KAISER PERMANENTE
CHEMICAL HYGIENE PLAN FOR
THE COLORADO REGION LABORATORIES
(revised December 2012)

TABLE OF CONTENTS

FOREWARD

The Occupational Safety and Health Administration (OSHA) disseminated a final rule on January 31, 1990 and updated it on February 9, 1994, relating to occupational exposure to hazardous chemicals in the laboratory (Lab Standard). The basis for this standard is that laboratories typically differ from industrial operations in their use and handling of hazardous chemicals and that a different approach from the Hazard Communication Standard of 1987 is warranted. OSHA proposed the Standard, "Occupational Exposures to Hazardous Chemicals in Laboratories", commonly called the Laboratory Standard. The Standard was originally published in the Federal Register on January 31, 1990 as CFR 29 1910, Subpart Z, subsection 1910.1450.

The final rule applies to all laboratories that use hazardous chemicals in accordance with the definition of laboratory use and laboratory scale (see Glossary, Section III) provided in the standard.

The effective date of this standard was May 1, 1990, and all Chemical Hygiene Plans are to be developed and implemented by January 31, 1991, in accordance with 29 CFR Part 1910.1450 of the Federal Register.

FORMAL POLICY STATEMENT

The Kaiser Foundation Health Plan of Colorado and its laboratories are committed to providing a safe working environment for employees and believe that employees have the right to know about health hazards associated with their work. So that employees can make knowledgeable decisions about any personal risks of employment, this Chemical Hygiene Plan (CHP) includes policies, procedures, and responsibilities designed to develop in employees the awareness of potential hazardous chemicals in the workplace and to train employees in appropriate and safe work practices. The CHP will be readily available to employees, employee representatives and, upon request, the Assistant Secretary of Labor.

It is important that both employers and employees assume responsibility for laboratory safety. All employees will have access to pertinent safety information through their supervisory staff, regional training programs, the Chemical Hygiene Plan, the Laboratory Infection Control Plan, the Formaldehyde Exposure Plan and any other document which discusses laboratory safety. When safety concerns arise, employees are encouraged to contact their supervisor and/or Workplace Health and Safety.

PURPOSE

The purpose of the Chemical Hygiene Plan (CHP) is to provide employees with information and training necessary for the safe handling, use and storage of hazardous chemicals in the laboratory. The CHP is designed and implemented in accordance with OSHA's standard, "Occupational Exposure to Hazardous Chemicals in the Laboratory" (29 CFR 1910.1450).

RESPONSIBILITIES

1. **Regional Reference Laboratory Director and Medical Office Laboratory Director** are responsible for implementation of the CHP in each facility laboratory and are involved in the selection and appointment of personnel who support the implementation of the CHP.

2. **Laboratory QA and Compliance Manager** is responsible for ensuring the CHP is updated every two years and posted to the laboratory website. Provides communication to all laboratory staff once the CHP is updated.

3. **Laboratory Managers and Supervisors** are responsible for overseeing implementation of the CHP in the facility laboratory they manage.

4. **Clinical Managers/Supervisors** are responsible for implementing, monitoring and enforcing the CHP within their designated area. Their responsibilities include the following:

    - Ensures safety training is provided to employees when new chemicals and/or new equipment utilizing chemicals are introduced into the laboratory within their designated area.
    - Ensure that training is provided to each employee upon hire and at least annually thereafter within their designated area.
    - Assures that the plan is available and that changes/additions/corrections to the Chemical Hygiene Plan (CHP) are made and communicated in a timely manner.
    - Provides technical assistance in complying with the CHP.
    - Monitors procurement of new chemicals (each lab area responsible for this)
    - Monitors collection and disposal of chemical wastes (each lab area responsible for this)
    - Remains current on new policies, procedures and related safety information as presented in meetings, in memoranda and other formal communication processes.
    - Ensures that appropriate personal protection equipment (PPE) is available as needed.
    - Ensures protective equipment, i.e., fume hoods, is properly maintained.
    - Ensures employees receive proper chemical hygiene and housekeeping instructions including department specific information
    - Ensures the location/dept Chemical Inventory is updated whenever a new reagent is added
    - Ensures that a current chemical inventory and Material Safety Data Sheets (MSDS/SDS) are maintained and available for each work area.

- Directs overexposure complaints to Workplace, Health and Safety (WH&S). Conditions indicative of a potential employee overexposure include, but are not limited to, the following:
    - Appearance of signs/symptoms consistent with overexposure to a particular hazardous chemical used in the laboratory
    - Results of monitoring which indicate exposures greater than the Permissible Exposure Limit (PEL)
    - The occurrence of a spill or other uncontrolled release of a hazardous chemical within the laboratory.

5. **Workplace Health and Safety** is responsible for communicating new federal/state regulations and policies pertaining to hazardous materials to the Colorado Laboratory.

   In addition Workplace, Health and Safety will:
   - Help managers/supervisors maintain a current Material Safety Data Sheet (MSDS/SDS) file by providing assistance with identifying hazardous chemicals to include in the department chemical inventory and obtaining appropriate MSDS/SDS.
   - Assist the purchasing department with efforts to:
     - ✓ Decrease the current stock of hazardous chemicals in the region through the substitution of less hazardous products when appropriate;
     - ✓ Evaluate new hazardous chemical purchases for approval.
   - Investigate hazardous material incidents, potential overexposure, engineering and/or administrative controls
   - Assist managers/supervisors in determining the appropriate level of Personal Protective Equipment (PPE) to be worn, and procedures for chemical spills.
   - Audit compliance with individual requirements of the CHP

6. **Material Management/Purchasing** routinely place product orders for the region. The Purchasing department will train facility buyers/receiving clerks on the current requirements for receiving chemicals into Kaiser Permanente facilities and provide annual hazardous waste training. Regionally, Kaiser Permanente continues to minimize the assortment and volumes of hazardous chemicals kept on hand. A current MSDS/SDS must accompany all chemical shipments.

7. **The Facility Buyer** will place orders, receive and distribute product deliveries. To meet current requirements, the facility buyer will:

   - Check for the Material Safety Data Sheets with each shipment of chemical products and distribute copies to the appropriate manager/supervisors
   - Notify the manager/supervisor that receives the chemical when an MSDS/SDS is NOT included with the chemical shipment.
   - Immediately notify the manager/supervisor who ordered the chemical and WH&S whenever there is any concern that a chemical is leaking or that a chemical is improperly packaged.

8. **Laboratory employees** are responsible for adhering to the CHP, thereby ensuring their own safety and the safety of others within the laboratory. Employees are responsible for the following:

    - Reviewing the CHP initially upon hire and annually thereafter.
    - Complying with safety policies.
    - Implementing appropriate chemical hygiene habits.
    - Completing regional, facility and laboratory safety training programs as required.
    - Reporting safety issues to the Laboratory Manager/Supervisor.
    - Reporting potential chemical spills and/or overexposure issues to the manager/supervisor.
    - Filling out the online Spill Report

GENERAL LAB SAFETY OPERATING PROCEDURES

Because few laboratory chemicals are without hazards, general precautions, which minimize exposure, should be adopted for all laboratory chemicals. General principles for working with chemicals include:

• Avoid skin contact with chemicals.
• Few chemicals are without hazard, handle all with care; follow specific precautions where they exist.
• Assume that any mixture will be more toxic than its most toxic component and that all substances of unknown toxicity are toxic.
• Employ safe work practices at all times.
• Wear a lab coat at all times and other PPE as necessary. Remove lab coat and other PPE when leaving the laboratory work area.
• Avoid unnecessary exposure to chemicals.
• Do not smell or taste chemicals. Apparatus that can discharge toxic chemicals (vacuum pumps, distillation columns, etc.) should be vented into the local exhaust devices.
• Use only those chemicals for which the quality of the available ventilation system is appropriate.
• Eating, drinking, smoking, gum chewing or applying cosmetics or lip balm is prohibited in the laboratory. Do not chew fingernails or put writing tools (pens and/or pencils) in the mouth. Keep hands away from mouth, nose, eyes, and face.
• Remove PPE and wash hands when leaving the laboratory and before eating, drinking, or engaging in any non-laboratory activity.
• Avoid storing, handling or consuming food or beverages in storage areas; do not place food or drink in refrigerators, glassware, or utensils that are also used for laboratory operations.
• Handle and store laboratory glassware with care to avoid damage; do not use damaged glassware. Use equipment only for its designed purpose.
• Wash areas of exposed skin thoroughly before leaving the laboratory.

• Use a bulb or pipetting device. **Never** mouth pipette under any circumstances.
• Wear hair in such a manner that it does not interfere with vision, is not contaminated by laboratory surfaces, and will not be caught in instruments or machines. Long neck chains are not safe or permitted. Do not wear loose clothing.
• Wear shoes that protect the feet from spills or slips. No open toed shoes or sandals are permitted in the laboratory.
• Keep the work area clean and uncluttered, with chemicals and equipment properly labeled and stored; clean up the work area on completion of an operation or at the end of each day.
• Wear gloves when working with specimens, drawing patient's blood, handling reagents and handling instruments exposed to chemical and/or biological hazards.
• Select the appropriate glove for protection against specific chemical/biological hazards in your area. After removing gloves, wash hands with soap and water.
• Wear appropriate gloves when the potential for contact with toxic materials exists; inspect the gloves before each use, and replace them periodically.
• Use PPE and emergency apparel and equipment as appropriate.
• Wearing contact lenses is discouraged. Contact lenses are not to be worn when handling chemicals which can damage the eye either through splashing or by contact with vapors. Soft contact lenses absorb chemicals, especially vapors, and can cause injury to the eye.
• Wear eye protection appropriate for the activity as in areas where chemicals are being used, stored or handled.
• Remove laboratory coats and other PPE immediately upon significant contamination.
• Seek information and advice about hazards, plan appropriate protective procedures, and plan positioning of equipment before beginning any new operation.
• Leave light on, place an appropriate sign on the door, and provide for containment of toxic substances in the event of failure of a utility service (such as cooling water) in an unattended operation.
• Use a hood for all operations involving chemicals, which may present health hazards due to airborne contamination. Confirm and document adequate hood performance before use. Do not use hoods with sash open wider than certified. Keep materials stored in hoods to a minimum, and do not allow materials to block vents airflow. (Using hood does not mean that personal protection equipment is not required)
• Leave hood "on" if toxic substances are stored in it or if it is uncertain whether adequate general laboratory ventilation will be maintained when it is "off".
• If using open flame, use only in area where there is no danger of contact with flammable chemicals.
• Be alert for the presence of unsafe conditions and see that they are corrected when detected. Document any unusual occurrences with the CHO or designee in your area.
• Do not combine chemicals without knowing their compatibility.

GENERAL CHEMICAL SAFETY

Chemical Hazards are often classified on MSDS/SDS as ignitable, corrosive, toxic, carcinogenic or explosive. Acids or alkalis may have more than one of these characteristics. Safety rules for the use of the chemical may vary depending on its classification. Information on hazards for each chemical may be found in the Material Safety Data Sheets.

Hazardous Material Classification

1. **Chemical Inventory**
   The responsibility for determining whether a chemical is hazardous lies with the chemical manufacturer or importer of a chemical. As a user of chemicals, you may rely on the evaluation received from these suppliers through labels on containers and the MSDS/SDS. To prepare a list of chemicals in your department that are covered by the standard, walk through and write down the names of chemicals in your department that have a label indicating a potential hazard. This is an excellent opportunity to eliminate chemicals that are no longer needed or used. Contact the WH&S department for assistance with chemical disposal. **Keep this list current**. Whenever a chemical is added to or removed from the department, make the appropriate changes to the location/department chemical inventory list. **Review the chemical inventory list annually** with appropriate notations if no changes have been made.

   Chemicals considered to be hazardous include, but are not limited to those chemicals:
   - Regulated by OSHA in 29 CFR 1910.1000, Air Contaminants, Table Z-1
   - Found to be suspected or confirmed carcinogens by the National Toxicology Program or by the International Agency for Research on Cancer 29 CFR 1910.1003.

2. **Container Labeling**
   A. **Primary Container Labeling (Original Containers)**
   29 CFR 1910.1450 contains specific labeling requirements. Original containers received directly from the manufacturer must include a container label indicating the following information:
   - **Identity** of the hazardous chemical(s);
   - Appropriate **hazard warnings**, including target organ effects of the hazardous chemical;
   - **Name and address** of the chemical manufacturer, importer, or other responsible party.

   The original label on a container should never be removed or defaced. Materials that are received, delivered, used, and disposed of in the original containers usually pose no labeling problems and meet OSHA's labeling requirements.

   NOTE: Primary containers require a secondary label if the original label is damaged, absent, inadequate and/or unreadable.

