



CHEMICAL HYGIENE PLAN

I. Purpose

This Chemical Hygiene Plan (CHP) sets forth policies, procedures, equipment, personal protective equipment and work practices that are capable of protecting employees and students from the health hazards presented by hazardous chemicals used in laboratories. This Plan is intended to meet the requirements of 8 CCR 5191, Occupational Exposure to Hazardous Chemicals In Laboratories, a copy of which is found in this plan.

II. Scope

This CHP applies to our Biology, Microbiology, Anatomy and Physiology, and Chemistry laboratories where employees work with substances in which the containers used for reactions, transfers, and other handling of substances are easily and safely manipulated by one person. The objective of this program is to provide guidance to all laboratory personnel who use chemicals, so that they can perform their work safely.

Laboratory Employees -- Each individual working in a laboratory shall be informed about hazards associated with that laboratory and the specific work going on there. This includes all staff, students, and assistants.

Support Personnel -- Storeroom, custodial, maintenance, and delivery personnel may be exposed to potential physical and chemical hazards from work carried out in the laboratory. They must be informed about the risks involved and trained how to avoid potential hazards.

III. Responsibilities

- **Chemical Hygiene Officer:**

Richard Hogrefe, Dean of Instruction, is the Chemical Hygiene Officer for the Chemical Hygiene Program throughout the college and will provide continued direction for the Chemical Hygiene Program.

The Chemical Hygiene Officer shall:

- Work with administrators and other faculty to develop and implement acceptable, appropriate chemical hygiene policies and practices
- Monitor procurement and use of chemicals in the lab; determining that laboratory facilities and training levels are adequate for chemicals in use
- Ensure regular, formal chemical hygiene and housekeeping inspections that include inspections of emergency equipment
- Maintain a current chemical inventory of Biology, Microbiology, Anatomy and Physiology, and Chemistry
- Review and improve the Chemical Hygiene Plan on, at a minimum, an annual basis
- Maintain overall responsibility for the safe operation of the Biology, Microbiology, Anatomy and Physiology, and Chemistry department laboratories
- Ensure that workers/students know and follow chemical hygiene rules
- Determine the proper level of personal protective equipment; ensure that such protective equipment is available and in working order
- Ensure that the appropriate training has been provided to employees
- Monitor lab waste disposal

Faculty and Staff –

Instructors: Directly responsible for chemical hygiene in the laboratory. All instructors are required to ensure that provisions of the CHP are being followed in the laboratory for the safety of the students and themselves.

Laboratory Technicians:

- Responsible for the daily maintenance and upkeep of the laboratory
- Prepare laboratory experiments for instruction.
- Responsible for ordering materials i.e. chemicals, ppe, and instructional equipment.
- Ensure chemicals must be segregated by hazard classification and compatibility in a well-identified area, with good general exhaust ventilation.
- Maintain a current inventory of all chemicals in the laboratory and accompanying MSDSs.
- Conduct an annual examination and inventory of all chemicals.

Students – Responsible for conducting each operation in accordance with prescribed chemical hygiene procedures.

IV. Standard Operating Procedures for Laboratory Chemicals

A. Chemical Procurement

The decision to procure a chemical shall be made by the Biology, Microbiology, Anatomy and Physiology, and Chemistry instructors. Each instructor will ensure a commitment to safe handling and use of the chemical from initial receipt to ultimate disposal.

Each department shall aggressively and continually evaluate current inventory and properly dispose of unnecessary materials.

Requests for procurement of new chemicals shall be submitted to the Chemical Hygiene Officer for approval. The instructor shall follow the appropriate college procurement process.

The laboratory technician, prior to procurement of a chemical, shall identify information on proper handling, storage and disposal. If, upon investigation, the chemical is extremely hazardous (e.g., mutagenic, carcinogenic, teratogenic), extremely flammable and/or explosive, or difficult to dispose of, the laboratory technician will not procure the chemical. All new chemicals procured must be approved by the Chemical Hygiene Officer.

In addition, chemicals will be evaluated and procured only if the chemical can be appropriately used for current laboratory conditions, taking into account ventilation and storage requirements.

Upon receipt of hazardous chemicals, and prior to their transfer to storage locations or the requesting laboratory, the receiving department will check all containers for accuracy in labeling: chemical identity, hazard warnings, and the name and address of the chemical manufacturer, distributor or importer. All labels and other forms of warning must be legible, in English, and prominently displayed on the container. If the labeling is found to be inadequate, the proper identity and/or hazard label will permanently affixed to the container by the receiving department. All old labeling must be removed or permanently defaced if new labeling is affixed.

As part of the receiving procedure for hazardous chemicals, a receipt log shall be maintained by each department. This log will include the date of receipt, chemical identity, quantity and initials of receiver. These logs are subject to review by University auditors, State and Federal officials. The ordering department is responsible for maintaining a MSDS for each hazardous chemical in its inventory.

B. Chemical Storage

Received chemicals shall be immediately moved to the designated chemical storage area by one of the lab technicians. Large glass containers shall either remain in their original shipping container or be placed in carrying containers (e.g., rubber "boots") during transportation.

The storage area shall be well illuminated, with storage maintained at or below eye level. Flammables will be stowed in the designated flammable storage cabinets in lab prep areas.

Mineral acids shall be segregated from flammable and combustible materials. Separation is defined by 8 CCR Section 5164.

§5164. Storage of Hazardous Substances.

(a) Substances which, when mixed, react violently, or evolve toxic vapors or gases, or which in combination become hazardous by reason of toxicity, oxidizing power, flammability, explosibility, or other properties, shall be evaluated for compatibility before storing. Incompatible substances shall be separated from each other in storage by distance, or by partitions, dikes, berms, secondary containment or otherwise, so as to preclude accidental contact between them.

Note: Some typical examples of such incompatible substances are: Mineral acids and oxidizing agents; mineral acids and cyanides; oxidizing agents and combustible materials; acids and alkalis.

(b) Hazardous substances shall be stored in containers, such as those approved by the U.S. Department of Transportation (DOT), which are chemically inert to and appropriate for the type and quantity of the hazardous substance.

(c) Containers of hazardous substances shall not be stored in such locations or manner as to result in physical damage to, or deterioration of, the container. Containers shall not be stored where they are exposed to heat sufficient to rupture the containers or to cause leakage.

(d) Containers used to package a substance which gives off toxic, poisonous, corrosive, asphyxiant, suffocant, or anesthetic fumes, gases, or vapors in hazardous amounts (e.g., fuming sulfuric acid, hydrofluoric acid, nitrous oxide, chlorine, or other compressed or liquefied toxic gases) shall not be stored locations where it could be reasonably anticipated that employees would be exposed. This requirement shall not apply to small quantities of such materials kept in closed containers, or to tank cars or trucks.

Nitric acid will be stored in an acid cabinet by itself.

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 and water.

Highly toxic chemicals or other chemicals whose containers have failed, leaking, or signs of crystallization shall be stored in unbreakable secondary containers. The second container shall be:

- A. Closable;
- B. Constructed to contain all contents and prevent leakage during handling, storage, transport, or shipping; and
- C. Labeled according to Section IV.(G).

Storage areas shall be accessible during normal working hours. Storage areas are under the control of each laboratory technician and appropriate instructor for Biology, Microbiology, Anatomy and Physiology, and Chemistry. The amount of chemicals at the lab bench shall be as small as practical.

Stored chemicals shall be examined annually by the appropriate laboratory technician for container integrity and/or deterioration. The inspection shall determine whether any corrosion, deterioration, or damage has occurred to the storage facility as a result of leaking chemicals. When signage or labels become defaced, they must be relabeled or reposted.

Laboratory technicians shall conduct periodic inspections for chemicals outside their respective storage areas. Unneeded items shall be properly discarded or returned to the storage area.

C. Chemical Handling

Each laboratory employee/student (with the training, education, and resources provided by supervision) shall develop work habits consistent with requirements of Crafton Hills College CHP to minimize potential personal and coworker exposure to chemicals. Based on the realization that all chemicals inherently present hazards in certain conditions, exposure to all chemicals shall be minimized.

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

1. Skin contact with chemicals shall be avoided at all times.
2. Employees and students shall wash all areas of exposed skin prior to leaving the laboratory. Hand soap is provided at each sink.
3. Mouth suction for pipetting or starting a siphon is prohibited.

4. Eating, drinking, smoking, chewing gum, or application of cosmetics in the laboratory is prohibited.
5. Storage of food or beverages is not allowed in storage areas or refrigerators used for laboratory operations.
6. Any chemical mixture shall be assumed to be as toxic as its most toxic component.
7. Substances of unknown toxicity shall be assumed to be toxic.
8. Laboratory employees/students shall be familiar with the symptoms of exposure for the chemicals that they work with and the precautions necessary to prevent exposure.
9. All laboratory employees/students shall adhere to the CHP.
10. In all cases of chemical exposure neither the Permissible Exposure Limits (PEL's) of OSHA or the Threshold Limit Values (TLV's) of the American Conference of Governmental Industrial Hygienists (ACGIH) shall be exceeded through appropriate monitoring.
11. Engineering controls and safety equipment in the laboratory shall be utilized and inspected in accordance with guidelines established in the CHP.
12. The maintenance department shall maintain an inspection log that documents eyewash/shower function.
13. Specific precautions based on the toxicological characteristics of individual chemicals shall be implemented as deemed necessary by the CHP.

D. Laboratory Equipment and Glassware

Each employee/student shall keep the work area clean and uncluttered. All chemicals and equipment shall be properly labeled, in accordance with the Chemical Hygiene Plan.

At the completion of each workday or operation, the work area shall be thoroughly cleaned and all equipment cleaned and stowed.

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 shall implosion occur.
4. Labels shall be attached to all chemical containers, identifying the contents and related hazards.
5. Waste receptacles shall be labeled as such.
6. All laboratory equipment shall be inspected on a periodic basis and replaced or repaired as necessary.
7. Installation of unapproved/unclassified electrical/other equipment into the laboratory hoods that could introduce an ignition source is prohibited.

E. Personal Protective Equipment

Safety glasses meeting ANSI Z87.1 are required for employees and students to laboratories and will be worn at all times when chemicals are being used or manipulated in the laboratory.

- The wearing of contact lenses in the laboratory is prohibited.
- Chemical goggles and/or a full-face shield shall be worn during chemical transfer and handling operations as procedures dictate.
- Chemical resistant aprons shall be worn in the laboratory. Aprons shall be removed immediately upon discovery of significant contamination.
- Appropriate chemical-resistant gloves (based on information from the included glove selection guide in Appendix E) shall be worn at all times when there exists the potential for skin contact with chemicals.
- Used gloves shall be inspected and if damaged or contaminated, will be immediately replaced.

- 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 OSHA Respiratory Protection Standard, 29 CFR 1910.134, Cal-OSHA 8 CCR 5144, and the Crafton Hills College's Respiratory Protection Program.
- Closed toe shoes shall be worn. Open toe shoes, sandals, and “flip flops” are prohibited.

F. Personal Work Practices

Instructors must ensure that each student knows and follows the rules and procedures established by this plan.

- All employees/students 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 instructional dean for Biology, Microbiology, Anatomy and Physiology, and Chemistry must PROMPTLY correct unsafe practices or conditions.
- Long hair or loose-fitting clothing shall be confined close to the body to avoid contact with chemicals or 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.
- Smelling or tasting of any chemicals is prohibited.
- Encourage safe work practices in coworkers by setting the proper example.
- Horseplay is strictly forbidden.
- Seek information and advice from knowledgeable persons regarding Standards and Codes about hazards present in the laboratory. Plan operations, equipment, and protective measures accordingly.
- Use engineering controls in accordance with Section V of the Chemical Hygiene Plan.

- Closed-toe shoes are required for employees and students to laboratories and will be worn at all times when chemicals are being used or manipulated in the laboratory. Opened-toe shoes, sandals, and “flip flops” are prohibited when chemicals are being used or manipulated in the laboratory.
- Inspect personal protective equipment prior to use, and wear appropriate protective equipment as procedures dictate and when necessary to avoid exposure.
- Employees and students shall wash all areas of exposed skin prior to leaving the laboratory.
- Good housekeeping practices shall apply to all laboratories at all times. Unneeded items shall be properly discarded or returned to their designated area.

G. Labeling

All containers in the laboratory shall be labeled. This includes chemical containers and waste containers. The labels shall be informative and durable, and at a minimum, will identify contents, source, date of acquisition, 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 that is intended only for the immediate use of the employee who performed the transfer.

The labeling program shall be periodically inspected by the appropriate laboratory technician to ensure that labels have not been defaced or removed. When labels become damaged or defaced, they must be relabeled.

V. CRITERIA FOR IMPLEMENTATION OF CONTROL MEASURES

A. When to use fume hoods:

Hoods shall be used **WHENEVER POSSIBLE** to contain and exhaust toxic, offensive, or flammable materials. Processes that have potential for generating hazardous airborne chemical concentrations shall be carried out within the fume hood.

B. When to use safety shields or other containment devices:

Safety shields must be used where the possibility exists for laboratory scale detonation. Protective devices, such as long and short-handled tongs for holding or manipulating hazardous items shall be used **WHENEVER POSSIBLE**.

C. When to use personal protective equipment:

Eye Protection - Safety goggles or laboratory splash glasses must be worn by all personnel in the laboratory whenever hazardous chemicals are in use. **NO EXCEPTIONS**.

Gloves - Gloves shall be worn to protect the skin from chemical and physical (e.g. heat, cold) exposures. Soiled or damaged gloves shall be decontaminated and disposed of properly.

Respirators - Respiratory protection may be necessary to maintain chemical exposure below OSHA's PEL. Respirators will be provided, if necessary.

D. When to institute special work practices:

The Chemical Hygiene Officer must approve special work practices. If particularly hazardous chemicals are to be used (e.g. carcinogens, reproductive toxins, teratogens, or acutely toxic chemicals), specific work practices and work locations must be designated. These requirements are identified in Section X of this plan.

VI. FUME HOOD MANAGEMENT

A. Frequency and type of monitoring - all local exhaust hoods used for primary containment control will be monitored for adequate airflow on an annual schedule. The survey will be completed with a calibrated velometer.

B. Acceptable operating range - Minimum face velocities of at least 100 linear feet per minute (fpm) must be maintained for each hood. If the face velocity does not meet a minimum of 100 linear fpm, maintenance personnel must be contacted to repair or upgrade the hood.

