procedures apply to the housekeeping standards of the laboratory:

All spills on lab benches or floors shall be immediately cleaned and properly disposed of. Large spills will necessitate the implementation of the Emergency Action Plan per OSHA 1910.38 and 1910.120/

The lab benches shall be kept clear of equipment and chemicals except those necessary for the work currently being performed.

The work area shall be cleaned at the end of each operation and each shift.

All apparatus shall be thoroughly cleaned and returned to storage upon completion of usage.

All floors, aisles, exits, fire extinguishing equipment, eyewashes, and showers, electrical disconnects and other emergency equipment shall remain unobstructed.

All labels shall face front.

Chemical containers shall be clean, properly labeled and returned to storage upon completion of usage.

All chemical wastes will be disposed of in accordance with the waste disposal plan.

## **Safety and Emergency Equipment**

Telephone numbers of emergency personnel, supervisors and other workers as deemed appropriate have been posted.

All laboratory personnel will be trained in the proper use of fire extinguishers when hired and annually thereafter. Prior to the procurement of new chemical, the Chemical Hygiene Officer shall verify that existing extinguishers and other emergency equipment are appropriate for such chemicals.

All employees who might be exposed to chemical splashes shall be instructed in the location and proper usage of emergency showers and eyewashes. The eyewash and emergency shower shall be inspected weekly. These inspections shall be performed by the laboratory employees. These inspections shall be in accordance

with ANSI Z358.1 and manufacturer's specifications. Records shall be maintained.

Location signs for safety and emergency equipment have been posted.

## **Engineering Controls**

### **Intent**

The engineering controls installed in the laboratory are intended to minimize employee's exposure to chemical and physical hazards in the workplace. These controls must be maintained in proper working order for this goal to be realized.

### **Modification**

No modification of engineering controls will occur unless testing indicates that worker protection will continue to be adequate.

### **Improper Function**

Improper function of engineering controls must be reported to the Chemical Hygiene Officer immediately. The system shall be taken out of service until proper repairs have been executed.

### **Usage**

All employees shall follow proper work practices when using the engineering controls.

### **Local Exhaust Ventilation**

The following procedures shall apply to the use of local exhaust ventilation:

Openings of hoods shall be placed as close as possible to sources of the air contaminant.

Clear the screen on the face of the hood prior to usage.

Hood fans shall operate when hoods are being used.

After using hoods, operate the fan for an additional period of time sufficient to clear residual contaminants from the ductwork.

The ventilation system shall be inspected every three months. The duct velocity shall be maintained at 3500 feet per minute, minimum. A record of each inspection shall be maintained by the Chemical Hygiene Officer.

### **Laboratory Hoods**

The following hoods shall be utilized for all chemical procedures which might result in release of hazardous chemical vapors or dust. As a general rule, the hood shall be used for all chemical procedures involving substance which are appreciably volatile and have a permissible exposure limit (PEL) less than 50 ppm.

The following work practices shall apply to the use of hoods:

Confirm adequate hood ventilation performance prior to opening chemical containers inside the hood. An inward flow of air can be confirmed by holding a piece of paper at the face of the hood and observing the movement of the paper.

Keep the sash of the hood closed at all times except when adjustments within the hood are being made. At these times, maintain the sash height as low as possible.

Storage of chemicals and equipment inside the hood shall be kept to a minimum.

Minimize interference with the inward flow of air into the hood.

Leave the hood operating when it is not in active use of hazardous chemicals are contained inside the hood or if it is uncertain whether adequate general laboratory ventilation will be maintained when the hood is non-operational.

The ventilation system shall be inspected every three months. The hood face velocity shall be maintained between 75 and 125 feet per minute. A record of each inspection shall be maintained by the Chemical Hygiene Officer.

The hood shall not be used as a means of disposal for volatile chemicals.

Prior to the introduction of new chemicals, the adequacy of hood ventilation systems shall be determined by the Chemical Hygiene Officer.

### **Glove Boxes and Isolation Rooms**

The exhaust air from a glove box or isolation room will pass through scrubbers or other treatment before release into the regular exhaust system.

### **Storage Cabinets**

Storage cabinets for flammable and hazardous chemicals will be ventilated as needed.

### **Employee Information and Training**

#### **Hazard Information**

All employees will be apprised of the hazards presented by the chemicals in use in the laboratory. Each employee shall receive training at the time of initial assignment to the laboratory, prior to assignments involving new exposure situations, and at a regular frequency as determined by the Chemical Hygiene Officer.