B. Secondary Container Labeling (Employer Containers)

A container must indicate the appropriate hazard warnings when a chemical is transferred from a primary container to a secondary container. The label on the secondary container must contain:

- The name of the chemical (same name as on the MSDS/SDS);
- The appropriate hazard rating/warning.

The secondary container label provides a space to write in the chemical name and indicate the specific health hazard/s, physical hazard/s and target organs and effects. The label may also include special waste handling information. An example of a completed secondary container label is shown below.

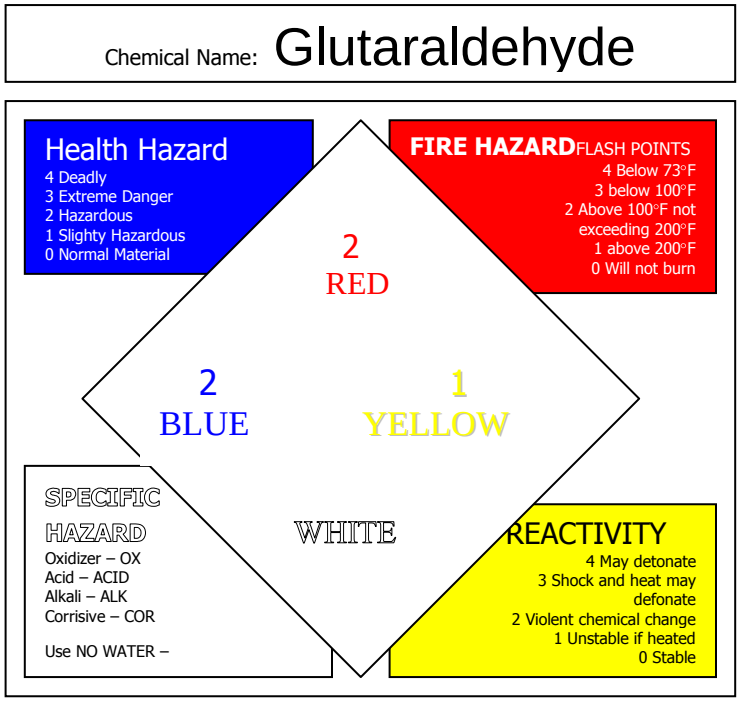
An alternative labeling system is the National Fire Protection Association's (NFPA) 704M Hazard Identification System which uses color, numbers and other information to convey the hazards of a chemical. An example of a completed NFPA label is shown below. The NFPA labeling system assigns a hazard rating of 0-4 for:

- health (blue)
- flammability (red)
- reactivity (yellow)
- special category (white)

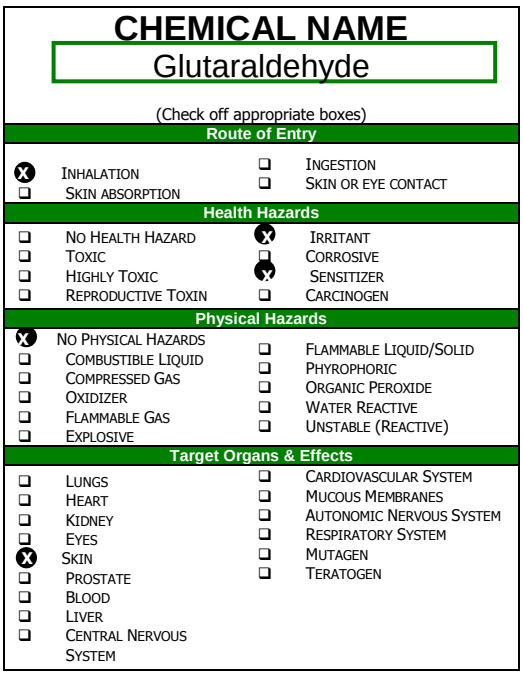
A hazard rating of:

- 3 or 4 can cause permanent health damage
- 1 or 2 can cause temporary health effects
- 0 presents no health danger

NFPA LABEL



SECONDARY LABEL



C. Portable Container Labeling

Working solutions in containers such as flasks or beakers may have a general label only provided the contents are for the single use of the person transferring the chemical into it and the contents are discarded at the conclusion of the operations. The user is responsible for the contents of the containers and it must be under the control of the user at all times.

3. Signage

Prominent signs must be posted for the following services and equipment:

- Location of fire alarm boxes, emergency eye wash stations, fire extinguishers, spill kits, and other safety equipment.
- Exit signs.
- Emergency escape routes.
- Cabinets with flammable or caustic chemicals.
- Emergency telephone numbers and information can be found in the Emergency Occurrence Flip Chart.
- Refrigerators and freezers should be labeled stating that food and beverages cannot be stored within.
- Contents of containers, including waste receptacles and associated hazards.
- Required types of PPE for work area

4. Material Safety Data Sheets

The material safety data sheet (MSDS/SDS) is used to communicate chemical hazard information on a chemical product from the manufacturer to the employee. The MSDS/SDS contains information for identifying hazardous ingredients, recognizing hazards of a material, precautions for safe handling and emergency procedures. The employer is required to have an MSDS/SDS for each hazardous chemical product used in the workplace and ensure MSDS/SDSs are readily accessible to employees during their work shift. For the Colorado Laboratories, the MSDS/SDS sheets are available on the laboratory website.

An MSDS/SDS is required for the following chemicals:

- For any hazardous chemical known to be present in the workplace to which employees may be exposed.
- Chemicals listed as physical hazards – corrosive, ignitable, reactive, etc. (example: glacial acetic acid, potassium hydroxide, trichloroacetic acid).
- Chemicals listed as health hazards – toxics, carcinogens, sensitizers, skin absorbers (example: methanol, formaldehyde, phenol, chloroform).

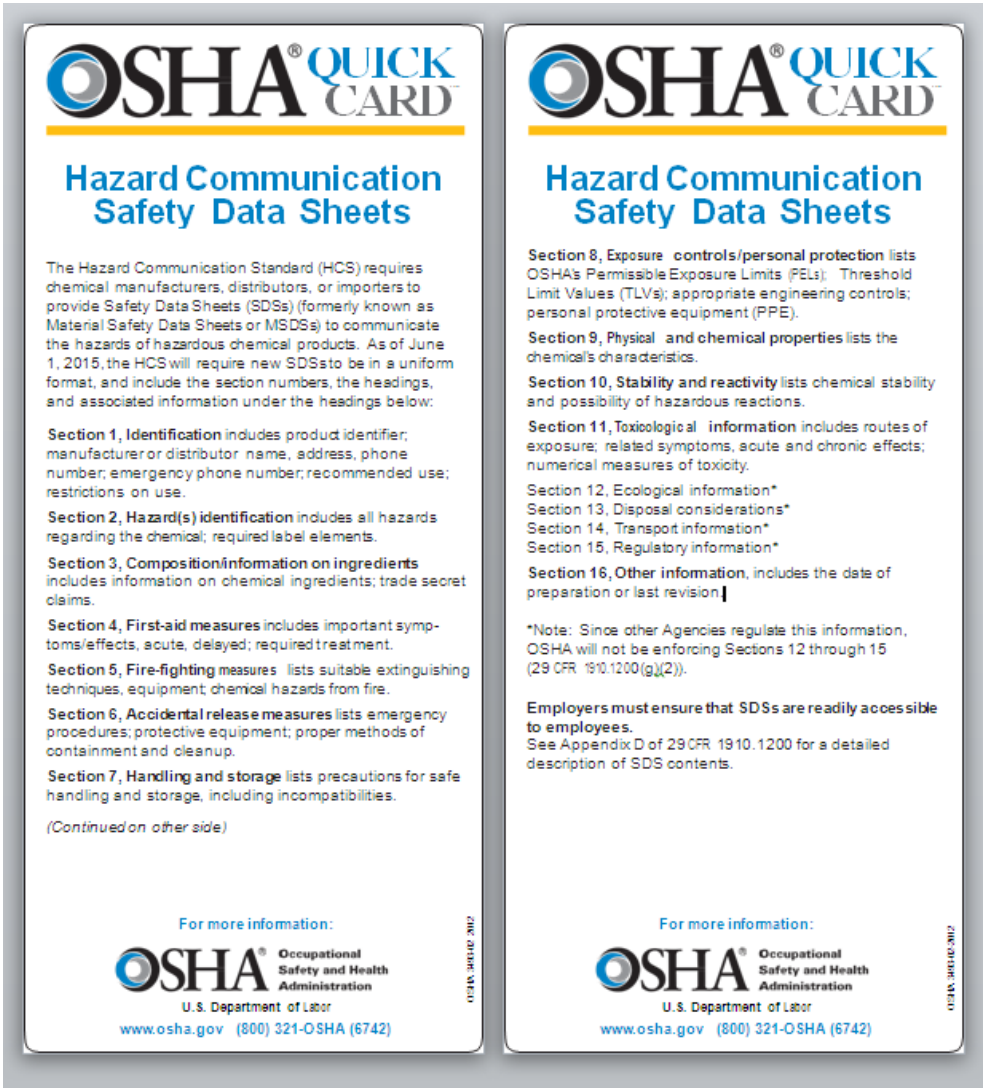
A MSDS/SDS is required for the following drug products:

- Drugs in the form of tablets, pills, or liquid-in-capsules which display physical or health hazards as described in the MSDS/SDS and are designed to be crushed or mixed by an employee prior to administration.

- Liquid drugs displaying characteristics similar to those described above, *if* there is a potential for exposure to employees.

Manufacturers may withhold the specific chemical identity and other specific identification, including the chemical name under certain specific conditions. In medical emergencies the information shall ***immediately*** disclose the identity of the chemical. In non-emergency situations a written request may be needed. See 29 CFR Part 1910, February 9, 1994 for specific information. Incoming hazardous chemicals for which an MSDS/SDS is not available ***should not*** be placed in service until obtained by laboratory.

Chemicals manufactured by the laboratory for the laboratory's exclusive use must be evaluated for hazard and appropriate records and documentation. Generally, in the Colorado Region reagents are purchased from vendors. Therefore, compounding should be limited to any reagents not commercially available.



OSHA® QUICK CARD

Hazard Communication Safety Data Sheets

The Hazard Communication Standard (HCS) requires chemical manufacturers, distributors, or importers to provide Safety Data Sheets (SDSs) (formerly known as Material Safety Data Sheets or MSDSs) to communicate the hazards of hazardous chemical products. As of June 1, 2015, the HCS will require new SDSs to be in a uniform format, and include the section numbers, the headings, and associated information under the headings below:

Section 1, Identification includes product identifier; manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use.

Section 2, Hazard(s) identification includes all hazards regarding the chemical; required label elements.

Section 3, Composition/information on ingredients includes information on chemical ingredients; trade secret claims.

Section 4, First-aid measures includes important symptoms/effects, acute, delayed; required treatment.

Section 5, Fire-fighting measures lists suitable extinguishing techniques, equipment; chemical hazards from fire.

Section 6, Accidental release measures lists emergency procedures; protective equipment; proper methods of containment and cleanup.

Section 7, Handling and storage lists precautions for safe handling and storage, including incompatibilities.

(Continued on other side)

For more information:

OSHA® Occupational Safety and Health Administration
U.S. Department of Labor
www.osha.gov (800) 321-OSHA (6742)

OSHA® QUICK CARD

Hazard Communication Safety Data Sheets

Section 8, Exposure controls/personal protection lists OSHA's Permissible Exposure Limits (PELs); Threshold Limit Values (TLVs); appropriate engineering controls; personal protective equipment (PPE).

Section 9, Physical and chemical properties lists the chemical's characteristics.

Section 10, Stability and reactivity lists chemical stability and possibility of hazardous reactions.

Section 11, Toxicological information includes routes of exposure; related symptoms, acute and chronic effects; numerical measures of toxicity.

Section 12, Ecological information*
Section 13, Disposal considerations*
Section 14, Transport information*
Section 15, Regulatory information*

Section 16, Other information, includes the date of preparation or last revision.

*Note: Since other Agencies regulate this information, OSHA will not be enforcing Sections 12 through 15 (29 CFR 1910.1200(g)(2)).

Employers must ensure that SDSs are readily accessible to employees.
See Appendix D of 29 CFR 1910.1200 for a detailed description of SDS contents.

For more information:

OSHA® Occupational Safety and Health Administration
U.S. Department of Labor
www.osha.gov (800) 321-OSHA (6742)

5. Signs and Symptoms Associated with Chemical Overexposure

Employees are required to understand symptoms associated with overexposure to hazardous chemicals. These symptoms are described in the MSDS/SDS for a particular chemical. The employee is responsible for notifying his/her manager if he/she has reason to believe that he/she has been overexposed.