When handling carcinogens (i.e., Benzene, Formaldehyde, etc.), minimum face velocities of at least 150 linear fpm must be maintained. If the face velocity does not meet a minimum of 150 linear fpm, maintenance personnel must be contacted to repair or upgrade the hood.

C. An approved Environmental Firm will provide monitoring on an annual basis. Results will be documented and kept in the office of Administrative Services.

D. **Maintenance schedule** – The Director of Facilities is responsible for the maintenance of local exhausts and fume hoods. The Director of Facilities will complete the maintenance on an "as needed" basis, or annually, whichever comes first. If local exhausts or fume hoods fail, or show signs of failing, please contact the Director of Facilities at (909) 389-3383 for service.

VII. EMPLOYEE INFORMATION AND TRAINING

A. Information

1. A copy of 8 CCR 5191 can be found in Appendix A of this plan and on the web at <http://www.dir.ca.gov/title8/5191.html>.
2. The THRESHOLD LIMIT VALUES published by the American Conference of Governmental Industrial Hygienists are available for review from the Chemical Hygiene Officer. Recommended exposure limits for other hazardous chemicals, information on signs and symptoms associated with exposures to hazardous chemicals, material safety data sheets, and other information on the hazards, safe handling, storage and disposal of hazardous chemicals can be found in the compliance manual.
3. A list of OSHA health hazard definitions and lists of select carcinogens, reproductive toxins, and high acute toxicity materials are included in the Documentation Section of the compliance manual.

B. Training

1. Employees will be provided with training to ensure that they are apprised of the hazards of chemicals present in their work area. Such training will be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations. Refresher training will be provided annually.
2. Students will receive safety training in conjunction with the course curriculum, as provided by the instructor.
3. Employee training will include:
 - Provisions of 8 CCR Section 5191 (see Appendix A) including methods and observations that may be used to detect the presence or release of a hazardous chemical; information a physical and health hazards of chemicals in the work area; and the measures employees can take to protect themselves from these hazards including the operation and use of the emergency eye wash and showers.
 - The applicable details of the Chemical Hygiene Plan.

4. Training documentation will be documented by the Dean of Instruction for Biology, Microbiology, Anatomy and Physiology, and Chemistry and a copy forwarded to district Human Resources.

VIII. REQUIRED APPROVALS

Certain laboratory procedures, which present serious health hazards upon exposure, require prior approval by the Dean of Instruction for Biology, Microbiology, Anatomy and Physiology, and Chemistry before work may commence.

For Crafton Hills College, prior approval is required before proceeding with the following procedures:

- Working with Carcinogens/Teratogens/Mutagens

BIOLOGY

Formaldehyde

Chloroform

*Formaldehyde is a suspect carcinogen but is not used in an experiment.

CHEMISTRY

Benzene

Carbon Tetrachloride

Lead

Chromium

Nickel

*Some chemicals within this category are stored in the chemical storage room but are NOT currently used in any experiments.

IX. MEDICAL CONSULTATION AND EXAMINATION

A. An employee who works with hazardous chemicals and:

- Develops symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory
- Works where exposure monitoring reveals an exposure level routinely above the OSHA action level or, in the absence of a designated action level, exposure above the OSHA Permissible Exposure Limit (PEL), for OSHA regulated substances for which there are medical monitoring and medical surveillance requirements. Chemicals that fall within this category are:
 - Asbestos
 - Vinyl Chloride

- Inorganic Arsenic
- Lead
- Benzene
- Coke Oven Emissions
- Cotton Dust
- 1,2-Dibromo-3-Chloropropane
- Acrylonitrile
- Ethylene Oxide
- Formaldehyde
- Carbon Tetrachloride
- 2-aminonaphthalene
- Methylene Chloride
- Or is exposed to a hazardous chemical during a spill, leak, or explosion or other occurrence resulting in exposure is entitled to medical attention including an examination and follow-up exams as deemed necessary by the physician.

An examination is provided without cost to the employee, without loss of pay, and conducted at a reasonable time and place.

B. Procedures to secure medical consultation and examination are as follows:

1. Report exposure to CHO and the Dean of Instruction for Biology, Microbiology, Anatomy and Physiology, and Chemistry
2. Seek medical care (refer to the District's procedures for injured employees: <http://www.sbccd.org/Include/Human%20Resources%20Forms/Workers%20Compensation/Workers%20Comp%20Complete%20Forms%20Package.pdf>)
3. The employer will provide the following information to the physician.
 - a) Identity of hazardous chemical.
 - b) Description of conditions under which exposure occurred.
 - c) Description of signs and symptoms employee is experiencing.
4. A written opinion from the physician shall be provided to the employer including:
 - a) Recommendation for further medical follow-up.
 - b) Results of medical exam and tests; limited to exposure with personal information disclosed.
 - c) Any medical condition revealed during the exam that places the employee at increased risk.
 - d) A statement that the employee has been informed by the physician of the results of the exam and any medical condition that may require further treatment or examination.

X. ADDITIONAL PROTECTION FOR WORK WITH PARTICULARLY HAZARDOUS SUBSTANCES

A. **Work with selected carcinogens, reproductive toxins and substances** that have a high degree of acute toxicity may require additional employee protection. Specific consideration will be given to:

- Establishment of a designated area
- Use of containment devices such as fume hoods or glove boxes
- Procedures for safe removal of contaminated waste
- And decontamination procedures.

Anatomy and Physiology Department

Establishment of a Designated Area

LADM 229 is the designated area for working with laboratory specimens that contain carcinogens, reproductive toxins and substances that have a high degree of acute toxicity.

Use of Containment Devices

In accordance to Appendix E, disposable or lightweight nitrile, neoprene, natural rubber or PVC gloves provide protection from incidental contact and serves as a containment device. Heavier gloves shall be used when extended handling of contaminated or preserved materials or immersion is likely. A chemically resistant apron shall be used when transferring or using large quantities and splash is likely.

Appropriately fitted respirators and local exhaust fans shall be used and serves as containment devices. If either device fails, or shows signs of failing, do not continue to work with formaldehyde. Notify the Director of Facilities at (909) 389-3383 to service the exhaust fans. Notify the Dean of Instruction for Biology, Microbiology, Anatomy and Physiology, and Chemistry to obtain a properly working respiratory.

Procedures for Safe Removal of Contaminated Waste

- Formaldehyde is a listed RCRA hazardous waste.
- Coordinate disposal of formaldehyde waste through the Maintenance and Operations (M&O) department.
- Read Material Safety Data Sheet (MSDS) prior to use.
- Keep in a tightly closed container.
- Separate from oxidizing agents.
- Keep away from heat and flame.

Request for Waste Pick-up / Removal

Hazardous waste collection is requested by submitting a work order at http://latka/mc_web/rapp_v12/rq_request_40.asp?i=y&fromapp=y. The requestor must include the following information:

- Requester: The name of the person submitting the form. This person shall have knowledge of the waste in the event that the M&O personnel have questions.
- Telephone #: A contact number for the requester or someone else with knowledge of the waste.
- Substance Location: Include the building name and room number. In addition, the location of the waste container shall also be noted in the event that M&O performs the waste pick-up when no lab personnel are present.
- Short Description
 - Chemical Name: Use full chemical names. Do not use formulas or abbreviations. Include all the constituents of each waste container.
 - Quantity: Include the number of containers of waste and their volumes.
- Click on “**Submit**” at the bottom of the form
- In the event that waste containers to be collected are intermingled with containers that you want to keep, it is helpful if you mark which containers that are being offered for disposal.
- Waste removers cannot accept unknown materials. All waste containers must be labeled and their contents identified.
- All waste containers must have a tightly fitting cap that will not leak during transport. Be sure that you have the correct cap for your bottle. The bottles of the various chemical manufacturers all have differently threaded caps that are not interchangeable with one another, (i.e. Fisher bottle caps do not fit Aldrich bottles and vice versa). Improperly capped waste bottles **will leak** and will not be picked up by M&O.

Decontamination Procedures

Decontamination procedures should be established in writing, especially those involving chemical treatments, and consist of any necessary periodic (daily, weekly, etc.) procedures performed to control exposure of employees. Depending on the chemical material, this may consist only of wiping a counter with a wet paper towel, or periodic use of a neutralizing agent. To determine the proper decontamination procedures, one must consider the chemical (or type of chemical), the amount of chemical used, the specific use, the location of use, and other factors. Contact the Office of Instruction if assistance is needed to determine the most appropriate decontamination procedures at 909-389-3205.

XI. EMERGENCY RESPONSE/CHEMICAL SPILLS

All science instructors shall be familiar with the College Emergency Preparedness Plan. This plan contains emergency telephone numbers and spill response contacts for the college.

A. When chemical spills occur within the Laboratory, the following procedures are followed to prevent injury or property loss:

1. Provide any first aid (if necessary) to affected personnel. Liberally use eyewash station and/or safety shower to flush affected areas. Flush continuously for AT LEAST 15 minutes. Any exposure merits medical care and a large exposure to the body merits ambulatory service.
2. Notify the Dean of Instruction for Biology, Microbiology, Anatomy and Physiology, and Chemistry, or the “administrator in charge,” of a spill. If a spill is larger than 1 liter or extremely hazardous, the Campus Police will be notified. Injured employees shall refer to the District’s procedures for injured employees. Injured students shall be referred to the Health and Wellness Center (909) 389-3272.
3. Evacuate students from the area.
4. If spilled materials exhibit flammability, eliminate ignition sources such as hot plates, Bunsen burners, etc.
5. Avoid all contact with spilled material. If necessary, use protective gloves, gown, goggles, and/or respirator.
6. Obtain supplies from Chemical Spill Clean-Up Kit (located in Chemistry Stockroom and/or Biology Prep. Rooms).
7. Neutralize acids and bases.
8. Contain collected materials and label container with name of contents and also as Hazardous Waste.
9. Always refer to MSDS for special precautions or spill cleanup requirements.

B. Liquid Spills

1. Confine spill to small area as practical.
2. For small quantities of acids or bases, use the neutralizing agent from the chemical spill clean-up kit. An absorbent material specially prepared for acid/base spills may also be used.
3. For small quantities of other materials, such as organic solvents, utilize an absorbent material to clean-up spill. Examples of absorbent materials are vermiculite, dry sand, paper towels, etc.
4. For large quantities of inorganic acids and bases, flush with large amounts of water, preferably toward a containment area or drain. *CAUTION must be taken not to add too much water to create a flood that may react with water-reactive materials and cause spattering and additional personnel exposure.
5. If possible, utilize a mop to pick up as much of the spilled material. An excellent clean-up device is the mop bucket and wringer to collect the liquid.
6. Carefully pick up and decontaminate any bottles, broken glass, and/or other containers. Decontaminate over the bucket or pail to collect contaminated wash.
7. Avoid using any shop vacuum that is not rated for chemical clean up. A potential exists for atomizing hazardous wastes and creating a potential human inhalation exposure.
8. If the spill is extremely volatile (high vapor pressure), allow the spill to evaporate and exhaust out the laboratory exhaust (e.g., fume hood).
9. Properly containerize, label, store and/or dispose of collected hazardous waste. (See waste disposal section for methods).

C. Solid Spills

1. If possible, sweep solid spills of low toxicity into a designated, easily decontaminated, dust pan and place in a labeled container for storage and/or disposal.

D. Additional Spills

- Mercury – Do not attempt to contain or clean the spill. Call the Maintenance and Operations Department at (909) 389-3380 to coordinate containment, cleaning, and disposal of mercury spills.

E. Compressed Gas Cylinders

Compressed gas cylinders are used in many workplaces to store gases that vary from flammable (acetylene) to inert (helium). Many of these cylinders store gases at high pressures that can turn a damaged cylinder into a torpedo, capable

of going through multiple concrete block walls. Other cylinders store the contents as a liquid (acetylene) and have special orientation requirements. If handled properly, compressed gas cylinders are safe. Regardless of the properties of the gas, any gas under pressure that is improperly stored can result in a hazardous release of energy.

Any person who handles compressed gas cylinders should be informed of their potential health safety hazards and trained to handle them properly. For additional advice, and/or assistance in training, contact the Maintenance and Operations Office.

F. Incident Report

An incident investigation shall take place after each spill and/or accident. The Incident report (as provided) shall be completed by the supervisor/instructor and forwarded to the Chemical Hygiene Officer and College Safety Committee.

XII. REVIEW AND UPDATE

This Chemical Hygiene Plan will be reviewed and updated annually.

XIII. SUGGESTED CHEMICAL STORAGE PATTERNS

Storage of laboratory chemicals presents an ongoing safety hazard for college science departments. Many chemicals are incompatible with each other. The common method of storing these products in alphabetical order sometimes results in incompatible shelved materials. For example, storing strong oxidizing materials next to organic chemicals can present a hazard.

A possible solution is to separate chemicals into their organic and inorganic families and then to further divide the materials into related and compatible families. Below is a list of compatible families.

INORGANIC

1. Metals, Hydrides
2. Acetates, Halides, Iodides, Sulfates, Sulfites, Halogens, Thiosulfates, Phosphates
3. Amides, Nitrates (except Ammonium Nitrate), Nitrites, Azides
4. Hydroxides, Oxides, Silicates, Carbonates, Carbon
5. Sulfides, Selenides, Phosphides, Carbides, Nitrides
6. Bromates, Perchlorates, Perchloric Acid, Chlorites, Hypochlorites, Peroxides, Hydrogen Peroxide
7. Arsenates, Cyanides, Cyanates

8. Borates, Chromates, Manganates, Permanganates
9. Acids (except Nitric). Store acids in a designated cabinet. *Nitric Acid is isolated and stored by itself in an acid cabinet
10. Sulfur, Phosphorus, Arsenic, Phosphorus Pentoxide.