#### **Forms**

The form in Appendices F-H entitled "New Employee Chemical Hygiene Orientation and Training Checklist", "Transfer Chemical Hygiene Training

Checklist”, and “New Chemical Training Checklist” shall be used for these purposes.

### **Training**

This training shall include methods of detecting the presence of a hazardous chemical, physical and health hazard of chemicals in the lab, and measures employees can take to protect themselves from these hazards. The training shall present the details of the Chemical Hygiene Plan, and shall include:

The contents of the CAL/OSHA laboratory standard, and its appendices;

The location and availability of the Chemical Hygiene Plan;

The permissible exposure limits for OSHA regulated substances or recommended exposure values for other hazardous chemicals not regulated by OSHA which are present in the laboratory;

Signs and symptoms associated with exposure to the chemicals present in the laboratory;

Location and availability of reference material on chemical hygiene;

Training shall be conducted by the laboratory manager or his designee. The following materials are used during training: Audiovisual Programs, Written Materials and Other Training Materials.

### **Prior Approval of Laboratory Activities**

#### **Permit System**

A permit system shall be used for laboratory activities which present specific, foreseeable hazards to the employees. These activities include off-hours work, sole occupancy of building, hazardous operations and unattended operations. The permit entitled “Chemical Hygiene Permit” is included in Appendix I to this plan and shall be executed prior to the performance of these activities.

#### **Off-Hours Work Procedures**

Laboratory personnel are not permitted to work after hours in the lab, except when permitted.

#### **Sole Occupancy**

At no time shall work be performed in the laboratory when the only person in the building is the laboratory person performing the work. Under unusual conditions, crosschecks, periodic security guard checks, closed circuit television, or other measures may be taken when permitted.

**Hazardous Work**

All hazardous operations are to be performed during a time when at least two personnel are present at the laboratory. At no time shall a laboratory person, while working alone in the laboratory, perform work which is considered hazardous. The determination of hazardous operations shall be made by the laboratory supervisor and permitted.

**Unattended Operations**

When laboratory operations are performed which will be unattended by laboratory personnel (continuous operations, overnight reactions, etc.) the following procedures will be employed:

The permit system shall be utilized.

The laboratory supervisor will review work procedures to ensure for the safe completion of the operation.

An appropriate sign will be posted at all entrances to the laboratory.

The overhead lights in the laboratory will be left on.

Precautions shall be made for the interruption of utility service during the unattended operation (lose of water pressure, electricity, etc.)

The person responsible for the operation will return to the laboratory at the conclusion of the operation to assist in the dismantling of the apparatus.

**Medical Consultations and Examinations**

An opportunity to receive medical attention is available to all employees who work with hazardous chemicals in the laboratory. The opportunity for medical attention will be made available to employees under the following circumstances:

Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory,

Medical surveillance programs will be established where exposure monitoring and medical surveillance requirements, and/or,

Whenever an event takes place in the laboratory such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure the employee will be provided an opportunity for medical consultation for the purpose of determining the need for medical examination.

These medical consultations and examinations shall be administered by or under the direct supervision of a licensed physician. A current list of available physicians is maintained by the Chemical Hygiene Officer. Employees seeking the opportunity of medical consultation should request the listing from the Chemical Hygiene Officer.

### **Chemical Hygiene Responsibilities**

Chief Executive officer: \_\_\_\_\_

He/she has the ultimate responsibility for chemical hygiene throughout the laboratory and with assistance of other program administrators, will provide continued support for chemical hygiene.

Chemical Hygiene Officer: \_\_\_\_\_

The Chemical Hygiene Officer shall:

Work with administrators and other employees to develop and implement appropriate chemical hygiene policies and practices,

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

Perform regular, formal chemical hygiene and housekeeping inspections including inspections for emergency equipment,

Help project directors develop precautions and adequate facilities,

Maintain current knowledge concerning the legal requirements of regulated substances in the laboratory,

Review and improve the Chemical Hygiene Plan on an annual basis,

Ensure that workers know and follow the chemical hygiene rules,

Determine the proper level of personal protective equipment is available and in working order,

Ensure that appropriate training has been provided to employees,

Monitor the waste disposal program.

## **Laboratory Workers**

The laboratory workers are individually responsible for:

Planning and conducting each laboratory operation in accordance with the Chemical Hygiene Plan,

Developing good personal chemical hygiene habits.

## **Special Precautions**

When laboratory procedures change to require the use of additional classifications of chemicals (allergens, embryotoxins, teratogens, carcinogens, etc.), additional special precautions shall be implemented as deemed necessary by the Chemical Hygiene Officer. The permit system shall be utilized for all special activities. All questions regarding the use of the permit system should be addressed to the Chemical Hygiene Officer.