The supervisor or manager is responsible for notifying Employee Health Nurse and WH&S within 24 hours.

6. Chemical Exposure Controls and Emergency Safety Equipment

Control of exposure to chemicals within laboratories is accomplished through engineering and administrative controls and personal protective equipment (PPE).

A. Administrative controls include general chemical safety handling as described in this plan, proper training, and periodic self-audits. Additionally, the **manager or supervisor** obtains and reviews **MSDS/SDS** prior to the purchase of new chemicals. The Regional Laboratory Managers or designee, Workplace, Health and Safety, Infection Control Coordinator or a facility or regional safety committee should review any new or changed safety procedures. Changes instituted in one laboratory should be instituted in all laboratories where they apply to provide the same level of safety to all laboratory workers.

B. Engineering controls within Kaiser Permanente include biological safety cabinets. These are required to undergo annual certification to ensure that they are functioning properly. Any hood that does not pass inspection is taken out of service immediately and will not be used until the hood has passed inspection. It is the responsibility of the employer to purchase the parts or to replace the unit in a timely fashion so as not to endanger the health and well-being of an employee or place the facility at risk. Daily records of hood performance must be maintained. The performance should be measured under normal working conditions.

C. PPE used in laboratories at Kaiser Permanente Colorado Region includes splash proof eye protection and/or face shields, gloves and lab coats appropriate for the types of chemicals being handled. Respiratory protection is not required provided the existing engineering controls are being properly utilized. The laboratory **manager/supervisor** is responsible for ensuring that all PPE is being properly maintained and available for staff.

Selection of PPE is determined by the recommendations contained in the MSDS/SDS and by prudent laboratory practice. PPE must be compatible with the requirements of each hazardous substance being handled.

- **Gloves** are required to be worn by employees when there is a potential for direct skin contact with blood, hazardous chemicals and/or biohazardous materials. Glove materials consisting of neoprene, butyl, hypalon, zetex and cryo are available for special applications.

- **Laboratory coats** are to be worn at all times when the employee is engaged in laboratory work to specimen handling. Coats should have long sleeves; cover the employee approximately to the knees and button to the neck. Coats are required to be buttoned at all times to provide desired protection. Coats are to be worn in the laboratory area only. A clean laboratory coat can be worn outside the laboratory. Used laboratory coats are placed in the laundry hamper supplied by the linen vendor and picked up weekly to be cleaned or repaired.

- **Impermeable aprons** should be worn when working with extremely toxic or caustic materials, i.e. when adding acid into urine specimens.

- **Masks and eye protection or chin-length face shield** is worn to prevent splashes or sprays of blood, infectious materials or hazardous chemicals if there is a potential for eye, nose or mouth contamination.

- **Goggles with side shields** are to be worn when handling chemicals with the potential of causing eye damage.

- **A full-face shield** should be worn when handling large amounts of chemicals; goggles do not provide adequate protection under these circumstances.

D. All laboratories are equipped with **eye wash stations and safety showers**. Eyewash fountains are inspected weekly and the check is documented by the laboratory manager or supervisor, or designated employee at each facility. Improperly functioning stations are taken out of service, are clearly labeled as such and immediately repaired or replaced. Eyewash stations should be ANSI approved and should be capable of delivering a continuous flow of clean and tempered water for no less than 15 minutes. Safety showers are inspected and the inspection is documented monthly.

E. **Chemical exposure monitoring** will be performed for those personnel engaged in functions using formaldehyde, xylene, and other chemicals identified as hazardous through inhalation and when it is determined exposure is possible. Routine monitoring will be task-specific using personal monitoring devices, i.e., badges. A representative number of individuals will be sampled who are engaged in the specific exposure-related task. If monitoring results indicate an exposure over the PEL or TLV, engineering and administrative controls will be assessed to determine ways to lower the exposure as much as possible. If implemented engineering and administrative controls do not succeed in reducing exposure below the PEL or TLV then appropriate PPE will be provided. Monitoring will occur annually for detecting exposure values for personnel engaged functions using chemicals indicated above. Employees will be notified in writing of the results of exposure monitoring within 15 working days of receiving the results. Monitoring results will also be discussed at the staff meeting following the receipt of results and will be made available to any interested employee(s).

F. **Formaldeyhde** is subject to provisions of the OSHA formaldehyde standard (29 CFR 1910.1048) and as such requires employee monitoring to ensure exposures do not exceed the 8-hour time-weighted average (TWA) of 0.75 ppm or the short-term exposure limit (STEL) of 2.0 ppm.

http://coweb.co.kp.org/hr/safety/docs/formaldehyde_communication_plan.pdf

G. **Fire Extinguishers** should be easily accessible in each laboratory work area. Fire extinguishers are checked to ensure that inspection has been completed annually. If the change level indicator is low or if the pin has been removed the extinguisher will be replaced with serviceable unit. In addition, all extinguishers are inspected annually by an outside inspection company.

H. **Fire Alarms and Detectors -** inspection and monitoring of these systems are under the direction of the facility engineer.

I. **Ventilated Storage Cabinets** for volatile chemicals are available as needed. The cabinets should have a separate exhaust duct.

7. Chemical Storage

All laboratory chemicals should be stored according to the manufacturers' instructions and in accordance with standard laboratory practices.

A. Chemicals shall be segregated according to their classes and compatibility and shall be stored in well ventilated areas with appropriate exhaust systems. Chemical compatibility information is generally available on the MSDS/SDS.

B. Flammable liquids are stored in flammable storage cabinets with proper ventilation according to NFPA standards unless the volume is small. Flammable chemicals should not be stored in conventional refrigerators or freezers.

C. Since corrosive chemicals can cause damage to the eyes in an accidental spill, **all acids with a pH below 5.0 and all bases with a pH above 9.0 should be stored below eye level as a common practice.**

D. The total volume of flammable and combustible liquids being stored outside the approved storage cabinets and safety shall not exceed 1 gallon (3.78 L) per 100 square feet. Flammable and combustible liquids exceeding this limit must be stored in approved safety cabinets.

E. Chemical amounts stored should be the least amount needed to maintain laboratory operations. Hoods should not be used for routine chemical storage. Ventilated cabinets and specially monitored refrigerators may be needed when large amounts of chemicals are needed for operations.

F. Toxic chemicals received in breakable containers are stored in acid carriers or an unbreakable secondary container. Toxic chemicals, including carcinogens, are stored in ventilated storage areas in breakable chemical resistant containers. These containers, if relabeled, are labeled "**CAUTION: HIGH CHRONIC TOXICITY OR CANCER-SUSPECT AGENT".** The laboratory, according to federal and state regulations, maintains a separate inventory list of carcinogens and suspected carcinogens.

G. Cylinders of compressed gases are strapped or chained to a wall or bench top or secured in a floor stand constructed for this purpose. Cylinders not in use must be capped. The valve assembly should be one specifically for the cylinder and gas in use. No more than one cylinder should be in the work area. Supplies should be stored away from the work area.

H. No food or drink is permitted in the same refrigerators or cabinets where chemicals are stored.

Chemical Waste Disposal

To assure that minimal harm to people, other organisms, and the environment will result from the disposal of waste laboratory chemicals, the Waste Segregation Matrix specifies how waste is to be collected, segregated, stored, and transported and includes consideration of what materials can be incinerated. All wastes are to be disposed of in accordance with all local, state and federal regulations.

Clean up of infectious waste and spill should occur according to the Bloodborne Pathogen Exposure Plan and Spill Procedure. Refer to the Hazardous Waste Program for management of chemical waste.

The laboratory must evaluate each type of hazardous waste generated by the laboratory prior to disposing of the waste.

Indiscriminate disposal by pouring waste chemicals down the drain or adding them to mixed refuse for landfill burial is unacceptable. Hoods are not to be used as a means of disposal for volatile chemicals. Disposal by recycling or chemical decontamination is used when possible.

SPILLS AND ACCIDENTS

It is generally recommended that the container label or MSDS/SDS sheet be consulted before action be undertaken.

Accident and Spills - general guidelines

a. Eye contact: promptly flush eyes with water for a prolonged period (15 minutes) and seek medical attention promptly.
b. Ingestion: encourage the victim to drink large amounts of water unless contraindicated by MSDS/SDS.
c. Skin Contact: promptly flush the affected area with large amounts of water and remove any contaminated clothing; use a safety shower when contact is extensive. If symptoms

persist after washing, seek medical attention immediately. If it is a dry chemical, brush off the contaminate.

d. Inhalation: remove employee to fresh air, monitor symptoms and seek medical attention.
e. Clean up incidental spills promptly using appropriate protective apparel and equipment. If the spill is large or the substance presents a substantial hazard, evacuate the area or building and call the Hazard Control Unit of the Local Fire Department (dial 911). When using spill kits, dispose of materials in accordance with instructions.

Hazardous Material Spill Classification

Training employees on the proper classification of hazardous spills ensures that employee exposure is minimized and releases to the environment are prevented. The distinction between an incidental spill, an incidental spill with considerations and an emergency response release is dependent upon the following factors:

- Hazardous properties of the spill (toxicity, flammability, corrosivity and reactivity)
- Circumstances of the release (quantity, location and ventilation)
- Employee training
- Pre-established Operating Procedures
- Available personal protective equipment and equipment available to mitigate release

Potential release of hazardous materials can be categorized into 3 distinct groups:

1. Incidental Hazardous Material Spill;
2. Incidental Hazardous Material Spill with Considerations; or
3. Emergency Response Release.

A. Incidental Hazardous Material Spill

An incidental spill is generally a spill in small quantities with very low volume exposure potential and toxicity that can be easily cleaned up with an absorbent, e.g. paper towel or absorbent spill kit material. A hazardous material spill of this type is usually:

a) Limited in quantity, exposure potential and toxicity; and
b) Poses no emergency or significant threat to the safety and health of employees in the immediate vicinity or to the spill responder.

B. Incidental Hazardous Material Spill with Considerations

An incidental hazardous material spill with considerations requires more than a few paper towels to clean up and may present other hazards including strong odors and a slip or a fall hazard. Spill response also requires alerting nearby staff and may require the assistance of others to clean up.

A hazardous material spill is usually:

a) Larger quantity of material spilled that has minimal exposure potential and toxicity; or
b) Larger quantity of material spilled that has a higher exposure potential and toxicity; or

c) Smaller quantity of material spilled that has a higher exposure potential and toxicity; and
d) Poses no emergency or significant threat to the safety and health of employees in the immediate vicinity or to the spill responder.

C. Emergency Response Release

Chemical releases that pose a significant threat to human health and safety and require an emergency response regardless of the circumstances. An emergency response typically includes the following:

a) The response will come from outside the area;
b) The release requires evacuation of employees;
c) Conditions exist which pose an immediate danger to life and health;
d) The release poses a serious threat of fire or explosion;
e) An imminent danger exists; the release may cause high levels of exposure due to toxic substances; There is uncertainty that the resources (e.g., trained personnel, equipment, etc.) are available to deal with the severity of the hazard; and
f) The situation is unclear and/or critical information is lacking.

Spill Response Procedures

Hazardous material spills will occasionally occur despite the best efforts to prevent them. The type of response depends upon what hazardous material has spilled, how much has spilled, and where the spill occurred. In general, the majority of hazardous material spills occurring in the health care setting are incidental release. In an incidental spill response there is no significant threat to the safety and health of employees and the spill responders in the immediate vicinity. Employees who have received training on the Hazardous Communication Standard that includes spill response information should be able to safely manage the clean-up process for incidental releases of materials. Incidental spill response spill sheets, located in Appendix C, serve as a quick resource and training tool in the event of a spill.

Spill Response Personnel

- Trained departmental personnel will act as the primary responder for responding to and cleaning hazardous incidental spills within a department.
- Environmental Health and Safety (WH&S), or designee, will be contacted to assist in determination of safe response and clean-up procedures in the event of an incidental spill with considerations. WH&S may approve and provide instructions to departmental staff on how to properly clean-up the spill or may recommend contacting appropriate Emergency Release Response personnel to and clean-up the spill.
- In the event of a hazardous emergency spill the department/clinical supervisor or manager will follow the Emergency Release Response Procedures. Staff will evacuate the area, call 911 and notify the administrator and WH&S.

A. Incidental Hazardous Material Spill Response

An incidental hazardous material spill is small spill limited in exposure potential and toxicity and can be cleaned up easily and quickly with a few paper towels or other absorbent material.

B. Incidental Hazardous Material Spill with Considerations Response

The incidental hazardous materials with considerations spill clean-up is a 5-step process. Each of these steps will include a series of actions required by trained personnel.