ORGANIC

1. Acids, Anhydrides, Peracids
2. Alcohols, Glycols, Amines, Amides, Imines, Imides
3. Hydrocarbons, Esters, Aldehydes
4. Esters, Ketones, Ketenes, Halogenated Hydrocarbons, Ethylene Oxide
5. Epoxy Compounds, Iso-cyanates
6. Peroxides, Hydroperoxides, Azides
7. Sulfides, Polysulfides, Sulfoxides, Nitriles
8. Phenols, Cresols

ADDITIONAL STORAGE SUGGESTIONS

1. Avoid floor chemical storage (even temporary).
2. No top shelf chemical storage.
3. No reactive liquid chemicals stored above eye level.
4. Shelf assemblies are firmly secured to walls. Avoid island shelf assemblies.
5. Provide anti-roll-off lips on all shelves.
6. Ideally shelving assemblies would be of wood construction.
7. Avoid metal, adjustable shelf supports and clips. Better-fixed, wooden supports.
8. Store acids in dedicated acid cabinet(s). Store Nitric Acid in that same cabinet ONLY if isolated from other acids. Store both inorganic and some organic acids in the acid cabinet.
9. Store flammables in a dedicated and ventilated flammables cabinet.
10. Store severe poisons in a dedicated poisons cabinet.
11. Segregate known or suspect carcinogens from other chemicals.

If you store volatile materials (ether, hydrocarbons, etc. in a refrigerator, the refrigerator must be explosion-proof. The thermostat switch or light switch in a standard refrigerator may spark and set off the volatile vapors in the refrigerator and cause an explosion.

APPENDIX A.

8 CCR 5191 OCCUPATIONAL EXPOSURE TO HAZARDOUS CHEMICALS
IN LABORATORIES <http://www.dir.ca.gov/title8/5191.html>

(a) Scope and application.

(1) This section shall apply to all employers engaged in the laboratory use of hazardous chemicals as defined below.

(2) Where this section applies, it shall supersede, for laboratories, the requirements of Title 8 of the California Code of Regulations Section 5190 and Article 110, Regulated Carcinogens of the General Industry Safety Orders, except as follows:

(A) The requirement to limit employee exposure to the specific exposure limit.

(B) When that particular regulation states otherwise, as in the case of Section 5209(c)(6).

(C) Prohibition or prevention of eye and skin contact where specified by any health regulation shall be observed.

(D) Where the action level (or in the absence of an action level, the exposure limit) is exceeded for a regulated substance with exposure monitoring and medical surveillance requirements.

(E) The "report of use" requirements of Article 110, (Section 5200 et. seq.) Regulated Carcinogens regulations.

(F) Section 5217 shall apply to anatomy, histology and pathology laboratories.

(3) This regulation shall not apply to:

(A) Uses of hazardous chemicals which do not meet the definition of laboratory use, and in such cases, the employer shall comply with the relevant regulations in Title 8, California Code of Regulations, even if such use occurs in a laboratory.

(B) Laboratory uses of hazardous chemicals which provide no potential for employee exposure. Examples of such conditions might include:

1. Procedures using chemically-impregnated test media such as Dip-and-Read tests where a reagent strip is dipped into the specimen to be tested and the results are interpreted by comparing the color reaction to a color chart supplied by the manufacturer of the test strip; and

2. Commercially prepared kits such as those used in performing pregnancy tests in which all of the reagents needed to conduct the test are contained in the kit.

(b) Definitions

Action level. A concentration designated in Title 8, California Code of Regulations for a specific substance, calculated as an eight (8)-hour time weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.

Carcinogen (see "select carcinogen").

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

Chemical Hygiene Plan. A written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment and work practices that

(1) are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular work place and

(2) meets the requirements of subsection 5191(e).

Chief. The Chief of the Division of Occupational Safety and Health.

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

Compressed gas.

(1) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70° F (21.1° C); or

(2) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130° F (54.4° C) regardless of the pressure at 70° F (21.1° C); or

(3) A liquid having a vapor pressure exceeding 40 psi at 100° F (37.8° C) as determined by ASTM D-323-72.

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

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

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

Explosive. A chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when 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, when tested by the method described in 16 CFR 1500.45, 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 with air at a concentration of 13 percent by volume or less; or

(B) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air greater than 12 percent 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 percent or more of the total volume of the mixture.

(4) "Solid, flammable" means a solid, other than a blasting agent or explosive as defined in 29 CFR 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

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

(1) Tagliabue Closed Tester (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24 - 1979 (ASTM D 56-79) - for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100° F (37.8° C), or that

do not contain suspended solids, and do not have a tendency to form a surface film under test; or

(2) Pensky-Martens Closed Tester (see American National Standard Method of Test for Flash Point by Pensky-Martens closed tester), Z11.7 - 1979 (ASTM D 93-79) for liquids with a viscosity equal to or greater than 45 SUS at 100° F (37.8°C), or that contain suspended solids, or that have a tendency to form a surface film under test; or

(3) Setaflash Closed Tester (see American National Standard Method of Test for Flash Point by Setaflash Closed Tester (ASTM D 3278-78)). Organic peroxides, which undergo auto accelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above.

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

Appendices A and B of the Hazard Communication Standard (Section 5194) provide further guidance in defining the scope of health hazards and determining whether or not a chemical is to be considered hazardous for purposes of this regulation.

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

Laboratory scale. Work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safely manipulated by one person. "Laboratory scale" excludes those workplaces whose function is to produce commercial quantities of materials.

Laboratory-type hood. 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

are not compromised and employees do not work inside the enclosure during the release of airborne hazardous chemicals.

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

- (1) Chemical manipulations are carried out on a "laboratory scale";
- (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 industry-wide to minimize the potential for employee exposure to 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.

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

Oxidizer. A chemical other than a blasting agent or explosive as defined in Section 5237(a) that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

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

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

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

Select carcinogen. Any substance which 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 anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:
 - (A) After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m³;
 - (B) After repeated skin application of less than 300 mg/kg of body weight per week; or
 - (C) After oral dosages of less than 50 mg/kg of body weight per day.

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

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

(c) Exposure limits. For laboratory uses of Cal/OSHA regulated substances, the employer shall ensure that laboratory employees' exposures to such substances do not exceed the exposure limits specified in Title 8, California Code of Regulations, Group 16, Section 5139 et seq., of the General Industry Safety Orders.

(d) Employee exposure determination

(1) Initial monitoring. The employer shall measure the employee's exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels for that substance exceed the action level (or in the absence of an action level, the exposure limit). The person supervising, directing or evaluating the monitoring shall be competent in industrial hygiene practice.

(2) Periodic monitoring. If the initial monitoring prescribed by subsection 5191(d)(1) discloses employee exposure over the action level (or in the absence of an action level, the exposure limit), the employer shall immediately comply with the exposure monitoring provisions of the relevant regulation.

(3) Termination of monitoring. Monitoring may be terminated in accordance with the relevant regulation.

(4) Employee notification of monitoring results. The employer shall, within 15 working days after the receipt of any monitoring results, notify the employee of these results in writing either individually or by posting results in an appropriate location that is accessible to employees.

(e) Chemical hygiene plan.

(1) Where hazardous chemicals as defined by this regulation are used in the workplace, the employer shall develop and carry out the provisions of a written Chemical Hygiene Plan which is:

(A) Capable of protecting employees from health hazards associated with hazardous chemicals in that laboratory and

(B) Capable of keeping exposures below the limits specified in subsection 5191(c).

(2) The Chemical Hygiene Plan shall be readily available to employees, employee representatives and, upon request, to the Chief.

(3) The Chemical Hygiene Plan shall include each of the following elements and shall indicate specific measures that the employer will take to ensure laboratory employee protection;

(A) Standard operating procedures relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals:

(B) Criteria that the employer will use to determine and implement control measures to reduce employee exposure to hazardous chemicals including engineering controls, 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 hazardous;

(C) A requirement that fume hoods comply with Section 5154.1, that all protective equipment shall function properly and that specific measures shall be taken to ensure proper and adequate performance of such equipment;

(D) Provisions for employee information and training as prescribed in subsection 5191(f);

(E) The circumstances under which a particular laboratory operation, procedure or activity shall require prior approval from the employer or the employer's designee before implementation;

(F) Provisions for medical consultation and medical examinations in accordance with subsection 5191(g);

(G) Designation of personnel responsible for implementation of the Chemical Hygiene Plan including the assignment of a Chemical Hygiene officer and, if appropriate, establishment of a Chemical Hygiene Committee; and

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

1. Establishment of a designated area;
2. Use of containment devices such as fume hoods or glove boxes;
3. Procedures for safe removal of contaminated waste; and
4. Decontamination procedures.

(4) The employer shall review and evaluate the effectiveness of the Chemical Hygiene Plan at least annually and update it as necessary.

Note: Appendix A of this section is non-mandatory but provides guidance to assist employers in the development of the Chemical Hygiene Plan.

(f) Employee information and training.

(1) The employer shall provide employees with information and training to ensure that they are apprised of the hazards of chemicals present in their work area. Information and training may relate to an entire class of hazardous substances to the extent appropriate.

(2) Such information shall be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations. The frequency of refresher information and training shall be determined by the employer.

(3) Information. Employees shall be informed of:

- (A) The contents of this regulation and its appendices which shall be available to employees;
- (B) The location and availability of the employer's Chemical Hygiene Plan;
- (C) The exposure limits for Cal/OSHA regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable Cal/OSHA regulation;
- (D) Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory; and
- (E) 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.

(4) Training.

(A) 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 conducted by the employer, 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 these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.

(B) The employee shall be trained on the applicable details of the employer's written Chemical Hygiene Plan.

(g) Medical consultation and medical examinations.

- (1) The employer shall provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances;

(A) 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.

(B) Where exposure monitoring reveals an exposure level above the action level (or in the absence of an action level, the exposure limit) for a Cal/OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements, medical surveillance shall be established for the affected employee as prescribed by the particular standard.

(C) 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, the affected employee shall be provided an opportunity for a medical consultation. Such consultation shall be for the purpose of determining the need for a medical examination.

(2) 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.

(3) Information provided to the physician. The employer shall provide the following information to the physician;

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

(B) A description of the conditions under which the exposure occurred including quantitative exposure data, if available; and

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

(4) Physician's written opinion.

(A) For examination or consultation required under this standard, the employer shall obtain a written opinion from the examining physician which shall include the following;

1. Any recommendation for further medical follow-up;

2. The results of the medical examination and any associated tests, if requested by the employee;

3. Any medical condition which may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous chemical found in the workplace; and

4. A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment.

(B) The written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure.

(h) Hazard identification.

(1) With respect to labels and material safety data sheets;

(A) Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced.

(B) Employers shall maintain in the workplace any material safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible to laboratory employees during each work shift when they are in their work area(s).

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

(A) If the composition of the chemical substance which is produced exclusively for the laboratory's use is known, the employer shall determine if it is a hazardous chemical as defined in subsection 5191(b). If the chemical is determined to be hazardous, the employer shall provide appropriate training as required under subsection 5191(f).

(B) If the chemical produced is a byproduct whose composition is not known, the employer shall assume that the substance is hazardous and shall implement subsection 5191(e).

(C) If the chemical substance is produced for commercial purposes by another user outside of the laboratory, the employer shall comply with the Hazard Communication Standard (Section 5194) including the requirements for preparation of material safety data sheets and labeling.

(i) Use of respirators.

Where the use of respirators is necessary to maintain exposure below permissible exposure limits, the employer shall provide, at no cost to the employee, the proper

respiratory equipment. Respirators shall be selected and used in accordance with the requirements of Section 5144.

(j) Recordkeeping.

(1) The employer shall establish and maintain for each employee an accurate record of any measurements taken to monitor employee exposures and any medical consultation and examinations including tests or written opinions required by this regulation.

(2) The employer shall ensure that such records are kept, transferred, and made available in accordance with Section 3204.

(k) Dates

(1) Employers shall have developed and implemented a written Chemical Hygiene Plan no later than October 31, 1991.

(2) Subsection (a) (2) shall not take effect until the employer has developed and implemented a written Chemical Hygiene Plan.

(l) Appendices. The information contained in the appendices is not intended, by itself, to create any additional obligations not otherwise imposed or to detract from any existing obligation.

NOTE: Authority cited: Sections 142.3 and 9020, Labor Code. Reference: Sections 142.3, 9004(d), 9009 and 9020, Labor Code.

[Appendix A](#)
[Appendix B](#)

HISTORY

1. New section filed 3-25-91; operative 4-24-91 (Register 91, No. 17).
2. Editorial correction of printing errors (Register 92, No. 33).
3. Change without regulatory effect amending Appendix B subsections (b)1. and (c)1. filed 12-28-92 pursuant to section 100, title 1, California Code of Regulations (Register 93, No. 1).
4. Editorial correction of Appendix A subsection D.11.(b) (Register 95, No. 24).

APPENDIX B. TLV's

Information forthcoming.

APPENDIX C. PEL's

Cal/OSHA Permissible Exposure Limits (PELs) can be found at:

http://www.dir.ca.gov/Title8/5155table_ac1.html.