## **Working with Allergens and Emryotoxins (Special Precautions)**

Suitable gloves to prevent hand contact shall be worn when exposed to allergens or substances of unknown allergen activity.

Women of child-bearing age will handle embryotoxins only in a hood with confirmed satisfactory performance and will use protective equipment to prevent skin contact as prescribed by the supervisor and Chemical Hygiene Officer.

Embryotoxins will be stored in adequately ventilated areas in unbreakable secondary containers.

The supervisor and Chemical Hygiene Officer will be notified of spills and other exposure incidents. A physician will be consulted when appropriate.

## **Working with Chemicals of Moderate Chronic or High Acute Toxicity (Special Precautions)**

Areas where these chemicals are stored and used are of restricted access and have special warning signs.

A special hood with a minimum face velocity of 60 linear feet per minute or other containment device will be used. Released vapors will not discharge with the hood exhaust, but will be trapped.

Gloves and long sleeves will be used. Hands and arms will be washed immediately after working with these chemicals.

Two people will always be present during work with these chemicals.



### **Working with Chemicals of High Chronic Toxicity (Special Precautions)**

All transfer and work with these substances shall be in a designated area: a restricted access hood, glove box or portion of lab.

Approval of the supervisor will be obtained before use.

Vacuum pumps must have scrubbers or high efficiency particulated absolute (HEPA) filters.

Any contaminated equipment or glassware will be decontaminated in the hood before removing them from the designated area.

For powders, a wet mop or vacuum with a HEPA filter will be used for cleanup.

Containers will be stored in a ventilated limited access area in labeled, unbreakable, chemically resistant, secondary containers.

### **Recordkeeping**

Accident investigations will be conducted by the immediate supervisor with assistance from other personnel as deemed necessary.

Accidents reports will be rewritten and retained for five years.

Exposure records for hazardous chemicals and harmful physical agents will be maintained for 30 years per 29 CFR 1910.20.

Medical records for employees exposed to hazardous chemicals and harmful physical agents will be maintained for the duration of employment plus 30 years per 29 CFR 1910.20.

Inventory and usage records for high risk substances (amounts of substances on-hand, amounts used and names of workers involved) shall be maintained for five years.

Records of inspections of equipment will be maintained for five years.

Records of employee training will be maintained for five years.

### **Chemical Spills, Releases and Accidents**

In the event of a chemical spill, release or other accident, we will adhere to the procedures outlined on our Emergency Business and Contingency plans.

**Annual Chemical Hygiene Plan Audit**

The Chemical Hygiene Officer will conduct an audit of all phases of the Chemical Hygiene Plan each year. Results will be provided to the ranking official and the laboratory manager. Supervisors are responsible for taking corrective action. Appendix J will be used as a guide for the audit.

## **References and Recommended Reading**

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

National Research Council, Prudent Practices for Disposal of Chemicals from Laboratories, National Academy Press, Washington, D.C., 1982.

Freeman, N.T., Introduction to Safety in the Chemical Laboratory, Academy Press, 1982.

Manufacturing Chemists' Association, Inc., Guide for Safety in the Chemical Laboratory, D. Van Nostrand Company, Inc., 1954.

Green, Michael E., Safety in Working with Chemicals, MacMillan Publishing Co., Inc. 1978.

Pipitone, David A., Safe Storage of Laboratory Chemicals, Wiley & Sons, Inc. 1984.

Code of Federal Regulations, 29 CFR part 1910 subpart Z section 1910.1450, Occupational Exposure to Hazardous Chemicals in Laboratories, 1990.