- **Alert** co-workers that a spill has occurred and warn them to be careful if they are working nearby until the spill is cleaned up. This may also include cordoning off the area to ensure other personnel cannot walk through the spill area and become exposed.
- **Assess** the spill.
  1. **Review the scene**
     - Identify staff exposures and/or injuries
     - Estimate quantity of material spilled
     - Evaluate surrounding conditions (location, ventilation, sources of ignition)
     - Identify resources (operating procedures, engineering controls, knowledgeable employees)
  2. **Identify the type(s) of material spilled**
     - Obtain MSDS/SDS
     - Review spill sheets
  3. **Evacuate and/or Isolate the Area** (if appropriate)
     - The area around the incidental spill should be isolated. A room or building may need to be evacuated if the spill is considered an incidental release with considerations or an emergency release response.
  4. **Develop a Plan of Action**
     - Determine how the spill will be contained, confined, and cleaned up.

- **Contain** the spill. Act quickly to minimize the spill if it can be done safely and quickly. If the identity of the spilled material has not been determined or there is potential for a hazardous exposure to occur, actions should be delayed until the material can be identified. Examples of containment include:
  - ***Tipped over container***: Turn container upright.
  - ***Leaking equipment***: Turn off equipment, raise drain line to stop flow, or put a container under the leak to catch spilling material.
  - ***Gas cylinder***: Turn off valve to cylinder.
  - ***Liquids***: Prevent further spread of liquid. Set out spill pigs/booms, create dikes with absorbent, or cover drains.
- **Confine** the spill to prevent the release from spreading or traveling to other areas. Confinement of a spill can be achieved by:
  - Diverting a liquid away from critical area (e.g., storm drain).
  - Using an absorbent boom to control the movement of liquid.
  - Using an absorbent to temporarily confine the spill.
  - Using neutralizers and vapor suppresser to confine vapors.

- **Clean-up** the spill. Employees responsible for cleaning up incidental spills should use departmental spill kits and refer to appropriate spill sheets, incorporating the following basic steps:
  - Use appropriate personal protective equipment.
  - De-energize and remove all sources of ignition (when required).
  - Neutralize and clean-up spill.
  - Decontaminate area using a general purpose cleaner and water.
  - Dispose of waste appropriately.
  - Decontaminate equipment
  - Launder contaminated clothing separately.
  - Decontaminate any area of your body that may have been exposed using soap and water.
  - Notify appropriate individuals and complete reports.

Incidental spill clean-up basics include the following:

- ***Liquids***: Confine the movement of liquid using a spill kit. Spill kits generally contain personal protective equipment, absorbent material, tools to pick up absorbent material, and plastic bags to contain waste material. When applying absorbents, start at the perimeter and work inwards.
- ***Dry Materials***: Cover dry spills to prevent spill material from becoming aerosolized. Scoop up the dry material using the tool provided in the spill kit. Minimize sweeping the material as it may aerosolize the product.
- ***Spill Area Decontamination***: The area should be wiped or mopped with water and appropriate decontamination solution once the spill is cleaned up. Wash and decontaminate reusable tools and supplies at the designated cleaning station with detergent. Rinse three times with clean water after cleaning. Wear double latex or nitrile gloves and apron during washing. Wash face, hands and other exposed parts of body with soap and water.
- ***Waste Handling***: Generating a hazardous waste as a result of a spill can pose a storage and disposal problem for the facility. Many hazardous materials (e.g., acids, bases, formaldehyde) may be neutralized as part of the spill clean-up process and disposed in a trash receptacle. Waste determination may be needed prior to disposal. Transport the spill clean-up waste container to a secure area to hold for hazardous waste pick-up. The waste container should be labeled. The label should include the following information:
  1. Name of material that was cleaned up;
  2. "Hazardous waste – hold for pick-up";
  3. "Notified EH&S"; and
  4. Include date and signature.

Please refer to Appendices C and D for assistance in determining appropriate spill kits and the recommended type and quantity of spill kit material for a specific location and department.

After Clean-up Actions, Reporting and Notifications

A. Internal Reporting/Notifications

- Notify departmental supervisor or manager
- Complete Spill Report, located in Appendix B, and fax report to WH&S.
- Contact WH&S Department for assistance if necessary.

B. Clearance Monitoring may be conducted following clean-up of an incidental hazardous materials response to reassure employees that the spill has been properly cleaned up and documented.

Three methods of clearance monitoring include:
a) Visual Inspection
b) Surface Sampling
c) Environmental Air Sampling

Most clearance monitoring for incidental spills is conducted by visually inspecting the area. The visual inspection involves reviewing the area for remaining evidence of spilled material. Contact the Workplace Health & Safety Department for more information on surface sampling and environmental air sampling.

C. External Reporting/Notifications

External reporting is generally not required for incidental spills. Factors that determine if external agency notification is required include:

- Type of hazardous material spilled.
- How much material was spilled
- Where spill occurred.

Environmental Health & Safety can assist in determining external agency notification in the event a hazardous material release occurred on outside ground, in a storm sewer, in a stream or other body of water, or into the atmosphere.

Emergency Response Release Procedures

Releases that pose a significant threat to human health and safety require an emergency response. The local fire department/HAZMAT team will act as first responders in an emergency response release. Notify WH&S for further assistance.

MEDICAL CONSULTATION AND EXAMINATION

- **Needle sticks and Sharps Injuries**
  Employees should clean the wound and notify supervisor immediately. You must page employee health at 303.203.9093. A red Exposure Packet must be obtained and the paperwork filled out and returned to WH&S immediately. Follow all instructions in the red Exposure Packet.

- **Formaldehyde**
  If exposure is to formaldehyde, consult the Formaldehyde Plan for specific information regarding that substance.

- **Non-acute employee and/or employee overexposure** discovered as a result of monitoring should be reported to the Employee Health Coordinator who will evaluate and refer the employee to the appropriate physician. The Workplace Health and Safety Specialist should be consulted regarding general management of the situation.

- **Medical Examinations and Consultations** are performed by, or under the direct supervision of, a licensed physician without cost to the employee, without loss of pay, and at a reasonable time and place. ***The employee is sent for medical evaluation:***
  - Whenever signs and symptoms associated with a hazardous chemical develop
  - When environmental monitoring reveals an exposure level routinely above the action level.
  - Whenever an event takes place in the work area such as a spill, leak or exposure resulting in hazardous chemical exposure

  The Laboratory provides the following information to the physician:
  - Identify the hazardous chemical(s) to which the employee may have been exposed; if practical; supply the physician with a copy of the MSDS/SDS(s).
  - A description of the conditions under which the exposure occurred - including quantitative exposure data (if available).
  - A description of the signs and symptoms of exposure.

  The physician provides a written opinion that will not reveal specific findings of a diagnosis unrelated to the exposure but will include:
  - Any recommendations for further medical follow-up.
  - Results of the medical examination.
  - Any medical conditions that may be revealed in the course of the examination that may place the employee at increased risk as a result of exposure to a hazardous chemical found in the workplace.
  - A statement by the physician that the employee has been informed of the consultation/examination results and any medical condition that may require further examination or treatment.

  Reporting exposure incidents:
  - Complete an Employee Incident and Accident Report found in the Red Exposure Packet.
  - Notify Employee Health Coordinator of all exposure incidents.

TRAINING

Training is a necessary part of the Chemical Hygiene Plan. All employees are required to complete Hazard Communication Web-Based Training (WBT) upon initial hire and annually thereafter. In addition, employees must complete department-specific training upon initial assignment to a work area where hazardous chemicals are present and before assignments involving new exposure situations.

Refresher information and retraining sessions are held periodically, whenever unsafe behaviors are observed and no less than annually. Training is conducted by the employee's supervisor, or by a trainer authorized by the WH&S. All training is documented appropriately.

Training Plan Objectives

Upon the completion of the Chemical Hygiene Training Program, the employee should be able to:

Locate the Chemical Hygiene Plan; Hazard Communication and Spill Response Manual.
Determine correct disposal procedures for each hazardous chemical.
Locate the Chemical Inventory/MSDS/SDS book in the workplace.
Locate the health hazard, physical hazard, environmental protection, and special protection sections of the MSDS/SDS and explain their use.
Identify the department Chemical Hygiene Officer(s) by name and title.
Discuss the major components of the facility's standard labeling system.
Identify the appropriate PPE for the area and describe its use.
Locate spill kits.
Locate the eyewash and shower stations.
Describe emergency procedures in the event of a hazardous chemical spill.
Describe the environmental monitoring protocol including identifying chemical hazards by visual inspection, odor, etc. and monitoring devices.
Locate the potentially hazardous chemicals in the workplace.
Locate and be informed of permissible limits of OSHA regulated substances and limits for hazardous chemicals for which there are no OSHA limits.

HOUSEKEEPING

Floors are cleaned regularly by contracted housekeeping services. All employees of the housekeeping department are formally trained in the risks associated with working in the laboratory prior to starting work.

The laboratory supervisor/manager, and/or safety committee randomly inspects and documents the inspection of the laboratory areas to assess whether:

1. Stairwells and hallways are free of obstruction.
2. Waste is deposited in appropriate receptacles and properly removed from the laboratory.
3. Chemical spills are cleaned according to established protocol.
4. Proper storage is accomplished to minimize clutter and is correct for the chemicals being stored.
5. Cleanliness of all work area, equipment, hood, refrigerators and freezers, sinks and general laboratory area.

RECORD KEEPING

The laboratory supervisor/manager will establish and maintain an accurate record for each employee of environmental monitoring, medical consultation and examination referrals (actual reports will not generally be available to the supervisor/manager).

Medical consultation records are maintained in the Employee Health Nurse files.

Generally, records are kept for the length of employment plus 30 years.

PRIOR APPROVAL FOR NON-ROUTINE LABORATORY PROCEDURES

New procedures, processes, tests, or experiments require planning to ensure safe work practices. This planning includes determining the hazards of the chemicals involved, obtaining the correct personal protective devices needed and forethought as to the placement of the equipment.

Therefore, an employee must obtain approval from their supervisor/manager to begin the procedure, process test or experiment when any of the following conditions prevail:

1. If a new procedure, piece of equipment, process, test or experiment is planned, even when it is similar to current practices.
2. If there is a substitution of a chemical ingredient in a procedure.
3. If there is a substantial increase in the amount of chemical used. In general, safety practices should be reviewed if the amount of chemical or reagent is to be increased by 20%.
4. When failure of any of the equipment has occurred especially safeguards such as fume hoods or clamp apparatus.
5. When a test or procedure result is different than is expected and the employee suspects a problem.
6. When a staff member becomes ill, suspects exposure, smells chemicals, or otherwise suspects a failure of the laboratory safeguards.
7. If an unattended operation is planned.

HIGH-HAZARD CHEMICAL OPERATIONS

The use of particularly hazardous chemicals including "select carcinogens," reproductive toxins and substances with a high degree of acute toxicity, require additional provision for employee protection. Supervisor/manager approval is required before operations start for any procedure, process or test. This provision includes, as necessary:

1. Establishment of designated use areas.
2. Use of containment devices, including fume hoods and glove boxes.
3. Procedure for safe removal of contaminated waste.
4. Decontamination procedures.

Note: Formaldehyde and OSHA-designated carcinogens in use in Kaiser Permanente laboratories, are handled in accordance with the requirements of 29 CFR 1910.1048.

REFERENCES

1. U.S. Department of Labor, final rule parts II. Federal Register 29 CFR part 1910. Occupational Exposure to Hazardous Chemicals in Laboratories, January 31, 1990 and February 9, 1994.
2. National Research Council. Prudent Practices for Handling Hazardous Chemicals in Laboratories, National academy Press, 1981.
3. National Research Council. Prudent Practices for Disposal of Chemicals from Laboratories, National Academy Press, 1981.
4. CLAM. A Model Chemical Hygiene Plan for Laboratories, Terry Jo Gile, MT (ASCP) MA ED, Sept. 1990.

CHP Revised 12/11/2012 by: Ellen Gibson, MT (ASCP) Laboratory QA & Compliance Mgr
John DiPaolo, Environmental Health and Safety Specialist

Reviewed by: Matthew Huray, National Environmental Health & Safety Specialist
Barbara D'Souza, Regional Workplace, Health & Safety Manager

APPENDIX A

MSDS/SDS GLOSSARY

ACGIH American Conference of Governmental Industrial Hygienists if an organization of professional personnel in governmental agencies or educational institutions engaged in occupational safety and health programs. ACGIH establishes recommended occupational exposure limits for chemical substances and physical agents. See TLV.

Acid Any chemical that undergoes dissociation in water with the formation of hydrogen ions. Acids have a sour taste and may cause severe skin burns. Acids turn litmus paper red and have pH values of 0 to 6.

Acute Effect Adverse effect on a human or animal that has severe symptoms developing rapidly and coming quickly to a crisis.