PERMISSIBLE EXPOSURE LIMITS FOR CHEMICAL CONTAMINANTS

Chemical Abstracts Registry Number ^(a)	Skin ^(b)	Name ^(c)	PEL ^(d)			STEL ^(e)	
			ppm ^(e)	mg/M ³ ^(f)	Ceiling ^(g)	ppm ^(e)	mg/M ³ ^(f)
75070		Acetaldehyde	25	45	C		
64197		Acetic acid	10	25	40 ppm	15	37
108247		Acetic Anhydride	5	20	C		
67641		Acetone	500	1200	3000 ppm	750	1780
75868		Acetone cyanohydrin as CN	4.7	5	C		
75058	S	Acetonitrile	40	70		60	105
98862		Acetophenone	10	49			
53963	S	2-Acetylaminofluorene; N-fluoren-2-yl acetamide; see Section 5209					
74862		Acetylene	(h)				
540590		Acetylene dichloride; see 1,2-Dichloroethylene					
79276		Acetylene tetrabromide; 1,1,2,2-tetrabromoethane	1	14			
79345		Acetylene tetrachloride; see 1,1,2,2-Tetrachloroethane					
50782		Acetylsalicylic acid (Aspirin)		5			
107028	S	Acrolein	0.1	0.25	C		
79061	S	Acrylamide	--	0.03			
79107	S	Acrylic acid	2	5.9			
107131	S	Acrylonitrile; see Section 5213	2	4.5			
124049		Adipic acid	--	5			
111693	S	Adiponitrile	2	8.8			
309002	S	Aldrin; 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-endo-1,2-exo-5,8-dimethanonaphthalene	--	0.25			
107186	S	Allyl alcohol	0.5	1.25		4	10
107051		Allyl chloride	1	3		2	6
106923	S	Allyl glycidyl ether; AGE	5	22		10	44
2179591		Allyl propyl disulfide	2	12		3	18
1344281		Alumina; see Particulates not otherwise regulated					
		Aluminum, alkyls (not otherwise classified)	--	2			
		Aluminum soluble salts	--	2			
		Aluminum metal and oxide	--				
		Total dust	--	10			
		Respirable fraction ⁽ⁿ⁾	--	5 ⁽ⁿ⁾			
		Aluminum pyro powders	--	5			
		Aluminum welding fumes	--	5			
300925		Aluminum distearate	--	10			
7047849		Aluminum stearate	--	10			
637127		Aluminum tristearate	--	10			
1300738		Aminodimethylbenzene; see Xylidene					
92671	S	4-Aminodiphenyl; see Section 5209					
141435		2-Aminoethanol; see Ethanolamine					
91598		2-Aminonaphthalene; see beta-Naphthylamine, Section 5209					
504290		2-Aminopyridine	0.5	2			
61825		Amitrole	--	0.2			
7664417		Ammonia	25	18		35	27
3825261	S	Ammonium perfluorooctanoate	--	00.1			

12125029		Ammonium chloride fume	--	10	--	20
1002897		Ammonium stearate	--	10		
7773060		Ammonium sulfamate	--			
		Total dust	--	10		
		Respirable fraction ⁽ⁿ⁾	--	5		
620111		3-Amyl acetate; See Pentyl acetate				
628637		n-Amyl acetate; See Pentyl acetate				
626380		sec-Amyl acetate (all isomers and mixtures); See Pentyl acetate				
625161		tert-Amyl acetate; See Pentyl acetate				
62533	S	Aniline	2	7.6		
29191524	S	Anisidine (ortho and para isomers)	0.1	0.5		
		Antimony and compounds, as Sb	--	0.5		
86884		ANTU; 1-(1-naphthyl)-2-thiourea; Bantu; Rattrack	--	0.3		
7440371		Argon	(h)			
7440382		Arsenic and inorganic arsenic compounds; see also Section 5214			0.01	
		Arsenic, organic compounds, as As	--	0.2		
7784421		Arsine; AsH ₃	0.05	0.2		
1332-21-4		Asbestos (including actinolite, amosite anthophyllite, chrysotile, crocidolite, and tremolite); see Section 5208				
8052424		Asphalt (petroleum) fumes	--	5		
1912249		Atrazine	--	5		
86500	S	Azinphos methyl; o,o-dimethyl S-(4-oxo-1,2,3-benzotriazin-3(4H)-ylmethyl) phosphorodithioate	--	0.2		
3333526	S	2,2'-Azobisisobutyronitrile decomposition product, see Tetramethyl succinonitrile				
7440393		Barium, soluble compounds, as Ba	--	0.5		
7727437		Barium sulfate; see Particulates not otherwise regulated				
17804352		Benomyl				
		Total dust	--	10		
		Respirable fraction ⁽ⁿ⁾	--	5		
71432	S	Benzene; see also Section 5218	1		5	--
92875	S	Benidine; 4,4'-diaminobiphenyl, see Section 5209				
71432		Benzol; see Benzene				
106514		D-Benzoquinone; see Quinone				
98884		Benzoyl chloride	0.2	1.1	C	
94360		Benzoyl peroxide; dibenzoyl peroxide	--	5		
140114		Benzyl acetate	10	61		
100447		benzyl chloride; alpha-chlorotoluene	1	5		
7440417		Beryllium, and beryllium compounds as Be	--	0.0002	0.025mg/M ³	--
92524		Biphenyl; diphenyl; phenylbenzene	0.2	1.5		
542881		Bis(chloromethyl) ether, see bis-Chloromethyl ether, Section 5209				
3033623	S	Bis (Dimethylaminoethyl) ether (DMAEE)	0.05	0.328	0.15	0.983
1304821		Bismuth telluride				
		Total dust	--	10		
		Respirable fraction ⁽ⁿ⁾	--	5		
		Bismuth telluride (selenium-doped)	--	5		
		Borates, tetra, sodium salts				
		Anhydrous	--	5		
		Decahydrate	--	5		
		Pentahydrate	--	5		
1303862		Boron oxide	--	10		
10294334		Boron tribromide	1	10	C	
7637072		Boron trifluoride	1	3	C	

314409		Bromacil	1	10			
7726956		Bromine	0.1	0.7	C		
7789302		Bromine pentafluoride	0.1	0.7			
74975		Bromochloromethane; see Chlorobromomethane					
74964		Bromoethane; see Ethyl bromide					
75252	S	Bromoform; tribromomethane	0.5	5			
74839		Bromomethane, see Methyl bromide					
75638		Bromotrifluoromethane; see Trifluorobromomethane					
106990		1,3-Butadiene (see also section 5201)	1	2.2		5	11
106978		Butane	800	1,900			
109795		1-Butanethiol; see Butyl mercaptan					
71363		1-Butanol; see n-Butyl alcohol					
78933		2-Butanone; see Methyl ethyl ketone					
111762	S	2-Butoxyethanol (EGBE)	20	97			
123864		n-Butyl acetate	150	710		200	950
105464		sec-Butyl acetate	200	950			
540885		tert-Butyl acetate	200	950			
141322		Butyl acrylate	2	11			
71363	S	n-Butyl alcohol; 1-butanol	50	150	C		
78922		sec-Butyl alcohol	100	305			
75650		tert-Butyl alcohol	100	300		150	450
109739	S	Butylamine	5	15	C		
1189851	S	tert-Butyl chromate; di-tert-butyl chromate, as CrO ₃ as Cr (see also Sections 1532.2, 5206 & 8359)	--	0.1 0.005	C		
2426086		n-Butyl glycidyl ether; BGE; 1-butoxy-2,3-epoxypropane	25	135			
138227		n-Butyl lactate	5	25			
109795		n-Butyl mercaptan	0.5	1.5			
89725	S	o-sec-Butylphenol	5	30			
98511		p-tert-Butyltoluene	1	6.1		20	120
7440439		Cadmium metal dust, as Cd (see also Sections 1532 & 5207)	--	0.005			
		Cadmium, soluble salts, as Cd (see also Sections 1532 & 5207)	--	0.005			
1306190		Cadmium oxide fume, as Cd (see also Sections 1532 & 5207)	--	0.005			
7778441		Calcium arsenate; see Arsenic, inorganic (see also Section 5214)					
471341		Calcium carbonate; see Particulates not otherwise regulated		--			
156627		Calcium cyanamide	--	0.5			
1305620		Calcium hydroxide	--	5			
1305788		Calcium oxide	--	2			
		Calcium silicate; see Particulates not otherwise regulated					
1344952		Calcium silicate (synthetic); see Particulates not otherwise regulated					
1592230		Calcium stearate	--	10			
7778189		Calcium sulfate; see Particulates not otherwise regulated					
76222		Camphor (synthetic)	--	2			
105602		Caprolactam dust	--	1		--	3
105602		Caprolactam vapor	5	20		10	40
2425061	S	Captafol	--	0.1			
133062		Captan	--	5			
63252		Carbaryl; 1-naphthyl N-methylcarbamate	--	5			
1563662		Carbofuran	--	0.1			
1333864		Carbon black	--	3.5			

124389		Carbon dioxide	5,000	9,000		30,000	54,000
75150	S	Carbon disulfide	4	12	30 ppm	12	36
630080		Carbon monoxide	25	29	200 ppm		
558134		Carbon tetrabromide	0.1	1.4		0.3	4
56235	S	Carbon tetrachloride	2	12.6	200 ppm	10	63
75445		Carbonyl chloride; see Phosgene					
353504		Carbonyl fluoride	2	5		5	15
120809	S	Catechol; pyrocatechol	5	20			
9004346		Cellulose (paper fiber); see Particulates not otherwise regulated					
21351791		Cesium hydroxide		2			
57749	S	Chlordane; 1,2,4,5,6,7,8,8-octachloro-3a,4,7,7a-tetrahydro-4,7-methanoindane	--	0.5			
8001352	S	Chlorinated camphene; toxaphene	--	0.5		--	1
		Chlorinated diphenyl oxide	--	0.5			
7782505		Chlorine	0.5	1.5		1	3
10049044		Chlorine dioxide	0.1	0.3		0.3	0.9
7790912		Chlorine trifluoride	0.1	0.4	C		
107200		Chloroacetaldehyde	1	3	C		
78955	S	Chloroacetone	1	3.8	C		
532274		alpha-Chloroacetophenone; phenacyl chloride	0.05	0.3			
79049	S	Chloroacetyl chloride	0.05	0.2		0.15	0.69
108907		Chlorobenzene; monochlorobenzene	10	46			
2698411	S	o-Chlorobenzylidene malononitrile; OCBM	0.05	0.4	C		
74975		Chlorobromomethane; bromochloromethane	200	1,050			
126998	S	2-Chloro-1,3-butadiene; see Chloroprene					
75456		Chlorodifluoromethane; Fluorocarbon 22	1,000	3,500			
53469219	S	Chlorodiphenyl (42% chlorine)	--	1			
11097691	S	Chlorodiphenyl (54% chlorine)	--	0.5			
106898		1-Chloro-2,3-epoxypropane; see Epichlorohydrin					
75003		Chloroethane; see Ethyl chloride					
107073		2-Chloroethanol; see Ethylene chlorohydrin					
75014		Chloroethylene, see Vinyl chloride, Section 5210					
67663		Chloroform; trichloromethane	2	9.78			
74873		Chloromethane, see Methyl chloride					
107302		Chloromethyl methyl ether; see Methyl chloromethyl ether, Section 5209					
542881		bis-Chloromethyl ether, see also Section 5209	0.001	0.005			
100005		1-Chloro-4-nitrobenzene; see p-Nitrochlorobenzene					
600259		1-Chloro-1-nitropropane	2	10			
76153		Chloropentafluoroethane	1,000	6,320			
76062		Chloropicrin; trichloronitromethane	0.1	0.7			
126998	S	Chloroprene; 2-chloro-1,3-butadiene	10	36			
598787	S	2-Chloropropionic acid	0.1	0.44			
2039874		o-Chlorostyrene	50	285		75	428
95498	S	o-Chlorotoluene	50	250			
1929824		2-Chloro-6-(trichloromethyl)pyridine; see Nitrapyrin					
2921882	S	Chlorpyrifos	--	0.2			
		Chromite ore processing (chromate), as Cr (see also Sections 1532.2, 5206 & 8359)	--	0.005			
7440473		Chromium metal	--	0.5			
		Chromium (II) compounds, as Cr	--	0.5			
		Chromium (III) compounds, as Cr	--	0.5			
		Chromium (VI) compounds, as Cr (see also Sections 1532.2, 5206 & 8359)	--	0.005	0.1mg/M ³		
14977618		Chromyl chloride	0.025	0.15			

2971906		Clopidol	--			
		Total dust	--	10		
		Respirable fraction	--	5		
		Coal (Bituminous) dust				
		<5% quartz, respirable fraction ⁽ⁿ⁾	--	2		
		>5% quartz, respirable fraction ⁽ⁿ⁾	--	0.1		
		Coal tar pitch volatiles ⁽ⁱ⁾	--	0.2		
7440484		Cobalt, metal fume and dust, as Co	--	0.020		
		Cobalt carbonyl, as Co	--	0.1		
16842038		Cobalt hydrocarbonyl, as Co	--	0.1		
		Coke oven emissions, see Section 5211		0.15		
7440508		Copper metal fume, as Cu	--	0.1		
		Copper salts, dusts and mists, as Cu	--	1		
		Corundum, see Particulates not otherwise regulated				
		Cotton dust, see also Section 5190	--	1 ^(f)		
1319773	S	Cresol (all isomers)	5	22		
123739	S	Crotonaldehyde; beta-methylacrolein				0.3
4170303						
299865		Crufomate	--	5		
98828	S	Cumene; isopropylbenzene	50	245		
420042		Cyanamide	--	2		
	S	Cyanide, as CN	--	5		
460195		Cyanogen	10	20		
506774		Cyanogen chloride	0.3	0.6		C
110827		Cyclohexane	300	1,050		
108930	S	Cyclohexanol	50	200		
108941	S	Cyclohexanone	25	100		
110838		Cyclohexene	300	1,015		
108918	S	Cyclohexylamine	10	40		
121824	S	Cyclonite; RDX; cyclotrimethylenetrinitramine	--	1.5		
542927		Cyclopentadiene	75	200		
287923		Cyclopentane	600	1,720		
13121705		Cyhexatin; tricyclohexyltin hydroxide		5		
94757		2,4-D;2,4-dichlorophenoxyacetic acid	--	10		
50293	S	DDT; 1,1,1-trichloro-2,2-bis-(p-chlorophenyl)ethane	--	1		
62737		DDVP, see Dichlorvos				
17702419	S	Decaborane	0.05	0.3		0.15 0.9
8065483	S	Demeton; a mixture of o,o-diethyl o-2(ethylthio)ethyl phosphorothioate and o,o'-diethyl S-2(ethylthio)ethyl phosphorothioate	0.01	0.1		
123422		Diacetone alcohol; 4-hydroxy-4-methyl-2-pentanone	50	240		
107153		1,2-Diaminoethane; see Ethylenediamine				
		Diatomaceous earth; see Silica-amorphous				
333415	S	Diazinon; o,o-diethyl o-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate	--	0.1		
334883		Diazomethane	0.2	0.4		
94360		Dibenzoyl peroxide; see Benzoyl peroxide				
19287457		Diborane	0.1	0.1		
2528361	S	Dibutyl phenyl phosphate	0.3	3.5		
96128		1,2-Dibromo-3-chloropropane; DBCP; see Section 5212	.001	.01		
75616		Dibromodifluoromethane; see Difluorodibromomethane				
106934	S	1,2-Dibromomethane; see Ethylene dibromide,				