## **APPENDICES**

**APPENDIX A**  
**Laboratory Safety Equipment Inspection Schedule**



**APPENDIX B**  
**Resistance to Chemicals of Common Glove Materials**

<b>RESISTANCE TO CHEMICALS OF COMMON GLOVE MATERIALS</b>				
<b>CHEMICAL</b>	<b>NATURAL RUBBER</b>	<b>NEOPRENE</b>	<b>NITRILE</b>	<b>VINYL</b>
Acetaldehyde	G	G	E	G
Acetic Acid	E	E	E	E
Acetone	G	G	G	F
Acrylonitrile	P	G	--	F
Ammonium hydroxide (sat)	G	E	E	E
Aniline	F	G	E	G
Benzaldehyde	F	F	E	G
Benzene <sup>a</sup>	P	F	G	F
Benzyl chloride <sup>a</sup>	F	P	G	P
Bromine	G	G	--	G
Butane	P	E	--	P
Butyraldehyde	P	G	--	G
Calcium hypochlorite	P	G	G	G
Carbon disulfide	P	P	G	F
Carbon tetrachloride <sup>a</sup>	P	F	G	F
Chlorine	G	G	--	G
Chloroacetone	F	E	--	P
Chloroform <sup>a</sup>	P	F	G	P
Chromic acid	P	F	F	E
Cyclohexane	F	E	--	P
Dibenzyl ether	F	G	--	P
Dibutyl phtalate	F	G	--	P
Diethanolamine	F	E	--	E
Diethyl ether	F	G	E	P
Dimethyl sulfoxide <sub>b</sub>	--	--	--	--
Ethyl acetate	F	G	G	F
Ethylene dichloride <sup>a</sup>	P	F	G	P
Ethylene glycol	G	G	E	E
Ethylene trichloride <sup>a</sup>	P	P	--	P
Fluorine	G	G	--	G
Formaldehyde	G	E	E	E
Formic acid	G	E	E	E
Glycerol	G	G	E	E
Hexane	P	E	--	P
Hydrobromic acid (40%)	G	E	--	E
Hydrochloric acid (conc.)	G	G	G	E
Hydrofluoric acid (30%)	G	G	G	E
Hydrogen peroxide	G	G	G	E
Iodine	G	G	--	G
Methylamine	G	G	E	E
			--	



<b>Methyl Cellosolve</b>	<b>F</b>	<b>E</b>	<b>--</b>	<b>P</b>
<b>Methyl chloride<sup>a</sup></b>	<b>P</b>	<b>E</b>	<b>--</b>	<b>P</b>
<b>Methyl ethyl ketone</b>	<b>F</b>	<b>G</b>	<b>G</b>	<b>P</b>
<b>Methylene chloride<sup>a</sup></b>	<b>F</b>	<b>F</b>	<b>G</b>	<b>F</b>
<b>Monoethanolamine</b>	<b>F</b>	<b>E</b>	<b>--</b>	<b>E</b>
<b>Morpholine</b>	<b>F</b>	<b>E</b>	<b>--</b>	<b>E</b>
<b>Napthalene<sup>a</sup></b>	<b>G</b>	<b>G</b>	<b>E</b>	<b>G</b>
<b>Nitric acid (conc)</b>	<b>P</b>	<b>P</b>	<b>P</b>	<b>G</b>
<b>Perchloric acid</b>	<b>F</b>	<b>G</b>	<b>F</b>	<b>E</b>
<b>Phenol</b>	<b>G</b>	<b>E</b>	<b>--</b>	<b>E</b>
<b>Phosphoric acid</b>	<b>G</b>	<b>E</b>	<b>--</b>	<b>E</b>
<b>Potassium hydroxide (sat)</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>E</b>
<b>Propylene dichloride<sup>a</sup></b>	<b>P</b>	<b>F</b>	<b>--</b>	<b>P</b>
<b>Sodium hydroxide</b>	<b>G</b>	<b>F</b>	<b>G</b>	<b>E</b>
<b>Sodium hypochlorite</b>	<b>G</b>	<b>P</b>	<b>F</b>	<b>G</b>
<b>Sulfuric acid (conc)</b>	<b>G</b>	<b>G</b>	<b>F</b>	<b>G</b>
<b>Toluene<sup>a</sup></b>	<b>P</b>	<b>F</b>	<b>G</b>	<b>F</b>
<b>Trichloroethylene<sup>a</sup></b>	<b>P</b>	<b>F</b>	<b>G</b>	<b>F</b>
<b>Tricresyl phosphate</b>	<b>P</b>	<b>F</b>	<b>--</b>	<b>F</b>
<b>Triethanolamine</b>	<b>F</b>	<b>E</b>	<b>E</b>	<b>E</b>
<b>Trinitrotoluene</b>	<b>P</b>	<b>E</b>	<b>--</b>	<b>P</b>

(E=Excellent, G=Good, F=Fair, P=Poor)

<sup>a</sup> Aromatic and halogenated hydrocarbons will attack all types of natural and synthetic glove materials. Should swelling occur, the user should change to fresh gloves and allow the swollen gloves to dry and return to normal.

<sup>b</sup> No data on the resistance to dimethyl sulfoxide of natural rubber, neoprene, nitrile rubber, or vinyl materials are available; the manufacturer of the substance recommends the use of butyl rubber gloves.