Acute Toxicity Acute effects resulting from a single dose of, or exposure to, a substance. Ordinarily used to denote effects in experimental animals.

Adenocarcinoma A tumor with glandular (secreting) elements.

Adenosis Any disease of a gland.

Aerosol A fine aerial suspension of particles sufficiently small in size to confer some degree of stability from sedimentation (e.g., smoke or fog).

Air-Line Respirator A respirator that is connected to a compressed breathable air source by a hose of small inside diameter. The air is delivered continuously or intermittently in a sufficient volume to meet the wearer's breathing requirements.

Air-Purifying Respirator A respirator that uses chemicals to remove specific gases and vapors from the air or that uses a mechanical filter to remove particulate matter. An air-purifying respirator must only be used when there is sufficient oxygen to sustain life and the air contaminant level is below the concentration limits of the device.

Alkali Any chemical substance that forms soluble soaps with fatty acids. Alkalis are also referred to as bases. They may cause severe burns to the skin. Alkalis turn litmus paper blue and have pH values from 8 to 14.

Allergic Reaction An abnormal physiological response to chemical or physical stimuli.

Anesthetic A chemical that causes a total or partial loss of sensation. Overexposure to anesthetics can cause impaired judgment, dizziness, drowsiness, headache, unconsciousness, and even death. Examples include alcohol, paint remover, and degreasers.

ANSI American National Standards Institute is a privately funded, voluntary membership organization that identifies industrial and public needs for national consensus standards and coordinates development of such standards.

Antidote A remedy to relieve, prevent, or counteract the effects of a poison. API American Petroleum Institute is an organization of the petroleum industry.

Aquatic Toxicity The adverse effect to marine life that result from being exposed to a toxic substance.

Asphyxiant A vapor or gas that can cause unconsciousness or death by suffocation (lack of oxygen). Most simple asphyxiants are harmful to the body only when they become so concentrated that they reduce the oxygen in the air (normally about 21 percent) to dangerous levels (18 percent or lower). Asphyxiation is one of the principle potential hazards of working in confined and enclosed spaces.

ASTM American Society for Testing and Materials is the world's largest source of voluntary consensus Standards for materials, products, systems, and services. ASTM is a resource for sampling and testing methods, health and safety aspects of materials, safe performance guidelines, and the effects of physical and biological and chemical agents.

Asymptomatic Showing no symptoms.

Atmosphere-Supplying Respirator A respirator that provides breathable air from a source independent of the surrounding atmosphere. There are two types: air-line and self-contained breathing apparatus.

Auto-Ignition Temperature The temperature to which a closed, or nearly closed container must be heated in order that the flammable liquid, when introduced into the container, will ignite spontaneously or burn.

BAL British Anti-Lewisite - A name for the drug dimecaprol-a treatment for toxic inhalations.

Base A substance that (1) liberate hydroxide (OH) ions when dissolved in water, (2) receives hydrogen ions from a strong acid to form a weaker acid, and (3) neutralizes in acid. Bases react with acids to form salts and water. Bases have a pH greater than 7 and turn litmus paper blue. See Alkali.

Benign Not recurrent or not tending to progress. Not cancerous.

Biodegradable Capable of being broken down into innocuous products by the action of living things.

Biopsy Removal and examination of tissue from the living effects.

Boiling Points-BP The temperature at which a liquid changes to a vapor state at a given pressure. The boiling point usually expressed in degrees Fahrenheit at sea level pressure (760 mmHg, or one atmosphere). For mixtures, the initial boiling point or the boiling range may be given.

Flammable materials with low boiling points generally present special fire hazards. Some approximate boiling points:	
Propane	-44 °F
Anhydrous Ammonia	-28 °F
Butane	31 °F
Gasoline	100 °F
Allyl Chloride	113 °F
Ethylene Glycol	387 °F

Bonding The interconnecting of two objects by means of a clamp and bare wire. Its purpose it to equalize the electrical potential between the objects to prevent a static discharge when transferring a flammable liquid from one container to another. The conductive path is provided by clamps that make contact with the charged object and a low resistance flexible cable which allows the charge to equalize. See Grounding.

Bulk Density Mass of powdered or granulated solid material per unit of volume. C Centigrade, a unit of temperature.

Ceiling Limit (PEL or TLV) The maximum allowable human exposure limit for an airborne substance which is not to be exceeded even momentarily. Also see PEL and TLV.

CAA Clean Air Act was enacted to regulate/reduce air pollution. CAA is administered by the U.S. Environmental Protection Agency.

Carcinogen A substance or agent capable of causing or producing cancer in mammals, including humans. A chemical is considered to be a carcinogen if

(a) It has been evaluated by the International Agency for Research on Cancer (IARC) and found to be a carcinogen or potential carcinogen; or

(b) It is listed as a carcinogen or potential carcinogen in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or

(c) It is regulated by OSHA as a carcinogen.

Carcinoma A malignant tumor. A form of cancer.

CAS Chemical Abstracts Service is an organization under the American Chemical Society. CAS abstracts and indexes chemical literature from all over the world in "Chemical Abstracts." "CAS Numbers" are used to identify specific chemicals or mixtures.

Caustic See Alkali.

cc Cubic centimeter is a volume measurement in the metric system that is equal in capacity to one milliliter (ml). One quart is about 946 cubic centimeters.

Central Nervous System The brain and spinal cord. These organs supervise and coordinate the activity of the entire nervous system. Sensory impulses are transmitted into the central nervous system, and motor impulses are transmitted out.

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act of 1980. The Act requires that the Coast Guard National Response Center be notified in the event of a hazardous substance release. The Act also provides for a fund (the Superfund) to be used for the cleanup of abandoned hazardous waste disposal sites.

CFR Code of Federal Regulations. A collection of regulations that have been promulgated under United States Law.

Chemical An element (e.g., chlorine) or a compound (e.g., sodium bicarbonate) produced by chemical reaction.

Chemical Cartridge Respirator A respirator that uses various chemical substances to purify inhaled air of certain gases and vapors. This type of respirator is effective for concentrations no more than ten times the TLV of the contaminant, if the contaminant has warning properties (odor or irritation) below the TLV.

Chemical Family A group of single elements or compounds with a common general name. Example: acetone, methyl ethyl ketone (MEK), and methyl isobutyl ketone (MIBK) are of the "Ketone" family; acrolein, furfural, and acetaldehyde are of the "aldehyde" family.

Chemical Name The name given to a chemical in the nomenclature system developed by the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS). The scientific designation of a chemical or a name that will clearly identify the chemical for hazard evaluation purposes.

Chemical Pneumonitis Inflammation of the lungs caused by accumulation of fluids due to chemical irritation.

CHEMTREC Chemical Transportation Emergency Center is a national center established by the Chemical Manufacturers Association to relay pertinent emergency information concerning specific chemicals on requests from individuals. CHEMTREC has a 24-hour toll-free telephone number (800-424-9300) to help respond to chemical transportation emergencies.

Chronic Effect An adverse effect on a human or animal body, with symptoms that develop slowly over a long period of time or that recur frequently. Also see Acute.

Chronic Exposure Long-term contact with a substance.

Chronic Toxicity Adverse (chronic) effects resulting from repeated doses of or exposures to a substance over a relatively prolonged period of time. Ordinarily used to denote effects in experimental animals.

Clean Water Act Federal law enacted to regulate/reduce water pollution. CWA is administered by EPA.

CMA Chemical Manufacturers Association. See CHEMTREC

CO Carbon monoxide is a colorless, odorless, flammable, and very toxic gas produced by the incomplete combustion of carbon. It is also a by-product of many chemical processes. A chemical asphyxiant; it reduces the blood's ability to carry oxygen. Hemoglobin absorbs CO two hundred times more readily than it does oxygen.

$C0_2$ Carbon dioxide is a heavy, colorless gas that is produced by the combustion and decomposition of organic substances and as a by-product of many chemical processes. $C0_2$ will not burn and is relatively nontoxic (although high concentrations, especially in confined spaces, can create hazardous oxygen-deficient environments).

COC Cleveland Open Cup is a flash point test method.

Combustible A term used by NFPA, DOT, and others to classify certain liquids that will burn, on the basis of flash points. Both NFPA and DOT generally define "combustible liquids" as having a flash point of 100 °F (37.8 °C), but below 200 °F (93.3 °C). Also see "flammable." Non-liquid substances such as wood and paper are classified as "ordinary combustibles" by NFPA.

Combustible Liquid Any liquid having a flash point 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 makes up ninety-nine (99) percent or more of the total volume of the mixture.

Common Name Any means used to identify a chemical other than its chemical name (e.g., code name, code number, trade name, brand name, or generic name). See Generic.

Compressed Gas:

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

(b) 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

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

Concentration The relative amount of a substance when combined or mixed with other substances. Examples: 2 ppm hydrogen sulfide in air, or a 50 percent caustic solution.

Confined Space Any area that has limited openings for entry and exit that would make escape difficult in an emergency, has a lack of ventilation, contains known and potential hazards, and is not intended nor designated for continuous human occupancy.

Conjunctivitis Inflammation of the conjunctiva, the delicate membrane that lines the eyelids and covers the eyeball.

Corrosive A chemical that causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the site of contact. For example, a chemical is considered to be corrosive if, when tested on the intact skin of albino rabbits by the method described by the DOT in Appendix A to 49 CFR Part 173, it destroys or changes irreversibly the structure of the tissue at the site of contact following an exposure period of four hours. This term shall not refer to action on inanimate surfaces.

CPSC Consumer Products Safety Commission has responsibility for regulating hazardous materials when they appear in consumer goods. For CPSC purposes, hazards are defined in the Hazardous Substances ACT and the Poison Prevention Packaging Act of 1970.

Decomposition Breakdown of a material or substance (by heat, chemical reaction, electrolysis, decay, or other processes) into parts or elements or simpler compounds. Density The mass (weight) per unit volume of a substance. For example, lead is much more dense than aluminum.

Depressant A substance that reduces a bodily functional activity or an instinctive desire, such as appetite.

Dermal Toxicity Adverse effects resulting from skin exposure to a substance. Ordinarily used to denote effects in experimental animals.

DHHS U.S. Department of Health and Human Services (replaced U.S. Department of Health, Education and Welfare). NIOSH and the Public Health Service (PHS) are part of DHHS.

Dilution Ventilation Air flow designed to dilute contaminants to acceptable levels. Also see general ventilation or exhaust.

DOL U.S. Department of Labor. OSHA and MSHA are part of DOL.

DOT U.S. Department of Transportation regulates transportation of chemicals and other substances.

Dry Chemical A powered fire-extinguishing agent usually composed of sodium bicarbonate, potassium bicarbonate, etc.

Dysplasia An abnormality of development.

Dyspnia A sense of difficulty in breathing; shortness of breath.

Edema An abnormal accumulation of clear watery fluid in the tissues.

Environmental Toxicity Information obtained as a result of conducting environmental testing designed to study the effects on aquatic and plant life.

EPA U.S. Environmental Protection Agency.

Epidemiology Science concerned with the study of disease in a general population. Determination of the incidence (rate of occurrence) and distribution of a particular disease (as by age, sex, or occupation) which may provide information about the cause of the disease.

Epithelium The covering of internal and external surfaces of the body. Estrogen Principal female sex hormone.

Evaporation Rate The rate at which a material will vaporize (evaporate) when compared to the known rate of vaporization of a standard material. The evaporation rate can be useful in evaluating the health and fire hazards of a material. The designated standard material is usually normal butyl acetate (NBUAC or n-Bu-Ac), with a vaporization rate designated as 1.0. Vaporization rates of other solvents or materials are then classified as:

- FAST evaporating if greater than 3.0. Examples: Methyl Ethyl Ketone = 3.8, Acetone = 5.6, Hexane = 8.3.
- MEDIUM evaporating if 0.8 to 3.0. Examples: 190 proof (95%) Ethyl Alcohol = 1.4, VM&P Naphtha = 1.4, MIBK =1.6.
- SLOW evaporating if less than 0.8. Examples: Xylene = 0.6, Normal Butyl Alcohol = 0.4, Water = 0.3, Mineral Spirits = 0.1.

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

Exposure or Exposed State of being open and vulnerable to a hazardous chemical by inhalation, ingestion, skin contact, absorption, or any other course; includes potential (accidental or possible) exposure.

Extinguishing Media The firefighting substance to be used to control a material in the event of a fire. It is usually identified by its generic name, such as fog, foam, water, etc.

F Fahrenheit is a scale for measuring temperature. On the Fahrenheit scale, water boils at 212 °F and freezes at 32 °F.

Fibrosis An abnormal thickening of fibrous connective tissue, usually in the lungs.