Section 5219						
102818	S	2-N-Dibutylaminoethanol	2	14		
107664		Dibutyl phosphate	1	5	2	10
84742		Dibutyl phthalate	--	5		
7572294		Dichloroacetylene	0.1	0.4	C	
95501	S	o-Dichlorobenzene	25	150	50 ppm	
106467		p-Dichlorobenzene; 1,4-dichlorobenzene	10	60	200 ppm	110 675
91941	S	3,3'-Dichlorobenzidine; 4,4'-diamino-3,3'-dichlorobiphenyl; see Section 5209				
764410	S	1,4 -Dichloro-2-butene	0.005	0.025		
75718		Dichlorodifluoromethane	1000	4950	6200 ppm	
118525		1,3-Dichloro-5,5-dimethyl hydantoin	--	0.2	--	0.4
75343		1,1-Dichloroethane	100	400		
107062		1,2-Dichloroethane, see Ethylene dichloride				
75354		1,1-Dichloroethylene; see Vinylidene chloride				
540590		1,2-Dichloroethylene; acetylene dichloride	200	790		
111444	S	Dichloroethyl ether; bis(2-chloroethyl) ether	5	30	10	60
75434		Dichlorofluoromethane; Fluorocarbon 21	10	42		
75092		Dichloromethane; see Methylene chloride				
594729		1,1-Dichloro-1-nitroethane	2	10		
78875		1,2-Dichloropropane; see Propylene dichloride				
542756	S	Dichloropropene	1	5		
75990		2,2-Dichloropropionic acid	1	6		
76142		1,2-Dichlorotetrafluoroethane; Fluorocarbon 114	1,000	7,000		
62737	S	Dichlorvos (DDVP); 2,2-dichlorovinyl dimethyl phosphate	0.1	1		
141662	S	Dicrotophos	--	0.25		
5124301		Dicyclohexylmethane-4,4'-diisocyanate; see Methylene bis-(4-cyclohexylisocyanate)				
77736		Dicyclopentadiene	5	30		
102545		Dicyclopentadienyl iron	--			
		Total dust	--	10		
		Respirable fraction ⁽ⁿ⁾	--	5		
60571	S	Dieldrin; 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo-exo-5,8-dimethanonaphthalene	--	0.25		
111422	S	Diethanolamine	0.46	2		
109897	S	Diethylamine	5	15	C	
112367	S	Diethylene glycol diethyl ether, Ethyl diglyme	5	33		
111966	S	Diethylene glycol dimethyl ether, Diglyme	1	5.5	5	27
100378	S	2-(Diethylamino) ethanol	2	9.6		
123911		1,4-Diethylene dioxide; see p-Dioxane				
111400	S	Diethylenetriamine	1	4		
60297		Diethyl ether; see Ethyl ether				
298044		Di-(2-ethylhexyl) phthalate; see Di-sec-octyl phthalate				
96220		Diethyl ketone	200	705	300	1057
84662		Diethyl phthalate	--	5		
75616		Difluorodibromomethane; dibromodifluoromethane	100	860		
2238075		Diglycidyl ether; DGE; bis(2,3-epoxypropyl) ether	0.1	0.5		
123319		p-Dihydroxybenzene; see Hydroquinone				
108838		Diisobutyl ketone; 2,6-dimethyl-4-heptanone	25	150		
108189	S	Diisopropylamine	5	20		
108203		Diisopropyl ether; see Isopryl ether				

109875		Dimethoxymethane; see Methylal				
127195	S	Dimethylacetamide	10	35		
124403		Dimethylamine	5	9.2	15	27.6
60117		4-Dimethylaminoazobenzene, see Section 5209				
1300738		Dimethylaminobenzene; see Xylidene				
121697	S	N,N-Dimethylaniline; dimethylphenylamine	5	25	10	50
1330207		Dimethylbenzene; see Xylene				
108849		1,3-Dimethylbutyl acetate; see sec-Hexyl acetate				
300765		o,o-Dimethyl o-(1,2-dibromo-2,2-dichloroethyl) phosphate; see Naled				
14857342		Dimethylethoxysilane	0.5	2.1	1.5	6.4
68122	S	Dimethylformamide; DMF	10	30		
108838		2,6-Dimethyl-4-heptanone; see Diisobutyl ketone				
57147	S	1,1-Dimethylhydrazine	0.01	0.025		
67641		Dimethyl ketone; see Acetone				
62759		N,N-Dimethylnitrosamine; see N-Nitrosodimethylamine, Section 5209				
131113		Dimethyl phthalate	--	5		
77781	S	Dimethyl sulfate; methyl sulfate	0.1	0.5		
148016		Dinitolmide; 3,5-Dinitro-o-toluamide	--	5		
528290,	S	Dinitrobenzene (all (isomers)				
99650,		ortho, meta and				
100254		para isomers	0.15	1		
534521	S	4,6-Dinitro-o-cresol; 2-methyl-4,6-dinitrophenol	--	0.2		
25321146	S	2,4-Dinitrotoluene	--	0.15		
123911	S	p-Dioxane, tech. grade; 1,4-dioxacyclohexane; 1,4-diethylene dioxide	25	90		
78342	S	Dioxathion	--	0.2		
92524		Diphenyl; see Biphenyl				
122394		Diphenylamine; N-phenylaniline	--	10		
101688		Diphenylmethane diisocyanate; see Methylene bis(phenylisocyanate)				
123193		Dipropyl ketone	50	235		
34590948	S	Dipropylene glycol methyl ether	100	600	150	900
85007		Diquat; 1,1'-ethylene-2,2'-dipyridinium dibromide	--			
		Total dust	--	0.5		
		Respirable fraction ⁽ⁿ⁾				
117817		Di-sec-octyl phthalate; bis(2 ethylhexyl) phthalate	--	5	--	
97778		Disulfiram	--	2		
298044	S	Disulfoton; o,o-diethyl S-2-(ethylthio)ethyl phosphorodithioate	--	0.1		
128370		2,6-Di-tert-butyl-p-cresol	--	10		
330541		Diuron	--	10		
68122		DMF; see Dimethylformamide				
57147		DMH; see 1,1-Dimethylhydrazine				
1321740		Divinyl benzene	10	50		
		Dust, nuisance dust and particulates, see Particulates not otherwise regulated				
12415348		Emery; see Particulates not otherwise regulated				
115297	S	Endosulfan; 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-6,9-methano-2,4,				

		3-benzodioxathiepin-3-oxide	--	0.1			
72208	S	Endrin; 1,2,3,4,10,10-hexachloro-6,7-epoxy- 1,4,4a,5,6,7,8,8a-octahydro-1,4-endo-endo-5, 8-dimethanonaphthalene	--	0.1			
13838169		Enflurane	2	15			
106898	S	Epichlorohydrin; 1-chloro-2, 3-epoxypropane	0.05	0.19			
2104645	S	EPN; o-ethyl o-(p-nitrophenyl) phenylphosphonothioate	--	0.1			
75569		1,2-Epoxypropane; see Propylene oxide					
556525		2,3-Epoxypropanol; see Glycidol					
74840		Ethane	(h)	--			
75081		Ethanethiol; see Ethyl mercaptan					
64175		Ethanol; see Ethyl alcohol					
141435		Ethanolamine; 2-aminoethanol	3	8		6	15
563122	S	Ethion	--	0.4			
110805	S	2-Ethoxyethanol	5	18			
111159	S	2-Ethoxyethyl acetate	5	27			
141786		Ethyl acetate	400	1,400			
140885	S	Ethyl acrylate	5	20		25	100
64175		Ethyl alcohol; ethanol	1,000	1,900			
75047	S	Ethylamine	5	9.2		C	
541855		Ethyl sec-amyl ketone; 5-methyl-3-heptanone	25	130			
100414		Ethylbenzene	100	435		125	545
74964	S	Ethyl bromide	5	22			
106354		Ethyl butyl ketone; 3-heptanone	50	230		75	345
75003	S	Ethyl chloride; chloroethane	100	264			
7085850		Ethyl cyanoacrylate	0.2	1.02			
673923		Ethyl tert-butyl ether	5	21			
74851		Ethylene	(h)	--			
107073	S	Ethylene chlorohydrin; 2-chloroethanol	1	3		C	
107153		Ethylenediamine; 1,2-diaminoethane	10	25			
106934	S	Ethylene dibromide; 1,2-dibromoethane, see Section 5219	0.13	1		C	
107062		Ethylene dichloride; 1,2-dichloroethane	1	4		200 ppm	2 8
107211		Ethylene glycol (vapor)	40	100		C	
629141	S	Ethylene glycol diethyl ether, 1,2-diethoxyethane	5	24			
110714	S	Ethylene glycol dimethyl ether, 1,2-dimethoxyethane, Glyme	1	3.7		5	18
628966	S	Ethylene glycol dinitrate		(k)		--	0.1
110805	S	Ethylene glycol monoethyl ether, see 2-Ethoxyethanol					
109864	S	Ethylene glycol monomethyl ether, see 2-Methoxyethanol					
110496	S	Ethylene glycol monomethyl ether acetate; see 2-Methoxyethyl acetate					
151564	S	Ethyleneimine; see also Section 5209	0.5	1			
75218		Ethylene oxide; see Section 5220	1	2		5	
60297		Ethyl ether	400	1,200		500	1500
109944		Ethyl formate	100	300			
75343		Ethylidene chloride; see 1,1-Dichloroethane					
16219753		Ethylidene norbornene	5	25		C	
75081		Ethyl mercaptan; ethanethiol	0.5	1			
78933		Ethyl methyl ketone; see Methyl ethyl ketone					
100743	S	N-Ethylmorpholine; 4-ethyl-1, 4-tetrahydrooxazine	5	23			

78104		Ethyl silicate; tetraethyl silicate	10	85		
22224926	S	Fenamiphos		0.1		
115902		Fensulfothion	--	0.1		
55389	S	Fenthion	--	0.2		
14484641		Ferbam; ferric N,N-dimethylthiocarbamate	--	10		
12604589		Ferovanadium dust	--	1	--	3
14808607		Fibrous glass, see Glass				
		Flour dust		0.5 ^(s)		
		Fluorides, as F	--	2.5		
7782414		Fluorine	0.1	0.2		
75694		Fluorocarbon 11; see Trichlorofluoromethane				
75718		Fluorocarbon 12; see Dichlorodifluoromethane				
75434		Fluorocarbon 21; see Dichlorodifluoromethane				
75456		Fluorocarbon 22; see Chlorodifluoromethane				
76120		Fluorocarbon 112; see 1,1,2,2-Tetrachloro-1,2-difluoroethane				
76131		Fluorocarbon 113; see 1,1,2-Trichloro-1,2,2-trifluoroethane				
		Fluorocarbon 114; see 1,2-Dichlorotetrafluoroethane				
75694		Fluorotrichloromethane; see Trichlorofluoromethane				
944229	S	Fonofos	--	0.1		
50000		Formaldehyde, see Section 5217	0.75	--	2	--
75127	S	Formamide	10	18		
64186		Formic acid	5	9	10	19
98011	S	Furfural	2	8		
98000	S	Furfuryl alcohol	10	40	15	60
8006619		Gasoline	300	900	500	1500
7782652		Germanium tetrahydride	0.2	0.6		
		Glass, fibrous	1.0 f/cc _(q)			
111308		Glutaraldehyde ⁽¹⁾	0.05	0.2	C	
56815		Glycerin mist; see Particulates not otherwise regulated				
123944		Glyceryl stearate	--	10		
556525		Glycidol; 2,3-epoxy-1-propanol	2	6.1		
111762		Glycol monobutyl ether; see 2-Butoxyethanol				
110805		Glycol monoethyl ether; see 2-Ethoxyethanol				
109864		Glycol monoethyl ether; see 2-Methoxyethanol				
		Grain dust (oat, wheat, barley)	--	10		
7782425		Graphite, natural respirable dust		2.5		
		Graphite, synthetic				
		Total dust	--	10		
		Respirable fraction ⁽ⁿ⁾	--	5		
13397245		Gypsum; Calcium sulfate dihydrate; see Particulates not otherwise regulated				
7440586		Hafnium	--	0.5		
151677		Halothane	2	16		
822060		HDI; see Hexamethylene diisocyanate				
7440597		Helium	(h)	--		
76448	S	Heptachlor; 1,4,5,6,7,8,8-hepta-chloro-3a,4,7,7a-tetrahydro-4,7-methanoindene	--	0.05		
142825		n-Heptane	400	1,600	500	2000
118741	S	Hexachlorobenzene	--	0.002		
87683	S	Hexachlorobutadiene	0.02	0.24		
77474		Hexachlorocyclopentadiene	0.01	0.11		
67721	S	Hexachloroethane; perchloroethane	1	10		