**APPENDIX C**  
**New Chemical Purchasing Request**

**NEW CHEMICAL PURCHASING REQUEST**

**No.**  
**Date:**

**1. Requesting Area:** \_\_\_\_\_ **2. Requestor:** \_\_\_\_\_

**3. Chemical Substance:** \_\_\_\_\_

**4. Material Safety Data Sheet (MSDS) Attached:**     **YES**  
*This request cannot be processed unless the MSDS is attached.*

**5. Proposed Chemical Use (amounts, Duration, etc.):** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**6. Engineering Controls (enclosures, ventilation systems, etc):** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**7. Storage Requirements:** \_\_\_\_\_  
\_\_\_\_\_

**8. Employee Exposure:** \_\_\_\_\_  
\_\_\_\_\_

**9. Expected Workplace Exposure Levels:** \_\_\_\_\_

**10. Personal Protective Equipment Required:**

- Respiratory Protection**                       \_\_\_\_\_
- Eye and Face Protection**                       \_\_\_\_\_
- Protective Clothing**                               \_\_\_\_\_

**11. Required Medical Surveillance:**

- Pulmonary Tests**                                       \_\_\_\_\_
- Urine Analysis**     \_\_\_\_\_
- Blood Analysis**     \_\_\_\_\_

**12. Routine Monitoring Requirements:**

- A. Workplace Exposure Levels:** \_\_\_\_\_
- B. Medical Surveillance:** \_\_\_\_\_

**13. Request approval by Laboratory Supervisor:** \_\_\_\_\_  
**Date:** \_\_\_\_\_

**14. Request Approval by Chemical Hygiene Officer:** \_\_\_\_\_  
**Date:** \_\_\_\_\_

**APPENDIX D**  
**Chemical Hazard Audit Sheet**

**CHEMICAL HAZARD AUDIT SHEET****No.  
Date:****1. Chemical Substance Audited:** \_\_\_\_\_**2. Work Area Audited:** \_\_\_\_\_**3. Audit Performed by:** \_\_\_\_\_**4. Reason for Audit:** \_\_\_\_\_ **Routine** **Special –Reason:****5. Date Audit Performed:** \_\_\_\_\_ **6. Time of Audit:** \_\_\_\_\_ a.m. \_\_\_\_\_ p.m.**7. Items Audited and Findings:**

ITEM	FINDING	RECOMMENDATIONS
<input type="checkbox"/> <b>Current MSDS in work area</b> <input type="checkbox"/> <b>Engineering controls maintained</b> <input type="checkbox"/> <b>Employees trained</b> <input type="checkbox"/> <b>Labels appropriate</b> <input type="checkbox"/> <b>Emergency procedures known</b> <input type="checkbox"/> <b>Personal protective equipment used</b> <input type="checkbox"/> <b>Workplace monitoring performed</b> <input type="checkbox"/> <b>Employees told of monitoring results</b> <input type="checkbox"/> <b>Required medical tests performed</b> <input type="checkbox"/> <b>Employee concerns, if any</b> <input type="checkbox"/> <b>Supervisory concerns, if any</b> <input type="checkbox"/> _____ <input type="checkbox"/> _____		

**8. Other Comments:****9. Auditor's Signature:****Date:****10. Route a copy to: 1- Area Supervisor, 2- Chemical Hygiene, 3- Personnel Department File**

**APPENDIX E**  
**Air Sampling Data Record**

**AIR SAMPLING DATA  
TABLE NUMBER**

**APPENDIX F**  
**New Employee Chemical Hygiene Orientation and**  
**Training Checklist**



<b>NEW EMPLOYEE CHEMICAL HYGIENE ORIENTATION AND TRAINING CHECKLIST</b>	<b>No. Date:</b>
<b>Name:</b> _____ <b>S.S. #:</b> _____	
<b>Job Assignment:</b> _____ <b>Supervisor:</b> _____	
<b>Employee Date:</b> _____	
<b>1. By Personnel Department on the First Day of Employment:</b>	
<input type="checkbox"/> Management's safety and health philosophy <input type="checkbox"/> Management's supervisor's, and employee's safety and health responsibilities <input type="checkbox"/> General plant safety and health rules <input type="checkbox"/> Chemical Hygiene Training Program <input type="checkbox"/> Location and availability of Chemical Hygiene Plan	
<b>Completed by:</b> _____ <b>Date:</b> _____	
<b>2. By Chemical Hygiene Officer:</b>	
<b>A. First Day In Work Area</b>	<b>Date:</b> _____
<input type="checkbox"/> Introduction to operations where chemical and physical hazards are present- types of hazards encountered. <input type="checkbox"/> Required work practices <input type="checkbox"/> Personal protective equipment <input type="checkbox"/> Emergency procedures <input type="checkbox"/> Detection of chemical hazards <input type="checkbox"/> Location and availability of Chemical Hygiene Plan <input type="checkbox"/> Labeling	
<b>B. One Week Follow-up</b>	<b>Date:</b> _____
<input type="checkbox"/> Review work practices and procedures with employee <input type="checkbox"/> Answer employee questions <input type="checkbox"/> Return completed checklist to Personnel Department for filing in employee personnel folder	
<b>Completed by:</b> _____ <b>Date:</b> _____	
<b>Employee's Signature:</b> _____ <b>Date:</b> _____	