FIFRA Federal Insecticide, Fungicide, and Rodenticide Act requires that certain useful poisons, such as chemical pesticides, sold to the public contain labels that carry health hazard warnings to protect users. It is administered by EPA.

Flammable A chemical that includes one of the following categories:

(a) "Aerosol, flammable." 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 the valve opening;

(b) 'Gas, flammable." (1) 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 (2) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12 percent by volume, regardless of the lower limit;

(c) "Liquid, flammable." Any liquid having a flashpoint below 100 °F (37.8 °C), except any mixture having components with flashpoints of 100 0C (37.8 °C) or higher, the total of which make up 99 percent or more of the total volume of the mixture;

(d) "Solid, flammable." A solid, other than a blasting agent or explosive as defined in 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A substance is 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.

Flashback Occurs when flame from a torch burns back into the tip, the torch, or the hose. It is often accompanied by a hissing or squealing sound with a smoky or sharp-pointed flame.

Flashpoint The minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested by the following methods:

(a) Tagliabue Closed Tester (see American National Standard Method of Test for Flash Point by Closed Tag Tester, Z11.24-1979 [ASTM D 56-79]).

(b) 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]).

(c) Setaflash Closed Tester (see American National Standard Method of Test for Flash Point by Setaflash Closed Tester [ASTM D 3278-78]).

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

Formula The scientific expression of the chemical composition of a material (e.g., water is H_2O, sulfuric acid is H_2SO_4, sulfur dioxide is SO_2).

Fume A solid condensation of particle of extremely small diameter, commonly generated from molten metal as metal fume.

General Exhaust A system for exhausting air containing contaminants from a general work area. Also see Local Exhaust.

Generic Name A designation or identification used to identify a chemical by other than its chemical name (e.g., code name, code number, trade name, and brand name). Genetic Pertaining to or carried by genes. Hereditary.

Grounding The procedure used to carry an electrical charge to ground through a conductive path. A typical ground may be connected directly to a conductive water pipe or to a grounding bus and ground rod. See Bonding.

Hand Protection Specific type of gloves or other hand protection required to prevent harmful exposure to hazardous materials.

Hazardous Chemical Any chemical whose presence or use is a physical hazard or a health hazard.

Hazard Warning Words, pictures, symbols, or combination thereof presented on a label or other appropriate form to inform of the presence of various materials.

HCS Hazardous Communication Standard is an OSHA regulation issued under 29 CFR Part 1910.1200.

Health Hazard A chemical for which there is 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 that are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents that act on the hematopoietic system, and agents that damage the lungs, skin, eyes, or mucous membranes.

Hemoglobin An iron-containing conjugated protein or respiratory pigment occurring in the red blood cells of vertebrates.

Hepatotoxin A substance that causes injury to the liver.

Highly Toxic A chemical in any of the following categories:

(a) A chemical with a median lethal dose (LD50) of 50 milligrams or less per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.

(b) A chemical with a median lethal dose (LD50) of 200 milligrams or less per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbit weighing between 2 and 3 kilograms each.

(c) A chemical with a median lethal concentration (LC50) in air of 200 parts per million by volume or less of gas or vapor, or 2 milligrams per liter or less of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within 1 hour) to albino rats weighing between 200 and 300 grams each.

Hyperplasia Increase in volume of tissue or organ caused by the growth of new cells.

IARC International Agency for Research on Cancer.

Ignitable Capable of being set on fire.

Impervious A material that does not allow another substance to pass through or penetrate it.

Incompatible Materials that could cause dangerous reactions by direct contact with one another.

Ingestion Taking in by the mouth.

Inhibitor A chemical added to another substance to prevent an unwanted chemical change.

Insoluble Incapable of being dissolved in a liquid.

Irritant A chemical, which is not corrosive, but which causes a reversible inflammatory effect on living tissue by chemical action at the site of contact. A chemical is a skin irritant if, when tested on the intact skin of albino rabbits by the methods of 16 CFR 1500.41 for 4 hours exposure or by other appropriate techniques, it results in an empirical score of 5 or more. A chemical is an eye irritant if so determined under the procedure listed in 16 CFR 1500.42 or other appropriate techniques.

Irritating As define by DOT, a property of a liquid or solid substance which, upon contact with fire or exposed to air, gives off dangerous or intensely irritating fumes (not including poisonous materials). See Poison, Class A and Poison, Class B.

Labels As of December 01, 2013 all employees who work with hazardous chemicals must be trained to the new labels as seen below. These labels will have pictograms and signal words.

Lacrimation Secretion and discharge of tears.

LC Lethal concentration is the concentration of a substance being tested that will kill.

LCL Lethal concentration, low, lowest concentration of a gas or vapor capable of killing a specified species over a specified time.

LC_{50} The concentration of a material in air that will kill 50 percent of a group of test animals with a single exposure (usually 1 to 4 hours). The LC50 is expressed as parts of material per million parts of air, by volume (ppm) for gases and vapors, or as micrograms of material per liter of air (g/l) or milligrams of material per cubic meter of air (mg/m3) for dusts and mists, as well as for gases and vapors.

LDL Lethal dose low, lowest administered dose of a material capable of killing a specified test species.

LD_{50} A single dose of material expected to kill 50 percent of a group of test animals. The LD_{50} dose is usually expressed as milligrams or grams of material per kilogram of animal body weight (mg/kg or g/kg). The material may be administered by mouth or applied to the skin.

LEL or LFL Lower explosive limit, or lower flammable limit, of a vapor or gas; the lowest concentration (lowest percentage of the substance in air) that will produce a flash of fire when an ignition source (heat, arc, or flame) is present. At concentrations lower than the LEL, the mixture is too "lean" to burn. Also see "UEL".

Lesion Any damage to a tissue.

Local Exhaust A system for capturing and exhausting contaminants from the air at the point where the contaminants are produced (welding, grinding, sanding, other processes or operations). Also see General Exhaust.

Malaise A feeling of general discomfort, distress, or uneasiness, an out-of-sorts feeling.

Malignant Tending to become progressively worse and to result in death.

Mechanical Exhaust A powered device, such as a motor-driven fan or air stream venturi tube, for exhausting contaminants from a workplace, vessel, or enclosure.

Mechanical Filter Respirator A respirator used to protect against airborne particulate matter like dusts, mists, metal fume, and smoke. Mechanical filter respirators do not provide protection against gases, vapors, or oxygen deficient atmospheres.

Melting Point The temperature at which a solid substance changes to a liquid state.

Metabolism Physical and chemical processes taking place among the ions, atoms, and molecules of the body.

Metastasis The transfer of disease from one organ or part to another not directly connected with it.

Mist Suspended liquid droplets generated by condensation from the gaseous to the liquid state, or by breaking up a liquid into a dispersed state, such as splashing, foaming or atomizing. Mist is formed when finely divided liquid is suspended in air.

Mixture Any combination of two or more chemicals if the combination is not, in whole or in part, the result of a chemical reaction.

mmHg Millimeters of mercury (Hg) is a unit of measurement for low pressures or partial vacuums.

Molecular Weight Weight (mass) of a molecule based on the sum of the atomic weights of the atoms that make up the molecule.

mppcf Million particles per cubic foot is a unit for expressing concentration of particles of a substance suspended in air. Exposure limits for mineral dusts (silica, graphite, Portland cement, nuisance dusts, and others), formerly expressed as mppcf, are now more commonly expressed as mg/m^3.

MSDS/SDS To be known as SDS in the future, the Safety Data Sheet will provide information about a hazardous chemical in a standard 16 part format with user information in the first 5 sections. The SDS will add pictograms and signal words for ease of use.

MSHA Mine Safety and Health Administration, U.S. Department of Labor.

Mutagen A substance or agent capable of altering the genetic material in a living cell.

N_2 Nitrogen is a colorless, odorless, and tasteless gas that will not burn and will not support combustion. The earth's atmosphere (air) is about 78 percent nitrogen. At higher concentrations, nitrogen can displace oxygen and become a lethal asphyxiant. See Asphyxiant.

Narcosis A state of stupor, unconsciousness, or arrested activity produced by the influence of narcotics or other chemicals.

Nausea Tendency to vomit, feeling of sickness at the stomach.

NCI National Cancer Institute is that part of the National Institutes of Health that studies cancer causes and prevention as well as diagnosis, treatment, and rehabilitation of cancer patients.

NFPA National Fire Protection Association is an international membership organization which promotes/improves fire protection and prevention and establishes safeguards against loss of life and property by fire. Best known on the industrial scene for the National Fire Codes - 16 volumes of codes, standards, recommended practices and manuals developed (and periodically updated) by NFPA technical committees. Among these is NFPA 704M, the code for showing hazards of materials as they might be encountered under fire or related emergency conditions, using the familiar diamond-shaped label or placard with appropriate numbers or symbols.

Neonatal The first four weeks alter birth.

Neoplasia A condition characterized by the presence of new growths (tumors).

Nephrotoxin A substance that causes injury to the kidneys.

Neurotoxin A material that affects the nerve cells and may produce emotional or behavioral abnormalities.

Neutralize To eliminate potential hazards by inactivating strong acids, caustics, and oxidizers. For example, acids can be neutralized by adding an appropriate amount of caustic substance to the spill.

NIOSH National Institute for Occupational Safety and Health, U.S. Public Health Service, U.S. Department of Health and Human Services (DHHS), among other activities, tests and certifies respiratory protective devices and air sampling detector tubes, recommends occupational exposure limits for various substances, and assists OSHA and MSHA in occupational safety and health investigations and research.

Nonflammable Not easily ignited, or if ignited, not burning rapidly.

Non-Sparking Tools Tools made from beryllium-copper or aluminum-bronze greatly reduce the possibility of igniting dusts, gases, or flammable vapors. Although these tools may emit some sparks when striking metal, the sparks have a low heat content and are not likely to ignite most flammable liquids.

NO_x Oxides of nitrogen which are undesirable air pollutants. NO emissions are regulated by EPA under the Clean Air Act.

NPIRS National Pesticide Information Retrieval System is an automated data base operated by Purdue University containing information on EPA registered pesticides, including reference file MSDS/SDS's.

NRC National Response Center is a notification center that must be called when significant oil or chemical spills or other environment-related accidents occur. The toll-free number is 1-800-424-8802.

NTP National Toxicology Program. The NTP publishes an Annual Report on Carcinogens. Odor A description of the smell of the substance.

Odor Threshold The lowest concentration of a substance's vapor, in air, that can be smelled.

Oral Toxicity Adverse effects resulting from taking a substance into the body by mouth. Ordinarily used to denote effects in experimental animals.

Organic Peroxide An organic compound that contains the bivalent -0-0 structure and may be considered a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

Organogenesis The formation of organs during development.

OSHA Occupational Safety and Health Administration, U.S. Department of Labor that oversees the administration of the OSH Act including implementation of minimal occupation health and safety standards.

Overexposure Exposure to a hazardous material beyond the allowable exposure limits.

Oxidation In a literal sense, oxidation is a reaction in which a substance combines with oxygen provided by an oxidizer or oxidizing agent. See Oxidizing Agent.

Oxidizing Agent A chemical or substance that brings about an oxidation reaction. The Agent may:

1) Provide the oxygen to the substance being oxidized (in which case the agent has to be oxygen or contain oxygen); or

2) It may receive electrons being transferred from the substance undergoing oxidation (chlorine is a good oxidizing agent for electron-transfer purposes, even though it contains no oxygen).

Pathologic Pertaining to or caused by disease. Pathology Scientific study of alterations produced by disease.

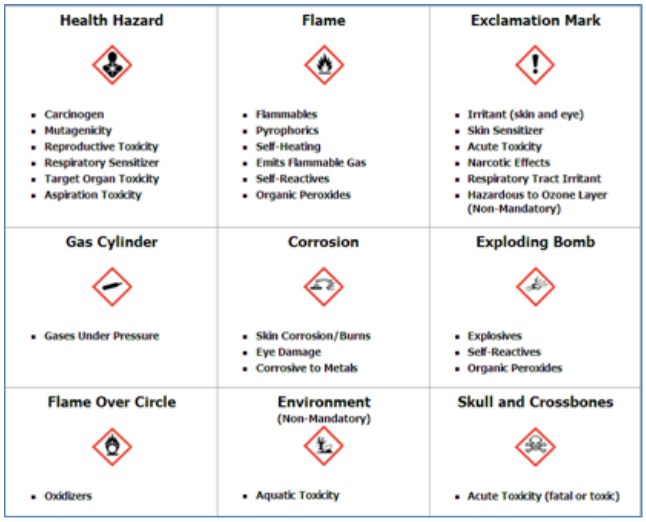
PEL Permissible Exposure Limit is an occupational exposure limit established by OSHA's regulatory authority. It may be a time-weighted average (TWA) limit or a maximum concentration exposure limit.