1335871	S	Hexachloronaphthalene	--	0.2				
684162	S	Hexafluoroacetone; 1,1,1,3,3,3-hexafluoro-2-propanone	0.1	0.7				
822060		Hexamethylene diisocyanate; HDI	0.005	0.034				
110543	S	n-Hexane	50	180				
		Hexane, other isomers	500	1800		1000		3600
124094		1,6-Hexanediamine	0.5	2.3				
591786		2-Hexanone; see Methyl butyl ketone						
592416		1-Hexene	50	180				
108101		Hexone; see Methyl isobutyl ketone						
108849		sec-Hexyl acetate; 4-methyl-2-pentyl acetate; 1,3-dimethyl-butyl acetate	50	300				
107415		Hexylene glycol	25	125	C			
302012	S	Hydrazine	0.01	0.013				
10035106		Hydrobromic acid; see Hydrogen bromide						
7647010		Hydrochloric acid; see Hydrogen chloride						
74908		Hydrocyanic acid; see Hydrogen cyanide						
7664393		Hydrofluoric acid; see Hydrogen fluoride						
1333740		Hydrogen	(h)	--				
61788327		Hydrogenated terphenyls	0.5	5				
10035106		Hydrogen bromide	3	10	C			
7647010		Hydrogen chloride; muriatic acid	5	7	C			
74908	S	Hydrogen cyanide	4.7	5	C			
7664393		Hydrogen fluoride, as F	3	2.5		6		--
7722841		Hydrogen peroxide, as H ₂ O ₂	1	1.4				
7783075		Hydrogen selenide, as Se	0.05	0.2				
7783064		Hydrogen sulfide	10	14	50 ppm	15		21
123319		Hydroquinone; 1,4-benzenediol	--	2				
999611	S	2-Hydroxypropyl acrylate	0.5	3				
95136		Indene	10	48				
7440746		Indium	--	0.1				
		Indium compounds	--	0.1				
7553562		Iodine	0.1	1	C			
75478		Iodoform	0.6	10				
4098719		IPDI; see Isophorone diisocyanate						
1309371		Iron oxide fume	--	5				
13463406		Iron pentacarbonyl, as Fe	0.1	0.8		0.2		1.6
		Iron salts, soluble, as Fe	--	1				
123922		Isoamyl acetate; 3-methylbutyl acetate; see Pentyl acetate						
123513		Isoamyl alcohol; 3-methylbutanol	100	360		125		450
110190		Isobutyl acetate; 2-methylpropyl acetate	150	700				
78831		Isobutyl alcohol; 2-methylpropanol	50	150				
26675467		Isoflurane	2	15				
26952216	S	Isooctyl alcohol	50	270				
78591		Isophorone; 3,5,5-trimethyl-2-cyclohexene-1-one	4	23				
4098719	S	Isophorone diisocyanate; IPDI	0.005	0.045		0.02		--
109591		Isopropoxyethanol	25	105				
108214		Isopropyl acetate	250	950		310		1185
67630		Isopropyl alcohol	400	980		500		1225
75310		Isopropylamine	5	12		10		24
768525	S	N-isopropylaniline	2	10				
108203		Isopropyl ether; diisopropyl ether	250	1,050				
4016142		Isopropyl glycidyl ether; IGE; 1,2-epoxy-3-isopropoxypropane	50	240		75		360
1332587		Kaolin; (respirable dust containing no						

		asbestos and <1% crystalline silica)	--	2		
463514		Ketene; ethenone	0.5	0.9	1.5	3
		Lead arsenate, see Sections 5214 and 5198				
7758976		Lead chromate, as Pb	--	0.02		
		as Cr	--	0.005		
		(see also Section 5198, 1532.1, 1532.2, 5206 & 8359)				
		Lead (metallic) and inorganic compounds, dust				
		and fume, as Pb (see also Section 5198)	--	0.05		
78002		Lead tetraethyl, see Tetraethyl lead				
75741		Lead tetramethyl, see Tetramethyl lead				
1317653		Limestone; calcium carbonate; see				
		Particulates not otherwise regulated				
58899	S	Lindane; 1,2,3,4,5,6-hexachlorocyclohexane,				
		gamma isomer	--	0.5		
7580678		Lithium hydride	--	0.025		
		L.P.G.; liquefied petroleum gas	1,000	1,800		
4485125		Lithium stearate	--	10		
13717005		Magnesite; magnesium carbonate; see				
		Particulates not otherwise regulated				
1309484		Magnesium oxide fume, as Mg	--	10		
557040		Magnesium stearate	--	10		
121755	S	Malathion; o,o-dimethyl S-1(1,2-				
		dicarboethoxyethyl) phosphorodithioate	--	10		
108316		Maleic anhydride; cis-butenedioic anhydride	0.1	0.4		
		Manganese and compounds, as Mn	--	0.2		
7439965		Manganese fume, as Mn	--	0.2	--	3
12079651	S	Manganese, cyclopentadienyl-tricarbonyl,				
		as Mn	--	0.1		
		Manganese tetroxide	--	0.2		
		Marble; calcium carbonate; see				
		Particulates not otherwise regulated				
101779	S	MDA; see 4,4'-Methylene dianiline				
101688		MDI; see Methylene bis(phenylisocyanate)				
7439976	S	Mercury alkyls, as Hg	--	0.01	0.04 mg/M ³	-- 0.03
7439976	S	Mercury, metallic and inorganic compounds as Hg	--	0.025	0.1 mg/M ³	
7439976	S	Mercury aryl compounds as Hg	--	0.01	C	
108678		Mesitylene; see 1,3,5-Trimethylbenzene				
141797		Mesityl oxide; 4-methyl-3-pentene-2-one	15	60	25	100
79414	S	Methacrylic acid	20	70		
74828		Methane	(h)	--		
74931		Methanethiol; see Methyl mercaptan				
67561		Methanol; see Methyl alcohol				
16752775	S	Methomyl	--	2.5		
72435		Methoxychlor; 1,1,1-trichloro-2,				
		2-bis(p-methoxyphenyl)ethane	--	10		
109864	S	2-Methoxyethanol	5	16		
110496		2-Methoxyethyl acetate	5	24		
76380		Methoxyflurane	2	13		
150765		4-Methoxyphenol	--	5		
79209		Methyl acetate	200	610	250	760
74997		Methyl acetylene; propyne	1,000	1,650		
		Methyl acetylene-propadiene mixture; MAPP	1,000	1,800	1250	2250
96333	S	Methyl acrylate	10	35		
126987	S	alpha-Methylacrylonitrile	1	3		
624419		2-Methylbutyl acetate; see Pentyl acetate				
109875		Methylal; dimethoxymethane	1,000	3,100		

67561	S	Methyl alcohol; methanol	200	260	1000 ppm	250	325
74895		Methylamine	5	6.4		15	19
108112		Methyl amyl alcohol; see Methyl isobutyl carbinol					
110430		Methyl n-amyl ketone; 2-heptanone	50	235			
100618	S	N-Methylaniline; monomethylaniline	0.5	2			
95534		o-Methylaniline; see o-Toluidine					
74839	S	Methyl bromide	1	3.88	20 ppm		
591786	S	Methyl butyl ketone; 2-hexanone	5	20			
74873		Methyl chloride	50	105	300 ppm	100	210
71556		Methyl chloroform; 1,1,1-trichloroethane	350	1900	800 ppm	450	2450
107302		Methyl chloromethyl ether; see Section 5209					
75058		Methyl cyanide; see Acetonitrile					
137053		Methyl 2-cyanoacrylate	0.2	0.908		4	
108872		Methylcyclohexane	400	1,600			
25639423		Methylcyclohexanol (meta- and para-isomer mixture)	50	235			
583608	S	o-Methylcyclohexanone	50	230		75	345
12108133	S	2-Methylcyclopentadienyl manganese tricarbonyl, as Mn	--	0.2			
8022002	S	Methyl demeton; a mixture of o,o-dimethyl o-(2-(ethylthio)ethyl) phosphorothioate and o,o-dimethyl S-(2-(ethylthio)-ethyl) phosphorothioate	--	0.5			
101144	S	4,4'-Methylene bis(2-chloroaniline), see also Section 5215	--	0.01			
5124301		Methylene bis(4-cyclohexylisocyanate); hydrogenated MDI	0.005	0.054			
101688		Methylene bis(phenylisocyanate); MDI; diphenylmethane diisocyanate	0.005	0.051			
75092		Methylene chloride; dichloromethane (see also section 5202)	25	87		125	435
101779	S	4,4'-Methylene dianiline; MDA (see also Sections 1535 and 5200)	0.01	0.08		0.1	0.8
78933		Methyl ethyl ketone; MEK; 2-butanone; ethyl methyl ketone	200	590		300	885
1338234		Methyl ethyl ketone peroxide	0.2	1.5	C		
107313		Methyl formate	100	250		150	375
60344	S	Methyl hydrazine; monomethyl hydrazine	0.01	0.019			
74884	S	Methyl iodide	2	10			
110123		Methyl isoamyl ketone	50	234			
108112	S	Methyl isobutyl carbinol; 4-methyl-2-pentanol; methyl amyl alcohol	25	100		40	165
108101		Methyl isobutyl ketone; Hexone	50	205		75	300
624839	S	Methyl isocyanate	0.02	0.05			
563804		Methyl isopropyl ketone	200	705			
74931		Methyl mercaptan	0.5	1			
80626		Methyl methacrylate; methyl 2-methyl-2-propenoate	50	205		100	410
298000	S	Methyl parathion; o,o-dimethyl o-(p-nitrophenyl) phosphorothioate	--	0.2			
107879		Methyl propyl ketone; 2-pentanone	200	700		250	875
681845		Methyl silicate; tetramethyl silicate	1	6			
98839		alpha-Methylstyrene; 1-methyl-1-phenylethene	50	240		100	485
77781		Methyl sulfate; see Dimethyl sulfate					

1634044		Methyl tert-butyl ether; MTBE	40	144		
21087649		Metribuzin	--	5		
7786347	S	Mevinphos; 2-carbomethoxy- 1-propen-2-yl dimethyl phosphate	0.01	0.1	0.03	0.3
		Mica, see Silicates				
		Mineral wool fiber; see Particulates not otherwise regulated				
7439987		Molybdenum, insoluble compounds, as Mo	--			
		Total dust	--	10		
		Respirable fraction ⁽ⁿ⁾	--	3		
		Molybdenum, soluble compounds, as Mo	--	0.5 ⁽ⁿ⁾		
6923224		Monocrotophos	--	0.25		
100618		Monomethylaniline; see N-Methylaniline				
60344		Monomethylhydrazine; see Methyl hydrazine				
110918	S	Morpholine; tetrahydro-4H-1, 4-oxazine	20	70	30	105
7647010		Muriatic acid; see Hydrogen chloride				
300765	S	Naled; o,o-dimethyl o- (1,2-dibromo-2,2-dichloroethyl) phosphate	--	3		
8030317		Naphtha, coal tar	100	400		
91203		Naphthalene	10	50	15	75
134327		alpha-Naphthylamine; 1-naphthylamine, see Section 5209				
91598		beta-Naphthylamine; 2-naphthylamine, see Section 5209				
63252		1-Naphthyl N-methylcarbamate; see Carbaryl				
25551284		Naphthalene diisocyanate; NDI	0.01	0.085	C	
7440019		Neon	(h)			
13463393		Nickel carbonyl; Ni (CO) ₄	0.001	0.007		
7440020		Nickel metal, as Ni	--	1		
		Nickel, insoluble compounds, as Ni	--	1		
		Nickel, soluble compounds, as Ni	--	0.1		
54115	S	Nicotine; 1-methyl-2-(3-pyridyl)-pyrrolidine	0.075	0.5		
1929824		Nitrapyrin	--			
		Total dust	--	10		
		Respirable fraction ⁽ⁿ⁾	--	5		
7697372		Nitric acid	2	5	4	10
10102439		Nitric oxide; NO	25	30		
100016	S	p-Nitroaniline	--	3		
98953	S	Nitrobenzene	1	5		
100005	S	p-Nitrochlorobenzene; 1-chloro-4-nitrobenzene	0.1	0.64		
92933		4-Nitrodiphenyl, see Section 5209				
79243		Nitroethane	100	310		
7727379		Nitrogen	(h)	--		
10102440		Nitrogen dioxide			1	1.8
		Nitrogen tetroxide; N ₂ O ₄ ; see Nitrogen dioxide				
7783542		Nitrogen trifluoride	10	29		
55630	S	Nitroglycerin		(k)	--	0.1
75525		Nitromethane	2	5		
108032		1-Nitropropane	25	90		
79469		2-Nitropropane	10	35		
62759		N-Nitrosodimethylamine, see Section 5209				
1321126, 99081, 88722, 99990 76062	S	Nitrotoluene	2	11		
		Nitrotrichloromethane; see Chloropicrin				

10024972		Nitrous oxide	50	90			
111842		Nonane	200	1,050			
		Nuisance particulates, see Particulates not otherwise regulated					
		Total dust	--	10			
		Respirable fraction ⁽ⁿ⁾	--	5			
2234131	S	Octachloronaphthalene	--	0.1		--	0.3
111659		Octane	300	1,450		375	1800
8012951		Oil (mineral) mist, particulate	--	(5) ^(l)			
		Oil (vegetable) mists (except castor, cashew nut or similar irritant oils); see Nuisance particulates					
		Organic arsenic compounds; see Arsenic, organic					
20816120		Osmium tetroxide, as Os	0.0002	0.002		0.0006	0.006
144627		Oxalic acid	--	1		--	2
7783417		Oxygen difluoride	0.05	0.1	C		
10028156		Ozone	0.1	0.2		0.3	0.6
8002742		Paraffin wax fume	--	2			
1910425, 2074502	S	Paraquat, total particulates	--	0.5			
1910425, 2074502	S	Paraquat, respirable sizes	--	0.1 ⁽ⁿ⁾			
56382	S	Parathion; o,o-diethyl o-(p-nitrophenyl) phosphorothioate	--	0.1			
		Particulates not otherwise regulated					
		Total dust	--	10			
		Respirable fraction ⁽ⁿ⁾	--	5			
		Particulate polycyclic; aromatic hydrocarbons (PPAH) see Coal tar pitch volatiles					
		PCB; see Chlorodiphenyl					
87865	S	PCP; see Pentachlorophenol					
19624227		Pentaborane	0.005	0.01		0.015	0.03
1321648	S	Pentachloronaphthalene	--	0.5			
87865	S	Pentachlorophenol; PCP	--	0.5			
115775		Pentaerythritol; tetrakis-(hydroxymethyl)methane; tetra-methylolmethane; see Particulates not otherwise regulated					
109660		Pentane	600	1,800			
107879		2-Pentanone; see Methyl propyl ketone					
628637; 626380; 123922; 625161; 620111; 624419		Pentyl acetate	50	266		100	532
67721		Perchloroethane; see Hexachloroethane					
127184		Perchloroethylene	25	170	300 ppm	100	685
594423		Perchloromethyl mercaptan; trichloromethanethiol	0.1	0.8			
7616946		Perchloryl fluoride; ClO ₃ F	3	14		6	28
382218		Perfluoroisobutylene	0.01	0.082	C		
		Perlite					
		Total dust	--	10			
		Respirable fraction ⁽ⁿ⁾	--	5			
108952	S	Phenol	5	19			
92842	S	Phenothiazine; dibenzothiazine	--	5			