**APPENDIX G**  
**Transfer Chemical Hygiene Training Checklist**

<b>TRANSFER CHEMICAL HYGIENE TRAINING CHECKLIST</b>	<b>No.</b> <b>Date:</b>		
<p><b>1. Employee Transferred:</b> _____</p> <p><b>2. First day in the new work area:</b> _____ <b>(dates)</b></p> <p><b>3. New Supervisor's name:</b> _____ <b>4. Title:</b> _____</p> <p><b>5. New work area:</b> _____ <b>6. Old work area:</b> _____</p> <p><b>7. Training date for transferred employee:</b> _____</p> <p><b>8. Employee training provided:</b></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> <b>Emergency procedures</b>  <input type="checkbox"/> <b>Work area safety rules</b>  <input type="checkbox"/> <b>Work are hazards</b> <ul style="list-style-type: none"> <li>• <b>Physical hazards</b></li> <li>• <b>Health hazards</b></li> </ul> <input type="checkbox"/> <b>Material Safety Data Sheets (MSDS)</b>  <input type="checkbox"/> <b>Detention of release or presence of hazardous chemicals</b> </td> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> <b>Labels</b>  <input type="checkbox"/> <b>Work area monitoring</b>  <input type="checkbox"/> <b>Work practices</b>  <input type="checkbox"/> <b>Personal protective equipment</b>  <input type="checkbox"/> <b>Chemical Hygiene Plan</b>  <input type="checkbox"/> <b>Location of Reference Material</b> </td> </tr> </table> <p><b>9. Additional safety and health information provided:</b></p>    		<input type="checkbox"/> <b>Emergency procedures</b> <input type="checkbox"/> <b>Work area safety rules</b> <input type="checkbox"/> <b>Work are hazards</b> <ul style="list-style-type: none"> <li>• <b>Physical hazards</b></li> <li>• <b>Health hazards</b></li> </ul> <input type="checkbox"/> <b>Material Safety Data Sheets (MSDS)</b> <input type="checkbox"/> <b>Detention of release or presence of hazardous chemicals</b>	<input type="checkbox"/> <b>Labels</b> <input type="checkbox"/> <b>Work area monitoring</b> <input type="checkbox"/> <b>Work practices</b> <input type="checkbox"/> <b>Personal protective equipment</b> <input type="checkbox"/> <b>Chemical Hygiene Plan</b> <input type="checkbox"/> <b>Location of Reference Material</b>
<input type="checkbox"/> <b>Emergency procedures</b> <input type="checkbox"/> <b>Work area safety rules</b> <input type="checkbox"/> <b>Work are hazards</b> <ul style="list-style-type: none"> <li>• <b>Physical hazards</b></li> <li>• <b>Health hazards</b></li> </ul> <input type="checkbox"/> <b>Material Safety Data Sheets (MSDS)</b> <input type="checkbox"/> <b>Detention of release or presence of hazardous chemicals</b>	<input type="checkbox"/> <b>Labels</b> <input type="checkbox"/> <b>Work area monitoring</b> <input type="checkbox"/> <b>Work practices</b> <input type="checkbox"/> <b>Personal protective equipment</b> <input type="checkbox"/> <b>Chemical Hygiene Plan</b> <input type="checkbox"/> <b>Location of Reference Material</b>		
<b>10. Instructor's Signature:</b>	<b>Date:</b>		
<b>11. Employee's Signature:</b>	<b>Date:</b>		
<b>12. Route a copy to: 1-Area Supervisor, 2- Chemical Hygiene Officer, 3- Personnel Department File</b>			