Percent Volatile Percent volatile by volume is the percentage of a liquid or solid (by volume) that will evaporate at an ambient temperature of 70 F (unless some other temperature is specified). Examples: butane, gasoline, and paint thinner (mineral spirits) are 100 percent volatile; their individual evaporation rates vary, but in time, each will evaporate completely.

pH The symbol relating to the hydrogen ion (H^+) concentration to that of a given standard solution. A pH of 7 is neutral. Numbers increasing from 7 to 14 indicate greater alkalinity. Numbers decreasing from 7 to 0 indicate greater acidity.

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

Pictograms are eight standard small point on end icons depicting chemical hazard categories n chemical labels that alert users to potential hazards. These will be mandatory on all chemical labels by the end of 2015.



PMCC Pensky-Martens Closed Cup. See Flashpoint.

Pneumoconiosis A condition of the lung in which there is permanent disposition of particulate matter and the tissue reaction to its presence. It may range from relatively harmless forms of iron oxide deposition to destructive forms of silicosis.

Poison, Class A A DOT term for extremely dangerous poisons-poisonous gases or liquids that, in very small amounts, either as gas or as vapor of the liquid, mixed with air, are dangerous to life. Examples: phosgene, cyanogen, hydrocyanic acid, nitrogen peroxide.

Poison, Class B A DOT term for liquid, solid, paste or semisolid substance-other than Class A poisons or irritating materials-that are known (or presumed on the basis of animal tests) to be so toxic to humans that they are a hazard to health during transportation.

Polymerization A chemical reaction in which one or more small molecules combine to form larger molecules. A hazardous polymerization is such a reaction that takes place at a rate that releases large amounts of energy. If hazardous polymerization can occur with a given material, the MSDS/SDS usually will list conditions that could start the reaction and since the material usually contains a polymerization inhibitor-the length of time during which the inhibitor will be effective.

ppb Parts per billion is the concentration of a gas or vapor in air-parts (by volume) of the gas or vapor in a billion parts of air. Usually used to express extremely low concentrations of unusually toxic gases or vapors; also the concentration of a particular substance in a liquid or solid.

ppm Parts per million is the concentration of a gas or vapor in air-parts (by volume) of the gas or vapor in a million parts of air; also the concentration of a particulate in a liquid or solid.

psi Pounds per square inch (for MSDS/SDS purposes) is the pressure a material exerts on the walls of a confining vessel or enclosure. For technical accuracy, pressure must be expressed as psig (pounds per square inch gauge) or psia (pounds per square inch absolute; that is, gauge pressure plus sea level atmospheric pressure, or psig plus approximately 14.7 pounds per square inch). Also see mmHg.

Pulmonary Edema Fluid in the lungs.

Pyrophoric A chemical that will ignite spontaneously in air at a temperature of 13 °F (54.4 °C) or below.

Reaction A chemical transformation or change. The interaction of two or more substances to form new substances.

Reactive See Unstable.

Reactivity Chemical reaction with the release of energy. Undesirable effects-such as pressure buildup, temperature increase, formation of noxious, toxic, or corrosive byproducts-may occur because of the reactivity of a substance to heating, burning, direct contact with other materials, or other conditions in use or storage.

Reducing Agent In a reduction reaction (which always occurs simultaneously with an oxidation reaction) the reducing agent is the chemical or substance which (1) combines with oxygen or (2) loses electrons to the reaction. See Oxidation.

REL The NIOSH REL (Recommended Exposure Limit) is the highest allowable airborne concentration which is not expected to injure the workers. It may be expressed as a ceiling limit or as a time-weighted average (TWA).

Reproductive Toxin Substances that affect either male or female reproductive systems and may impair the ability to have children.

Respiratory Protection Devices that will protect the wearer's respiratory system from overexposure by inhalation to airborne contaminants. Respiratory protection is used when a worker must work in an area where he/she might be exposed to concentration in excess of the allowable exposure limit.

Respiratory System The breathing system that includes the lungs and the air passages (trachea or windpipe, larynx, mouth, and nose) to the air outside the body, plus the associated nervous and circulatory supply.

Routes of Entry The means by which material may gain access to the body, for example, inhalation, ingestion, and skin contact.

RCRA Resource Conservation and Recovery Act is environmental legislation aimed at controlling the generation, treating, storage, transportation, and disposal of hazardous wastes. It is administered by EPA.

Sarcoma A tumor that is often malignant.

Self-Contained Breathing Apparatus A respiratory protection device that consists of a supply or a means of respirable air, oxygen, or oxygen-generating material, carried by the wearer.

Sensitizer A chemical that causes a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical.

SETA Setaflash Closed Tester. See Flashpoint.

Signal Words are beneath pictograms on hazardous chemical labels. These words summarize the overall hazard of the chemical.


SAMPLE LABEL

PRODUCT IDENTIFIER

CODE _____
Product Name _____

SUPPLIER IDENTIFICATION

Company Name_____
Street Address _____
City _____ State _____
Postal Code _____ Country _____
Emergency Phone Number _____

PRECAUTIONARY STATEMENTS

Keep container tightly closed. Store in cool, well ventilated place that is locked.
Keep away from heat/sparks/open flame. No smoking.
Only use non-sparking tools.
Use explosion-proof electrical equipment.
Take precautionary measure against static discharge.
Ground and bond container and receiving equipment.
Do not breathe vapors.
Wear Protective gloves.
Do not eat, drink or smoke when using this product.
Wash hands thoroughly after handling.
Dispose of in accordance with local, regional, national, international regulations as specified.

In Case of Fire: use dry chemical (BC) or Carbon dioxide (CO_2) fire extinguisher to extinguish.

First Aid
If exposed call Poison Center.
If on skin (on hair): Take off immediately any contaminated clothing. Rinse skin with water.

HAZARD PICTOGRAMS

SIGNAL WORD
Danger

Highly flammable liquid and vapor.
May cause liver and kidney damage.

SUPPLEMENTAL INFORMATION

Directions for use

_____
_____
_____

Fill weight: _____ Lot Number _____
Gross weight: _____ Fill Date: _____
Expiration Date: _____

Silicosis A disease of the lungs (fibrosis) caused by the inhalation of silica dust.

"Skin" A notation (sometimes used with PEL or TLV exposure data) that indicates the stated substance may be absorbed by the skin, mucous membranes, and eyes-either airborne or by direct contact-and that this additional exposure must be considered part of the total exposure to avoid exceeding the PEL or TLV for the substance.

Skin Absorption Ability of some hazardous chemicals to pass directly through the skin and enter the bloodstream.

Skin Sensitizer See Sensitizer.

Skin Toxicity See Dermal Toxicity.

Solubility in Water A term expressing the percentage of a material (by weight) that will dissolve in water at ambient temperature. Solubility information can be useful in determining spill cleanup methods and reextinguishing agents and methods for materials.

Solvent A substance, usually a liquid, in which other substances are dissolved. The most common solvent is water.

SO_x Oxides of sulfur.

Specific Chemical Identity The chemical name, Chemical Abstracts Service (CAS) Registry Number, or any precise chemical designation of a substance.

Specific Gravity The weight of a material compared to the weight of an equal volume of water is an expression of the density (or heaviness) of a material. Insoluble materials with specific gravity of less than 1.0 will float in (or on) water. Insoluble materials with specific gravity greater than 1.0 will sink in water. Most (but not all) flammable liquids have a specific gravity less than 1.0 and, if not soluble, will float on water-an important consideration for fire suppression.

Spill or Leak Procedures The methods, equipment, and precautions that should be used to control or clean up a leak or spill.

Splash-Proof Goggles Eye protection made of a noncorrosive material that fits snugly against the face, and has indirect ventilation ports.

Spontaneously Combustible A material that ignites as a result of retained heat from processing, or that will oxidize to generate heat and ignite, or that absorbs moisture to generate heat and ignite.

Squamous Scaly or platelike.

Stability The ability of a material to remain unchanged. For MSDS/SDS purposes, a material is stable if it remains in the same form under expected and reasonable conditions of storage or use. Conditions that may cause instability (dangerous change) are stated; for example, temperatures above 150 °F; shock from dropping.

STEL Short-Term Exposure Limit (ACGIH terminology). See TLV.

Stenosis Narrowing of a body passage or opening.

Steroid A complex molecule among which are the male and female sex hormones.

Subcutaneous Beneath the layers of the skin.

Supplied-Air Respirators Air line respirators of self-contained breathing apparatus.

Systemic Poison A poison that spreads throughout the body, affecting all body Systems and organs. Its adverse effect is not localized in one spot or area.

Systemic Toxicity Adverse effects caused by a substance that affects the body in a general rather than local manner.

Synonym Another name or names by which a material is known. Methyl alcohol, for example, is known as methanol or wood alcohol.

Target Organ Toxin A toxic substance that attacks a specific organ of the body. For example, overexposure to carbon tetrachloride can cause liver damage.

TCC Tag (Tagliabue) Closed Cup. See Flashpoint.

TCL Toxic concentration low, the lowest concentration of a gas or vapor capable of producing a defined toxic effect in a specified test species over a specified time.

TDL Toxic dose low, lowest administered dose of a material capable of producing a defined toxic effect in a specified test species.

Teratogen A substance or agent, exposure to which by a pregnant female can result in malformations in the fetus.

TLV Threshold Limit Value is a term used by ACGIH to express the airborne concentration of material to which nearly all persons can be exposed day after day without adverse effects. ACGIH expresses TLV's in three different ways:

- TLV-TWA: The allowable Time-Weighted Average concentration for a normal 8 hour workday or 80-hour workweek.
- TLV-STEL: The Short-Term Exposure Limit, or maximum concentration for a continuous 15-minute exposure period (maximum of four such periods per day, with at least 60 minutes between exposure periods, and provided the daily TLV-TWA is not exceeded).
- TLV-C: The ceiling exposure limit-the concentration that should not be exceeded even instantaneously.

Toxic A chemical falling within any of the following categories:

(a) A chemical that has a median lethal dose (LD_{50}) of more than 50 milligrams per kilogram but not more than 500 milligrams per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.

(b) A chemical that has a median lethal dose (LD_{50}) of more than 200 milligrams per kilogram but not more than 1,000 milligrams per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each.

(c) A chemical that has a median lethal concentration (LC50) in air of more than 200 parts per million but not more than 2,000 parts per million by volume of gas or vapor, or more than two milligrams per liter but not more than 20 milligrams per liter of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within 1 hour) to albino rats weighing between 200 and 300 grams each.

Toxic Substance Any substance that can cause acute or chronic injury to the human body, or which is suspected of being able to cause diseases or injury under some conditions.

Toxicity The sum of adverse effects resulting from exposure to a material, generally, by the mouth, skin, or respiratory tract.

Trade Name The trademark name or commercial trade name for a material or product. transplacental An agent that causes physical defects in the developing embryo.

TSCA Toxic Substances Control Act (Federal Environmental Legislation administered by EPA) regulates the manufacture, handling, and use of materials classified as "toxic substances".

TWA Time-Weighted Average exposure is the airborne concentration of a material to which a person is exposed, averaged over the total exposure time-generally the total workday (8 to 12 hours). Also see TLV.

UEL or UFL Upper explosive limit or upper flammable limit of a vapor or gas; the highest concentration (highest percentage of the substance in air) that will produce a flash of fire when an ignition source (heat, arc, or flame) is present. At higher concentrations, the mixture is too "rich" to burn. Also see LEL.

Unstable Tending toward decomposition or other unwanted chemical change during normal handling or storage.

Unstable Reactive A chemical that, in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or become self-reactive under conditions of shocks, pressure, or temperature.

USDA U.S. Department of Agriculture.

Vapor The gaseous form of a solid or liquid substance as it evaporates.

Vapor Density The weight of a vapor or gas compared to the weight of an equal volume of air is an expression of the density of the vapor or gas. Materials lighter than air have vapor densities less than 1.0 (examples: acetylene, methane, hydrogen). Materials heavier than air (examples: propane, hydrogen sulfide, ethane, butane, chlorine, sulfur dioxide) have vapor densities greater than 1.0. All vapors and gases will mix with air, but the lighter materials will tend to rise and dissipate (unless confined). Heavier vapors and gases are likely to concentrate in low places - along or under floors, in sumps, sewers, and manholes, in trenches and ditches - where they may create health hazards or fires.

Vapor Pressure The pressure exerted by a saturated vapor above its own liquid in a closed container. When quality control tests are performed on products, the test temperature is usually 100 °F, and the vapor pressure is expressed as pounds per square inch (psig or psia), but vapor pressures reported as MSDS/SDS's are in millimeters of mercury (mmHg) at 68 °F (20 °C), unless stated otherwise. Three facts are important to remember:

1. Vapor pressure of a substance at 100 °F will always be higher than the vapor pressure of the substance at 68 °F (20 °C).