106503	S	p-Phenylenediamine	--	0.1		
101848		Phenyl ether, vapor	1	7		
100425		Phenylethylene; see Styrene				
122601	S	Phenyl glycidyl ether, PGE;1,2-epoxy-3-phenoxypropane	0.1	0.6		
100630	S	Phenylhydrazine	5	20	10	45
108985		Phenyl mercaptan	0.5	2		
638211		Phenylphosphine	0.05	0.25	C	
298022	S	Phorate; o,o-diethyl S-(ethylthio)methyl phosphorodithioate	--	0.05	--	0.2
75445		Phosgene; carbonyl chloride; COCl ₂	0.1	0.4		
7803512		Phosphine; PH ₃	0.3	0.4	1	1
7664382		Phosphoric acid	--	1	--	3
7723140		Phosphorus, yellow	--	0.1		
10025873		Phosphorus oxychloride	0.1	0.6		
10026138		Phosphorus pentachloride	0.1	1		
1314803		Phosphorus pentasulfide; P ₂ S ₅	--	1	--	3
7719122		Phosphorus trichloride	0.2	1.5	0.5	3
85449		Phthalic anhydride	1	6		
626175		m-Phthalodinitrile	--	5		
1918021		Picloram	--			
		Total dust	--	10		
		Respirable fraction ^(m)	--	5		
88891	S	Picric acid; 2,4,6-trinitrophenol	--	0.1		
83261		Pindone; 2-pivalyl-1, 3-indandione		0.1		
142643		Piperazine dihydrochloride	--	5		
26499650		Plaster of Paris; calcium sulfate hemihydrate; see Particulates not otherwise regulated				
7440064		Platinum, metal	--	1		
		Platinum, soluble salts, as Pt	--	0.002		
		Polychlorobiphenyls, see Chlorodiphenyl				
		Polytetrafluoroethylene, decomposition products	--	(m)		
		Portland Cement; see Particulates not otherwise regulated				
1310583		Potassium hydroxide; caustic potash	--	2	C	
593293		Potassium stearate	--	10		
74986		Propane	1000	1800 ^(h)		
107197	S	Propargyl alcohol; 2-propyn-1-ol	1	2		
57578		beta-Propiolactone, see Section 5209	0.5	1.5		
79094		Propionic acid	10	30		
114261		Propoxur; 2-isopropoxyphenyl N-methyl carbamate		0.5		
109604		n-Propyl acetate	200	840	250	1050
71238	S	n-Propyl alcohol	200	500	250	625
115071		Propylene	(h)	--		
78875		Propylene dichloride; 1,2-dichloropropane	75	350	110	510
6423434	S	Propylene glycol dinitrate; PGDN	0.05	0.3		
107982	S	Propylene glycol monomethyl ether	100	360	150	540
108656	S	Propylene glycol monomethyl ether acetate	100	541	150	811
75558	S	Propyleneimine; 2-methylaziridine	2	5		
75569		Propylene oxide; 1,2-epoxy-propane	2	4.75		
627134		n-Propyl nitrate	25	107	40	170
74997		Propyne; see Methylacetylene				
8003347		Pyrethrum	--	5		
110861		Pyridine	5	15		
106514		Quinone	0.1	0.4		
121824		RDX; see Cyclonite				

108463		Resorcinol	10	45	20	90
7440166		Rhodium, metal	--	0.1		
		Insoluble compounds, as Rh	--	0.1		
		Soluble salts, as Rh	--	0.001		
299843		Ronnel; o,o-dimethyl o-(2,4,5-trichlorophenyl) phosphorothioite	--	10		
		Rosin core solder, pyrolysis products, as formaldehyde	--	0.1		
83794		Rotenone, commercial	--	5		
1309371		Rouge; see Particulates not otherwise regulated				
		Rubber solvent (Naphtha)	400	1,600		
		Selenium compounds, as Se	--	0.2		
7783791		Selenium hexafluoride	0.05	0.4		
136787		Sesone; sodium 2,4-dichloro-phenoxyethyl sulfate				
		Total dust	--	10		
		Respirable fraction ⁽ⁿ⁾	--	5		
61790532		Silica, amorphous				
		Diatomaceous earth				
		Total dust	--	6		
		Respirable fraction _(m)	--	3		
		Precipitated and gel	--	6		
		Silica, crystalline				
14464461		Cristobalite, respirable dust	--	0.05		
14808607		Quartz, respirable dust	--	0.1		
14808607		Quartz, total dust	--	0.3		
60676860		Silica, fused, respirable dust	--	0.1		
15468323		Tridymite, respirable dust	--	0.05		
1317959		Tripoli, respirable dust	--	0.1		
		Silicates (<1% crystalline silica)				
12001262		Mica (respirable dust)	--	3		
		Soapstone, total dust	--	6		
		Soapstone, respirable dust	--	3		
		Talc (containing asbestos); see Section 5208				
14807966		Talc (containing no asbestos fibers), respirable dust	--	2		
		Tremolite (containing no asbestos fibers), respirable dust	--	2		
7440213		Silicon; see Particulates not otherwise regulated				
409212		Silicon carbide; SiC; see Particulates not otherwise regulated				
7803625		Silicon tetrahydride; silane	5	7		
7440224		Silver metal, as Ag	--	0.01		
		Silver, soluble compounds, as Ag	--	0.01		
		Soapstone, see Silicates				
26628228	S	Sodium azide	0.1	0.3	C	
7631905		Sodium bisulfite	--	5		
136787		Sodium 2,4-dichlorophenoxyethyl sulfate; see Sesone				
62748	S	Sodium fluoroacetate	--	0.05		0.15
1310732		Sodium hydroxide; caustic soda	--	2	C	
7681574		Sodium metabisulfite	--	5		
822162		Sodium stearate	--	10		
9005258		Starch; see Particulates not otherwise regulated				
7789062		Strontium chromate, as Cr (see also Sections 1532.2, 5206 & 8359)	--	0.0005		
		Stearates; see specific compound				

7803523		Stibine; SbH ₃	0.1	0.5			
8052413		Stoddard solvent	100	525			
57249		Strychnine	--	0.15			
100425	S	Styrene (monomer); phenylethylene	50	215	500 ppm	100	425
9014011		Subtilisins (as pure crystalline proteolytic enzymes)	--				0.00006 ⁽⁹⁾
57501		Sucrose; see Particulates not otherwise regulated					
74222972		Sulfometuron methyl	--	3.5			
3689245	S	Sulfotep; tetraethyl dithionopyrophosphate		0.2			
7446095		Sulfur dioxide	2	5		5	10
2551624		Sulfur hexafluoride	1,000	6,000			
7664939		Sulfuric acid	--	1		--	3
10025679		Sulfur monochloride; S ₂ Cl ₂	1	6	C		
5714227		Sulfur pentafluoride; S ₂ F ₁₀	0.01	0.1	C		
7783600		Sulfur tetrafluoride	0.1	0.4	C		
2699798		Sulfuryl fluoride; SO ₂ F ₂	5	20		10	40
35400432		Sulprofos		1			
93765		2,4,5-T; 2,4,5-trichlorophenoxyacetic acid	--	10			
		Talc; see Silicates					
7440257		Tantalum metal dust, as Ta	--	5			
1314610		Tantalum oxide dust, as Ta	--	5			
78308		TCP; see Triorthocresyl phosphate					
584849		TDI; see Toluene-2,4-diisocyanate					
3689245	S	TEDP; see Sulfotep					
		Tellurium and compounds, as Te	--	0.1			
7783804		Tellurium hexafluoride	0.02	0.2			
3383968		Temphos; o,o,o',o'-tetramethyl o,o'-thiodi-p-phenylene phosphorothioate					
		Total dust	--	10			
		Respirable fraction ⁽ⁿ⁾	--	5			
107493	S	TEPP; tetraethyl pyrophosphate;	0.004	0.05			
100210		Terephthalic acid	--	10			
		Terphenyls	0.5	5	C		
79276		1,1,2,2-Tetrabromoethane; see Acetylene tetrabromide					
76119		1,1,1,2-Tetrachloro-2,2-difluoroethane	500	4170			
76120		1,1,2,2-Tetrachloro-1,2-difluoroethane; fluorocarbon 112	500	4,170			
79345	S	1,1,2,2-Tetrachloroethane; acetylene tetrachloride	1	7			
127184		Tetrachloroethylene; see Perchloroethylene					
56235		Tetrachloromethane; see Carbon tetrachloride					
1335882	S	Tetrachloronaphthalene	--	2			
3689245		Tetraethyl dithionopyrophosphate; see Sulfotep					
78002	S	Tetraethyl lead; tetraethylplumbane, as Pb	--	0.075			
107493		Tetraethyl pyrophosphate; see TEPP					
109999		Tetrahydrofuran	200	590		250	735
75741	S	Tetramethyl lead; tetramethylplumbane, as Pb	--	0.075			
115775		Tetramethylolmethane; see Pentaerythritol					
3333526	S	Tetramethyl succinonitrile (decomposition product of 2,2'-azobisisobutyronitrile)	0.5	3			
137268		Tetramethyl thiuram disulfide, see Thiram					
509148		Tetranitromethane	0.005	0.04			
7722885		Tetrasodium pyrophosphate	--	5			
479458	S	Tetryl; 2,4,6-trinitrophenylmethylnitramine	--	1.5			
	S	Thallium, soluble compounds, as Tl	--	0.1			

109999		THF; see Tetrahydrofuran						
96695		4,4'-Thiobis(6-tert-butyl-m-cresol)	--					
		Total dust	--	10				
		Respirable fraction ⁽ⁿ⁾	--	5				
68111	S	Thioglycolic acid	1	3.8				
7719097		Thionyl chloride	1	5		C		
137268		Thiram; bis(dimethylthiocarbamoyl) disulfide	--	5				
	S	Tin, organic compounds, as Sn	--	0.1			--	0.2
21651194		Tin, tin oxide and inorganic compounds, except SnH ₄ , as Sn	--	2				
13463677		Titanium dioxide, as Ti; see Particulates not otherwise regulated						
137268		TMTD; see Thiram						
118967		TNT; see 2,4,6-Trinitrotoluene						
108883	S	Toluene; toluol	50	188		500 ppm	150	560
584849		Toluene-2,4-diisocyanate; TDI	0.005	0.04		0.02 ppm	0.02	0.15
108441	S	m-Toluidine	2	9				
95534	S	o-Toluidine; o-methylaniline	2	9				
106490	S	p-Toluidine	2	9				
8001352		Toxaphene; see Chlorinated camphene						
115866		TPP; see Triphenyl phosphate						
		Tremolite, nonasbestiform; see Silicates						
75252		Tribromomethane; see Bromoform						
126738		Tributyl phosphate	0.2	2.5				
76039		Trichloroacetic acid	1	5				
120821		1,2,4-Trichlorobenzene	5	40		C		
50293		1,1,1,-Trichloro-2,2-bis(p-chlorophenyl)ethane; see DDT						
71556		1,1,1-Trichloroethane; see Methyl chloroform						
79005	S	1,1,2-Trichloroethane	10	45				
79016		Trichloroethylene; trichloroethene	25	135		300 ppm	100	537
75694		Trichlorofluoromethane; Fluorocarbon 11	1,000	5,600		C		
67663		Trichloromethane; see Chloroform						
594423		Trichloromethanethiol; see Perchloromethyl mercaptan						
1321659	S	Trichloronaphthalene	--	5				
76062		Trichloronitromethane; see Chloropicrin						
93765		2,4,5-Trichlorophenoxyacetic acid see 2,4,5-T						
96184		1,2,3-Trichloropropane	10	60				
76131		1,1,2-Trichloro-1,2,2- trifluoroethane	1000	7600		2000 ppm	1250	9500
78308		Tricresyl phosphate; see Triorthocresyl phosphate						
13121705		Tricyclohexyltin hydroxide; see Cyhexatin						
102716		Triethanolamine	--	5				
121448	S	Triethylamine	1	4.1		C		
112492	S	Triethylene glycol dimethyl ether, Triglyme	5	36				
75638		Trifluorobromomethane	1,000	6,100				
2451629		1,3,5-Triglycidyl-s-triazinetriene		0.005				
552307		Trimellitic anhydride	0.005	0.04		C		
75503		Trimethylamine	5	12			15	36
		Trimethylbenzene, all isomers	25	125				
121459		Trimethyl phosphite	2	10				
88891		2,4,6-Trinitrophenol; see Picric acid						
479458		2,4,6-Trinitrophenylmethyl nitramine; see Tetryl						

118967	S	2,4,6-Trinitrotoluene; TNT	--	0.5			
78308	S	Triorthocresyl phosphate	--	0.1			
603349		Triphenylamine	--	5			
115866	S	Triphenyl phosphate; TPP	--	3			
7440337		Tungsten metal, as W	--	5			
		Tungsten, insoluble compounds, as W	--	5	--		10
		Tungsten, soluble compounds, as W	--	1	--		3
8006642		Turpentine	100	560			
		Uranium (natural), insoluble compounds, as U	--	0.2	--		0.6
		Uranium (natural), soluble compounds, as U	--	0.05			
110623		Valeraldehyde	50	175			
1314621		Vanadium pentoxide (V ₂ O ₅), respirable dust and fume	--	0.05 ⁽ⁿ⁾			
75014	S	VC; see Vinyl chloride, Section 5210					
		Vegetable oil mists (except castor, cashew nut or similar irritant oils); see Particulates not otherwise regulated					
108054		Vinyl acetate	10	30		15	45
100425		Vinylbenzene; see Styrene					
593602		Vinyl bromide; bromoethylene	5	20			
75014	S	Vinyl chloride, see Section 5210	1				
107131	S	Vinyl cyanide, see Acrylonitrile, Section 5213					
100403	S	4-Vinyl cyclohexene	0.1	0.4			
106876	S	Vinyl cyclohexene dioxide	0.1	0.57			
75354		Vinylidene chloride; 1,1-dichloroethylene	1	4			
75387		Vinylidene fluoride	100	262			
25013154		Vinyltoluene	50	240			
8030306		VM & P (Varnish Makers and Painters) Naphtha	300	1,350		400	1800
81812		Warfarin; 3-(alpha-acetonyl-benzyl)-4-hydroxycoumarin	--	0.1			
		Welding fumes; total particulates (see also individual constituents)	--	5			
		Wood dust	--				
		All soft and hard woods, except Western red cedar	--	5	--		10
		Wood dust, Western red cedar--	--	2.5			
1330207		Xylene; xylol; dimethylbenzene	100	435	300 ppm	150	655
1477550	S	m-Xylene-a,a'-diamine	--	0.1	C		
1300738	S	Xylidine; aminodimethylbenzene	0.5	2.5			
		Yttrium compounds, as Y	--	1			
7646857		Zinc chloride fume	--	1		--	2
13530659		Zinc chromate, as Cr (see also Sections 1532.2, 5206 & 8359)	--	0.005			
15930946		Zinc chromate hydroxide, as Cr (see also Sections 1532.2, 5206 & 8359)	--	0.005			
1314132		Zinc oxide fume	--	5		--	10
		Zinc oxide dust, see Particulates not otherwise regulated					
11103869		Zinc potassium chromate, as Cr (see also Sections 1532.2, 5206 & 8359)	--	0.005			
557051		Zinc stearate	--	10			
37300235		Zinc yellow, as Cr (see also Sections 1532.2, 5206 & 8359)	--	0.005			
		Zirconium compounds, as Zr	--	5		--	10

S

Footnotes to Table AC-1

(a) The Chemical Abstracts Service Registry Number is a designation used to identify a specific compound or substance regardless of the naming system; these numbers were obtained from the Desk Top Analysis Tool for the Common Data Base and from the Chemical Abstracts Indexes.