**APPENDIX H**  
**New Chemical Training Checklist**



**APPENDIX I**  
**Chemical hygiene Permit**

<b>CHEMICAL HYGIENE PERMIT</b>				<b>Page 1 of _____</b>							
<b>PERMIT NUMBER:</b> _____ <b>Date:</b> _____											
<b>LOCATION:</b> _____ <b>TIME:</b> _____											
<b>REASON REQUESTING PERMIT:</b>											
<b>POTENTIAL HAZARDS AND REQUIRED CONTROLS</b>											
<b>Safety</b>			<b>Health</b>			<b>Fire</b>					
<b>Hazards:</b>			<b>Hazards:</b>			<b>Hazards:</b>					
Precautions	<b>Y</b>	<b>N</b>	<b>NA</b>	Precautions	<b>Y</b>	<b>N</b>	<b>NA</b>	Precautions	<b>Y</b>	<b>N</b>	<b>NA</b>
Provide guards				Possible oxygen deficiency				Fire extinguishers			
Personal protective equip.				Special ventilation				Open flame permit			
Special safety training				Toxic materials				Explosion protection			
Special safety procedures				Personal protective equip.				Remove combustibles			
Lockouts required				Special rescue procedures				Test Atmosphere			
Unattended operation				Lockouts required				Emergency Egress			
Work Alone				Exceed PELs				Pyrophorics			
Sole Occupancy								Unattended operation			
<b>Additional Comments:</b>											
Approval of Chemical Hygiene Officer:								Name:			
								Date:			

**APPENDIX J**  
**OSHA Hazardous Chemicals in Laboratories Standard**  
**Compliance Checklist**



## OSHA HAZARDOUS CHEMICALS IN LABORATORIES STANDARD COMPLIANCE CHECKLIST

**PURPOSE:** This laboratory chemical hygiene program checklist is intended for use by companies in conducting annual chemical hygiene program evaluations to ensure continuing effectiveness and regulatory compliance.

**REFERENCE:** Refer to OSHA Standard 29 CFR 1910.1450. Occupational Exposure to Hazardous Chemicals in Laboratories, for details concerning the requirements of the standard.

<b>ORGANIZATION:</b>	<b>LOCATION:</b>
<b>LABORATORY:</b>	<b>DATE OF AUDIT:</b>
<b>LAB MANAGER:</b>	<b>CHEMICAL HYGIENE OFFICER:</b>

ITEM	29 CFR 1910.1450 REQUIREMENT	REF. NO.	YES	NO	COMMENTS
<b>APPLICATION</b>					
<b>1</b>	Laboratory engaged in the use of hazardous chemicals as defined by standard.	(a)(1)			
<b>2</b>	Work performed on laboratory scale.	(b)			
<b>OCCUPATIONAL EXPOSURE</b>					
<b>3</b>	Employee exposure to OSHA regulated substance do not exceed the permissible exposure limits specific in 29CFR part 1910, subpart Z.	(c)			
<b>EXPOSURE MONITORING</b>					
<b>4</b>	Initial monitoring performed for employees exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels for that substance routinely exceed the action level (or in the absence of an action level, the PEL).	(d)(1)			
<b>5</b>	Exposure monitoring provisions of relevant standards complied with for employee exposures over the action level (or in the absence of an action level, the PEL).	(d)(2)			
<b>6</b>	Employee monitoring terminated in accordance with relevant standard.	(d)(3)			
<b>EMPLOYEE NOTIFICATION</b>					

<b>7</b>	Employees notified of monitoring results within 15 days of receipt.	(d)(4)			
<b>CHEMICAL HYGIENE PLAN</b>					
<b>8</b>	A written Chemical Hygiene Plan is developed and implemented for hazardous chemical use as defined in the standard.	(e)(1)			
<b>9</b>	The Chemical Hygiene Plan is capable of protecting employees from health hazards associated with the chemicals in the laboratory.	(e)(1)(i)			
<b>10</b>	The Chemical Hygiene Plan is capable of maintaining employee exposures below the permissible exposure limits specified in 29 CFR part 1910, subpart Z.	(e)(1)(ii)			
<b>11</b>	The Chemical Hygiene Plan is readily available to employees, employee representatives and, upon request to the Assistant Secretary.	(e)(2)			
<b>12</b>	The Chemical Hygiene Plan indicates specific measures to ensure laboratory employee protection and includes each of the following elements:	(e)(3)			
<b>13</b>	Standard operating procedures relevant to safety and health to be utilized when using hazardous chemicals	(e)(3)(i)			
<b>14</b>	Criteria for the implementation of control measures including engineering controls, personal protective equipment and hygiene practices.	(e)(3)(ii)			
<b>15</b>	Measures to ensure adequate performance and proper usage of engineering controls	(e)(3)(iii)			
<b>16</b>	Provisions for medical consultation and examination in accordance with the standard.	(e)(3)(iv)			
<b>17</b>	Circumstances which require prior approval prior to implementation.	(e)(3)(v)			
<b>18</b>	Provisions for medical consultation and examination in accordance with the standard.	(e)(3)(vi)			
<b>19</b>	Designation of responsible personnel and responsibilities.	(e)(3)(vii)			
<b>20</b>	Identification of, and provisions for work with, particularly hazardous substances, including: <ul style="list-style-type: none"> <li>• Establishment of designated areas</li> <li>• Use of containment devices</li> <li>• Removal of waste</li> <li>• Decontamination procedures.</li> </ul>	(e)(3)(viii) (e)(3)(vii)(A) (e)(3)(vii)(B) (e)(3)(vii)(C) (e)(3)(vii)(D)			