2. Vapor pressures reported on MSDS/SDS's in mmHg are usually very low pressures; 760 mmHg is equivalent to 14.7 pounds per square inch.

3. The lower the boiling point of a substance, the higher its vapor pressure. Ventilation See General Exhaust, Local Exhaust, and Mechanical Exhaust.

Vermiculite An expanded mica (hydrated magnesium-aluminum-iron silicate) used as sorbent for spill control and cleanup.

Viscosity The tendency of a fluid to resist internal flow without regard to its density. Volatility A measure of how quickly a substance forms a vapor at ordinary temperatures.

Water Disposal Methods Proper disposal methods for contaminated material, recovered liquids or solids, and their containers.

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

Work Area A room or defined space in a workplace where hazardous chemicals are produced or used, and where employees are present.

Workplace An establishment at one geographical location containing one or more work areas.

Zinc Fume Fever A condition brought on by inhalation of zinc oxide fume characterized by flu-like symptoms with a metallic taste in the mouth, coughing, weakness, fatigue, muscular pain, and nausea, followed by fever and chills. The onset of symptoms occurs four to twelve hours after exposure.

APPENDIX B

DOT HAZARD CLASSIFICATION LIST

HAZARD CLASSIFICATIONS	EXAMPLES
blasting agents	plastic explosives
combustible liquids	kerosene
corrosive material	**hydrochloric acid**
etiological agents	**microorganisms (E. Coli)/anthrax**
explosive C	fireworks
explosives A & B	dynamite
flammable gases	oxygen
flammable liquids	**alcohol**
flammable solids	picric acid/10% wet
irritating material	lacrimator
non-flammable compressed gases	nitrogen
organic peroxide	benzoyl peroxide
***ORM-A**	**formaldehyde**
ORM-B	mercury
ORM-C	asbestos
ORM-D	bleach
ORM-E	ferric sulfate
oxidizer	nitric acid
poison A	heptachlor
poison B	phenol
pyrophoric liquids	phosphorus hydrides
radioactive material	CO-60 or I-130

* ORM= other regulated material

APPENDIX C

EPA HAZARD CLASSIFICATION LIST

1. IGNITABLE WASTE	Flash point <140º F
	Flammable solids (10)
	Oxidizers (11)
	Flammable Gasses (8)
	Some combustible liquids (9)
	Flammable liquids (5)
	Pyrophoric liquids (6)
2. CORROSIVES	Any liquid of pH ≤ 2 or ≥ 12.5 (12)
3. REACTIVE	Explosives A, B or C (1, 2, or 3)
	Water reactive
	Cyanide or sulfide
	Organic peroxides
	Poison B (15)
4. EXTRACTION PROCEDURE (E) TOXIC	
Metals	Arsenic
	Beryllium
	Cadmium
	Chromium
	Lead
	Mercury
	Silver
	Thallium
Peptides	Endrin
	Lindane
	Methoxychlor
	Toxzphene
Herbicides	2,4, D
	2,4,5, T
Poison and some Poison B (14 and 15)	
Irritating material (13)	
Radioactive material (4)	
ORM-A-B-C (17, 18, and 19)	
ORM-E (21)	

**Note: Numerals in parenthesis indicate chemical categories on the DOT list.

APPENDIX D

TARGET ORGAN LIST

A list of target organ effects shall be available in a central location for access by all employees. Chemicals listed are representative examples and not a complete listing of substances in each category.

HEPATOTOXINS—Chemicals that produce liver damage

Signs & Symptoms: jaundice; enlarged liver
Chemicals: Carbon tetrachloride, nitrosamines

NEPHROTOXINS—Chemicals that produce kidney damage

Signs % Symptoms: edema, proteinuria
Chemicals: halogenated hydrocarbons, uranium

NEUROTOXINS—Chemicals that produce their primary toxic effects on the nervous system

Signs & Symptoms: narcosis, behavioral changes, decreases in motor functions
Chemicals: mercury, carbon disulfide

AGENTS THAT ACT ON THE BLOOD OR HEMATOPOIETIC SYSTEM – Decrease hemoglobin function; deprive body tissue of oxygen

Signs & Symptoms: cyanosis, loss of consciousness
Chemicals: carbon monoxide cyanides

AGENTS THAT DAMAGE THE LUNGS—Chemicals that irritate or damage the pulmonary tissue

Signs & Symptoms: cough, tightness in chest, shortness of breath
Chemicals: silica, asbestos

REPRODUCTIVE TOXINS—Chemicals that affect the reproductive capabilities including the chromosomal damage - mutations and effects on fetuses (teratogenesis)

Signs & Symptoms: birth defects, sterility
Chemicals: lead

CUTANEOUS HAZARDS—Chemicals that affect the dermal layer of the body

Signs & Symptoms: defatting of the skin, rashes, and irritation
Chemicals: ketones chlorinated compounds

EYE HAZARDS—Chemicals that affect the eye or visual capacity

Signs & Symptoms: conjunctivitis; corneal damage
Chemicals: organic solvents, acids

APPENDIX E

TARGET ORGAN EFFECTS

The following is a target organ categorization of effects that may occur. These examples are presented to illustrate the range and diversity of effects and hazards found in the workplace, and the broad scope employers must consider in this area, but they are not intended to be all inclusive.

(a) Hepatotoxins	Chemicals that produce liver damage.
Signs and Symptoms	Jaundice; liver enlargement.
Chemicals	Carbon tetrachloride; nitrosamines.
(b) Nephrotoxins	Chemicals that produce kidney damage.
Signs and Symptoms	Edema; proteinuria.
Chemicals	Halogenated hydrocarbons; uranium.
(c) Neurotoxins	Chemicals that produce their primary toxic effects on the nervous system.
Signs and Symptoms	Narcosis; behavioral changes; decrease in motor functions.
Chemicals	Mercury; carbon disulfide.
(d) Agents that act on blood hematopoietic system	Decrease in hemoglobin function; deprive the body tissues of oxygen.
Signs and Symptoms	Cyanosis; loss of consciousness.
Chemicals	Carbon monoxide; cyanides.
(e) Agents that damage the lung	Chemicals that irritate or damage the pulmonary tissue.
Signs and Symptoms	Cough; tightness in chest; shortness of breath.
Chemicals	Silica; asbestos.
(f) Reproductive toxins	Chemicals that adversely affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).
Signs and Symptoms	Birth defects; sterility.
Chemicals	Lead; DBCP.
(g) Cutaneous hazards	Chemicals that affect the dermal layer of the body.
Signs and Symptoms	Defatting of the skin; rashes, irritation
Chemicals	Ketones; chlorinated compounds.
(h) Eye hazards	Chemicals that effect the eye or visual capacity.
Signs and Symptoms	Conjunctivitis; corneal damage.
Chemicals	Organic solvents; acids.

APPENDIX F

HAZARDOUS WASTE DISPOSAL AT REGIONAL REFERENCE LAB

Main Storage Area – all 55 gallon drums must be labeled "Hazardous Waste" and dated with "date started." The hazardous label is provided by Clean Harbor. The container must be closed at all times except for when adding waste.

Satellite Accumulation Area (SAA) – Histology tissue processing room has a temporary storage area of hazardous waste. Alcohol, Xylene and Formalin are generated during the day while changing tissue processors, stainers, etc.

All employees must wear appropriate PPE while disposing of chemicals. Lab coats, gloves, goggles or face shields are required. The face shield is kept in the main storage area.

1. Full containers from the Satellite Accumulation area must be placed on a cart and transported to the Main Storage area. Employees must wear PPE while performing this task.

2. For full barrels, call Clean Harbor Environmental Services. Provide the pickup location at Regional Reference Laboratory and ask for replacement barrels for each barrel picked up.

3. Provide our phone number so we can be notified of the pickup date and write the date on the board to inform all when the pickup will be.

4. After Clean Harbor arrives, lab personnel who have been DOT trained can release and sign the Hazardous Waste manifest.

5. Signed copies of the manifest will be kept in the Histology Dept. manager's office in a binder labeled "Hazardous Waste Disposal."

6. Clean Harbor will give the original signed copy of the manifest to RRL at the time of pick up. After the chemicals are destroyed a copy of the manifest will be mailed to RRL by Clean Harbor. This copy will be attached to the original and retained indefinitely.

APPENDIX G

INCOMPATIBLE STORAGE LIST
FOR REGIONAL REFERENCE LAB

There are nine recommended storage groups for incompatible chemicals. Seven of the nine are for the storage of liquids because of the hazards posed by these chemicals. For reactives and solids there are specific instructions that may apply depending on the chemical. Work with your WH&S professional and chemical hygiene officer to ensure proper segregation is in place for your incompatible materials.

Many of the liquid chemicals may fall under more than one group, the chemical should be stored in the lowest number group. 1 being the lowest number and 9 being the highest number.

Group 1 Flammable and Combustible Liquids

Flammable liquids are liquids that have a flash point of less than 100 F. Examples are all alcohols, acetone, ether, histoclad, xylene.

Store flammable liquids in cabinets. Combustible liquids and Volatile Poisons are known to be compatible and can be stored next to flammable liquids. Combustible liquids are those with a flashpoint greater than 100º F but less than 200º F. Examples are Motor oil, fuel oil, diesel oil, oil based paints, and formalin with methanol.

Store stock in flammable storage cabinets, keep unprotected in-use containers and quantity to a minimum.

See NEH&S Flammable and Combustible Liquids Storage document.

Group 2 Poisons – Volatile

These are chemicals that are poisons, toxics, and suspected carcinogens with strong odors and or evaporation rate greater than 1. Examples, Chloroform, Mercaptoethanol, methylene choride, phenol.

Primary storage concern is to prevent inhalation hazards.

Recommended storage: flammable storage cabinet.

Group 3 Acids – Oxidizing Liquid

All oxidizing acids are highly reactive with most substances and each other. Examples nitric, sulfuric, perchloric, phosphoric and chromic acids.

Primary storage concern: preventing contact and reaction with each other and other substances and corrosive action on surfaces.

Recommended storage: in an acid safety cabinet and each acid in secondary containment.

Compatible storage groups: Oxidizing Acids must be double contained and should be segregated in their own compartment in an acid safety cabinet. Store oxidizing acids on the bottom shelf. Organic and Mineral Acids may be stored in the same cabinet as long as segregation is maintained.

Group 4 Acids – Organic and Mineral Liquid

Examples: Acetic, formic, glacial acetic and hydrochloric acids.

Primary Storage Concern: To prevent contact and reaction with bases and oxidizing acids and corrosive action on surfaces.

Recommended Storage: Acid Safety Cabinet.

Compatible Storage Groups: Store on top shelves if Oxidizing acids are stored in the same cabinet. Store acids in secondary containment. These acids are very reactive with other acids and acids that are corrosive such as acetic anhydride should be isolated. It is best to store corrosive acids with group 7 non-volatile liquid poisons.

Group 5 Bases – Liquid

Examples: sodium hydroxide, ammonium hydroxide, calcium hydroxide, glutaraldehyde, Cidex OPA.

Primary Storage Concern: preventing contact and reaction with acids.

Recommendations: store in secondary containment or in isolated areas.

Compatible storage groups: may be stored with flammables in the flammable cabinet if volatile poisons are not stored in the flammable cabinet.

Group 6 Oxidizer – Liquid

Oxidizing liquids react with everything, potentially causing explosions or corrosion of surfaces.
Examples: Hydrogen Peroxide (if greater than or equal to 30%).

Primary Storage Concern: isolate from other chemicals.

Recommendations store quantities greater than 3 liters in secondary containment.

Compatible Storage Groups: None

Group 7 Poisons – Non-Volatile Liquid Poisons

Includes Highly Toxic and toxic chemicals, known carcinogens, suspected carcinogens, and mutagens.
Examples Chemo Drugs, acrylamine solutions.

Primary storage concerns: to prevent contact and reaction with other chemicals

Recommended Storage: In second containment in a controlled environment

Compatible Storage Groups: non-hazardous liquids (buffer solutions)

Group 8 Reactives - Metal Hydrides and Pyrophorics

Most metal hydrides react violently with water, some ignite spontaneously in air.
Examples: Lithium

Primary Storage Concern: prevent contact with liquid and sometimes air.

Compatible Storage Groups: If stored in secondary containment, may store where Group 9 Dry solids are stored.

Group 9 Solids (Includes all powders, hazardous and non-hazardous)

Primary storage concern: to prevent contact with liquids.

Recommended storage: Store in cabinets, store above liquids; ensure warning labels are visible.