(b) Refer to section 5155(d) for the significance of the Skin notation.

(c) Trade Names Removed from Table AC-1.

Trade Name	Chemical/Generic Name
Abate	see Temephos
Ammate	see Ammonium Sulfamate
Aqualin	see Acrolein
Arasan	see Thiram
Azodrin	see Moncrotophos
Baygon	see Propoxur
Bidrin	see Dicrotophos
Butyl Cellosolve	see 2-Butoxyethanol
Cellosolve	see 2-Ethoxyethanol
Cellosolve Acetate	see 2-Ethoxyethyl acetate
Compound 1080	see Sodium Fluoracetate
Coyden	see Clopidol
Crag Herbicide	see Sesone
Cythion	see Malathion
Dasanit	see Fensulfothion
Delnav	see Dioxathion
Dibrom	see Naled
Difolatan	see Captafol
Disyston	see Disulfoton
Dowtherm A	see Phenylether and Biphenyl
Dursban	see Chloropyrifos
Dyfonate	see Fonofos
Fermate	see Ferbam
Freons	see Fluorocarbons
Furadan	see Carbofuran
Guthion	see Azinphos Methyl
Korlan	see Ronnel
Lannate	see Methomyl
Mariate	see Methoxychlor
MLT	see Malathion
Moxie	see Methoxychlor
Nialate	see Ethion
Nankor	see Ronnel
Phosdrin	see Mevinphos
Pival	see Pindone
Plictran	see Cyhexatin
Santobrite	see Pentachlorophenol
Sevin	see Carbaryl
Systox	see Demeton
Teflon	see Polytetrafluoroethylene
Thimet	see Phorate
Thiodan	see Endosulfan
Tordon	see Picloram
Trolene	see Ronnel
Vapona	see Dichlorvos
Weedone 638	see 2, 4-D
Zoalene	see Dinitolmide

(d) For the definition and the application of the Permissible Exposure Limit (PEL), refer to section 5155(b) and (c)(1).

(e) Parts of gas or vapor per million parts of air by volume at 25oC and 760mm Hg pressure.

(f) Milligrams of substance per cubic meter of air at 25°C and 760mm Hg pressure.

(g) Refer to section 5155(b) and (c)(3) for the significance of the Ceiling notation. A "C" notation in this column means the values given in the PEL columns are ceiling values. A numerical entry in this column represents a ceiling value in addition to the TWA values.

(h) A number of gases and vapors, when present in high concentrations, act primarily as asphyxiants without other adverse effects. A concentration limit is not included for each material because the limiting factor is the available oxygen. (Several of these materials present fire or explosion hazards.)

(i) Coal tar pitch volatiles (benzene or cyclohexane-soluble fraction) include fused polycyclic hydrocarbons (some of which are known carcinogens) which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the "coal tar pitch volatiles" standard.

(j) This standard applies to the cotton waste processing operations of waste recycling (sorting, blending, cleaning, and willowing) and ginning. It does not apply to cotton gins, cottonseed oil industry, or operations covered by section 5190.

(k) A PEL of 0.05 ppm shall apply to exposures involving a mixture of ethylene glycol dinitrate and nitroglycerin.

(l) As sampled by method that does not collect vapor.

(m) Thermal decomposition of the fluorocarbon chain in air leads to the formation of oxidized products containing carbon, fluorine and oxygen. An index of exposure to these products is possible through their alkaline hydrolysis followed by a quantitative determination of fluoride content. No particular concentration limit is specified pending evaluation of the toxicity of the products but concentrations shall be kept below the sensitivity of the analytical method.

(n) The concentration and percentage of the particulate used for this limit are determined from the fraction passing a size selector with the following characteristics:

<i>Aerodynamic Diameter in Micrometers (unit density sphere)</i>	<i>Percent Passing Selector</i>
≤ 2	90
2.5	75
3.5	50
5.0	25
10	0

Source: American Conference of Governmental Industrial Hygienists TLV Committee 1968 Proceedings.

(o) Refer to sections 5155(b) and (c)(2) for the definition and application of the Short Term Exposure Limit (STEL).

(p) (Reserved)

(q) Fibers per cubic centimeter of air at 25°C and 760mm Hg pressure. To be considered a fiber for this limit the glass particle must be longer than 5µm, have a length to diameter ratio of three or more, and have a diameter less than 3µm. The National Institute for Occupational Safety and Health (NIOSH), Method 7400, Issue 2, August 15, 1994, which is hereby incorporated by reference, shall be used for measuring airborne fiber concentrations.

(r) Compliance with the subtilisins PEL is assessed by sampling with a high volume sampler (600-800 liters per minute) for at least 60 minutes.

(s) The concentration and percentage of the particulate used for this limit are determined from the fraction passing a size selector with the following characteristics:

<i>Aerodynamic Diameter in Micrometers (unit density sphere)</i>	<i>Percent Passing Selector</i>
0	100
1	97
2	94
5	87
10	77
20	65
30	58
40	54.5
50	52.2
100	50

(t) Glutaraldehyde can cause occupational asthma and skin sensitization responses such as contact dermatitis. Exposure related symptoms may include one or more of the following: shortness of breath, chest tightness, wheeze, cough, skin rash, hives, and irritation of the nose, throat, skin or eye. Hazard communication training required by sections 5191 or 5194 shall address these health hazards and symptoms along with the measures taken by the employer to evaluate and control exposures that can include medical evaluations, exposure monitoring, ventilation systems, work practices, and personal protective equipment. The communication system required by section 3203 shall inform employees where to report possible health symptoms and where to ask questions, report concerns, and receive information about the employer's evaluation and control measures.

The following guide is a general guide for glove selection in relation to chemicals handled. The information presented here is believed to be accurate; however, we cannot guarantee its accuracy. Many factors affect the breakthrough times of glove materials including, but not limited to:

1. Thickness of glove material
2. Concentration of the chemical worked with
3. Amount of chemical the glove comes in contact with
4. Length of time which the glove is exposed to the chemical
5. Temperature at which the work is done
6. Possibility of abrasion or puncture.

Some Common Sense Rules for Glove Use

- Select gloves which are resistant to the chemicals you may be exposed to. Consult the relevant Material Safety Data Sheet (MSDS) which may recommend a particular glove material.
- Select gloves of the correct size and fitting; gloves that are too small are uncomfortable and may tear whereas overlarge gloves may interfere with dexterity. In some cases, such as use of HF, it may be advisable to select gloves that can be removed very rapidly in an emergency.
- Before use, check gloves (even new ones) for physical damage such as tears or pin holes and for previous chemical damage: this is especially important when dealing with dangerous materials such as HF.
- When working, it may be advisable to wash the external surface of the gloves frequently with water.
- Some gloves, especially lightweight disposables, may be flammable: keep hands well away from naked flames or other high temperature heat sources.
- When removing gloves, do so in a way that avoids the contaminated exterior contacting the skin.
- Wash hands after removing gloves.
- Dispose of contaminated gloves properly.
- Do not attempt to re-use disposable gloves.
- Never wear possibly contaminated gloves outside of the laboratory or to handle telephones, computer keyboards, *etc.*

This information is provided as a guide to proper glove material selection. Glove performance varies between manufacturers, so always give yourself extra time and do not push glove strength to the estimated limits and consult a certified safety consultant when in doubt to make sure you have the right glove for your application.

Selection Key:

- | | |
|---|---|
| 4 | Excellent, breakthrough times generally greater than 8 hours. |
| 3 | Good, breakthrough times generally greater than 4 hours. |
| 2 | Fair, breakthrough times generally greater than 1 hour. |

- 1** Not Recommended, breakthrough times generally less than 1 hour.
- ?** Not Tested or Information unknown. Use known tested glove type.

GLOVE SELECTION GUIDE

Source: <http://www.allsafetyproducts.biz/site/323655/page/74172>

	Natural Rubber	Neoprene	Butyl	PVC	Nitrile	Viton®
Chemical						
Organic Acids						
Acetic acid	2	3	4	2	1	4
Formic acid	2	3	4	3	2	2
Lactic Acid	4	4	4	3	4	4
Maleic acid	3	3	2	3	3	4
Oxalic acid	4	4	4	4	4	4
	Natural Rubber	Neoprene	Butyl	PVC	Nitrile	Viton®
Inorganic acids						
Chromic acid up to 70%	1	1	4	3	3	4
Hydrochloric acid up to	3	3	4	3	3	3

37%						
Hydrofluoric acid up to 70%	2	2	3	1	1	?
Nitric acid 70+ %	?	1	2	?	1	4
Perchloric acid up to 70%	4	4	3	4	4	4
Phosphoric acid 70+ %	4	4	4	4	4	4
Sulfuric acid 70+ %	1	2	4	2	1	2
	Natural Rubber	Neoprene	Butyl	PVC	Nitrile	Viton®
Alkalis						
Ammonium hydroxide up to 70%	1	3	4	2	3	?
Potassium hydroxide up to 70%	4	4	4	4	4	4
Sodium hydroxide 70+ %	4	4	4	4	3	3
	Natural Rubber	Neorene	Butyl	PVC	Nitrile	Viton®
Salt Solutions						
Ammonium nitrate	4	4	4	4	4	4
Calcium hypochlorite	1	3	4	4	3	4
Ferric chloride	4	4	4	4	4	4

Mercuric chloride	3	3	4	3	3	4
Potassium cyanide	4	4	4	4	4	4
Potassium dichromate	4	4	4	4	4	4
Potassium permanganate	4	4	?	4	4	?
Sodium cyanide	4	4	4	4	4	4
Sodium thiosulfate	4	4	4	4	4	4
	Natural Rubber	Neoprene	Butyl	PVC	Nitrile	Viton®
Aromatic hydrocarbons						
Benzene	1	1	1	1	1	3
Gasoline	1	1	1	1	4	4
Naphthalene	1	1	1	1	4	4
Toluene	1	1	1	1	1	4
Xylene	1	1	1	1	1	4
	Natural Rubber	Neoprene	Butyl	PVC	Nitrile	Viton®
Aliphatic hydrocarbons						
Diesel fuel	1	2	1	2	3	4

Hexanes	1	1	1	1	4	4
Kerosene	1	3	1	3	4	4
Naphtha	1	2	1	3	4	4
Pentane	1	1	1	1	3	4
Petroleum ether	1	1	1	2	3	4
Turpentine	1	1	1	1	2	4
	Natural Rubber	Neoprene	Butyl	PVC	Nitrile	Viton®
Halogenated hydrocarbons						
Carbon tetrachloride	1	1	1	1	1	4
Chloroform	1	1	1	1	1	4
Methylene chloride	1	1	1	1	2	3
Polychlorinated biphenyls (PCB's)	1	4	4	?	2	4
Perchloroethylene	1	1	1	1	2	4
Trichloroethylene	1	1	1	1	1	4
	Natural Rubber	Neoprene	Butyl	PVC	Nitrile	Viton®
Esters						

Ethyl acetate	1	1	3	1	1	1
Butyl acetate	1	1	2	1	1	1
Methyl acetate	1	1	4	1	1	1
Isobutyl acrylate	1	1	4	1	1	1
	Natural Rubber	Neoprene	Butyl	PVC	Nitrile	Viton®
Ethers/Glycols						
Diethyl ether	1	2	1	1	2	1
Ethylene glycol	1	2	4	1	2	4
Isopropyl ether	1	2	1	1	3	1
Propylene glycol	?	3	3	2	2	?
Tetrahydrofuran	1	1	2	1	1	1
	Natural Rubber	Neoprene	Butyl	PVC	Nitrile	Viton®
Aldehydes						
Acetaldehyde	1	1	4	1	1	1
Acrolein	1	1	4	1	1	1
Benzaldehyde	1	1	4	1	1	3
Butyraldehyde	1	1	4	1	1	1

Formaldehyde	1	2	4	2	4	4
Glutaraldehyde	?	4	4	2	?	4
	Natural Rubber	Neoprene	Butyl	PVC	Nitrile	Viton®
Ketones						
Acetone	1	1	4	1	1	1
Diisobutyl ketone	1	1	2	1	1	2
Methyl ethyl ketone	1	1	4	1	1	1
	Natural Rubber	Neoprene	Butyl	PVC	Nitrile	Viton®
Alcohols						
Allyl alcohol	1	1	4	1	4	3
Butyl alcohol	1	3	4	2	3	4
Ethyl alcohol	1	2	4	1	3	4
Isopropyl alcohol	1	3	4	2	4	4
Methyl alcohol	1	1	4	1	1	4
	Natural Rubber	Neoprene	Butyl	PVC	Nitrile	Viton®

Amines						
Aniline	1	1	4	1	1	2
Ethanolamine	2	4	4	3	4	4
Ethylamine	1	2	4	1	1	1
Methylamine	1	3	4	2	4	4
Triethanolamine	1	1	4	1	4	4
	Natural Rubber	Neoprene	Butyl	PVC	Nitrile	Viton®
Elements						
Bromine	1	2	1	?	1	4
Chlorine aqueous	?	1	2	?	1	4
Iodine	?	1	3	?	3	4
Mercury	?	4	4	?	4	4
	Natural Rubber	Neoprene	Butyl	PVC	Nitrile	Viton®
Miscellaneous						
Acetic anhydride	1	2	4	1	1	1
Acetonitrile	1	1	4	1	1	1
Acrylamide	1	1	3	1	2	3

Carbon disulfide	1	1	1	1	1	4
Cresols	1	3	4	?	2	4
Cutting fluid	?	2	?	2	3	?
Dimethyl sulfoxide	1	4	4	1	1	1
Hydraulic oil	?	?	1	2	3	?
Hydrazine	2	4	4	4	4	1
Hydrogen Peroxide	4	2	4	3	4	4
Lubricating oil	3	3	?	?	4	3
Malathion	?	3	1	?	3	?
Nitrobenzene	1	1	4	1	1	4
Phenol	1	3	2	1	1	4
Photo solutions	3	4	?	3	4	?
Picric acid	1	2	3	1	2	4
Pyridine	1	1	4	1	1	1

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