<b>PLAN REVIEW</b>					
<b>21</b>	The Chemical Hygiene Plan is reviewed and updated at least annually	(e)(4)			
<b>EMPLOYEE INFORMATION AND TRAINING</b>					
<b>22</b>	Employees receive information and training to ensure that they are apprised of the hazards of chemicals present in their work area.	(f)(1)			
<b>23</b>	Information and training provided at the time of initial assignment and prior to assignments involving new exposure situations.	(f)(2)			
<b>24</b>	Employees are informed of: <ul style="list-style-type: none"> <li>• Contents of the standard</li> <li>• Location of Chemical Hygiene Plan</li> <li>• PELs or recommended exposure limits for substances in the laboratory</li> <li>• Signs and symptoms associated with exposures to hazardous chemicals in the laboratory.</li> <li>• Location and availability of known reference material.</li> </ul>	(f)(3)(i) (f)(3)(ii) (f)(3)(iii)  (f)(3)(iv)  (f)(3)(v)			
<b>25</b>	Employee training includes: <ul style="list-style-type: none"> <li>• Methods to detect the presence of a hazardous chemical</li> <li>• Physical and health hazards of chemicals in the work area</li> <li>• Measures employees can take to protect themselves from hazards</li> <li>• Details of the Chemical Hygiene Plan.</li> </ul>	(f)(4)(i)(A)  (f)(4)(i)(B)  (f)(4)(i)(C) (f)(4)(ii)			
<b>MEDICAL CONSULTATIONS</b>					
<b>26</b>	Employees are provided an opportunity to receive medical attention under the circumstances defined in the standard.	(g)(1)			
	Medical consultations are performed by or under the direct supervision of a licensed physician	(g)(2)			
	Medical consultations are performed without cost to the employee, without loss of pay and at a reasonable time and place.	(g)(2)			
<b>27</b>	Information on chemical identity, exposure conditions and exposure symptoms is provided to the physician performing medical consultation.	(g)(3)(i)-(iii)			
<b>28</b>	A written opinion is obtained from the examining physician which includes results, recommendations and any medical condition resulting in increase employee risk as a result of exposure to a hazardous chemical in the work area.	(g)(4)(a)(A)-(D)			

<b>29</b>	The written opinion does not address diagnoses unrelated to occupational exposure.	(g)(4)(iii)			
<b>HAZARD IDENTIFICATION</b>					
<b>30</b>	Labels on incoming containers of hazardous chemicals are not removed or defaced.	(h)(1)(i)			
<b>31</b>	All received material safety data sheets are maintained and readily available to laboratory employees	(h)(1)(ii)			
<b>32</b>	Training is provided for all hazardous chemicals produced in the laboratory are assumed hazardous and covered in the Chemical Hygiene Plan	(h)(2)(i)			
<b>33</b>	Chemical byproducts of unknown composition produced in the laboratory are assumed hazardous and covered in the Chemical Hygiene Plan.	(h)(2)(ii)			
<b>34</b>	Chemical production for a user outside of the laboratory comply with the Hazard Communication Standard, 29 CFR 1910.134	(h)(2)(iii)			
<b>RESPIRATORY PROTECTION</b>					
<b>35</b>	Where respirators are used to maintain employee exposure below permissible exposure limits: <ul style="list-style-type: none"> <li>Respirators are provided at no cost to the employee</li> <li>Respirators are selected and used in accordance with 29 CFR 1910.134.</li> </ul>	(i) (i)			
<b>RECORDKEEPING</b>					
<b>36</b>	A recordkeeping system is established to maintain for each employee, accurate records of measurements taken to monitor employee exposures and any medical consultations and examinations.	(j)(1)			
<b>37</b>	Records are kept, transferred, and made available in accordance with 29 CFR 1910.20	(j)(2)			

**Notes: (Use additional sheets as necessary)**

**Conducted by:**

**Title(s)**

**Date:**

**Reviewed by:**

**Title(s)**

**Date:**