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# 1.0 Purpose

This policy is intended to provide direction and assistance for employees who need to be aware of the potential chemical hazards in their workplace and complies with OSHA's "Hazard Communication Standard" 29CFR 1910.1200. The standard is based on the premise that employees have a need and a right to know and understand the hazards associated with the chemicals that they may be exposed to during the process of their daily work activities. In addition, it is designed to give employees information on how to protect themselves from the hazards.

The purpose of this program is to ensure that employees understand where they can obtain information about the chemicals they work with, what that information means and how to protect themselves.

# 2.0 Scope

This policy is designed to meet the needs of all university employees who work with or around potential chemical hazards including regular staff, administrative staff, faculty and students.

All affected employees (employees who are potentially exposed to chemicals during their normal work activities) shall receive Hazard Communication training on an annual basis, shall have a copy of this policy available to them and shall be provided necessary Personal Protective Equipment (PPE) when needed, at no cost to them. This training shall be provided by Risk Management and Safety (hereinafter RM&S) or a qualified outside contractor.

# 3.0 Responsibilities

It is important that all responsible parties of this program understand their individual responsibilities and carry them out so that the "communication" link is not broken, allowing all program requirements to be met. A successful Hazard Communication Program requires a commitment at every level of the University.

## 3.1 Risk Management and Safety (RM&S)

It is the responsibility of RM&S is to provide the following services to the University and its employees:

**A. Development and Maintenance of the Policy**

RM&S shall develop the Hazard Communication Program which serves to protect University employees and comply with Federal OSHA standards. RM&S shall review the policy annually and make changes when necessary.

**B. Maintain Material Safety Data Sheets.**

RM&S shall maintain paper copies or computer access to material safety data sheets (MSDS's) on the chemical products that each department uses. The location and method of access to these MSDS's shall be communicated to all affected employees of the program. As new products are purchased by departments, a copy of the MSDS received from the product manufacturer shall be sent to RM&S. The original MSDS shall be maintained by the department and inserted into the MSDS book for their products.

**C. Training**

RM&S shall provide training to all affected departments on an annual basis. This training shall comply with the training requirements outlined in 29CFR 1910.1200 (see "Training" section 5.0 )

**D. Providing Consultation**

RM&S shall be available to all University staff, administrators, faculty and students for inquiries they may have about chemical hazards in their workplace or assistance with related problems.

**E. Assessing Workplace Hazards**

When notified of changes in the workplace, RM&S shall review the changes and assist with the development of safe protocols and personal protective equipment needs.

When seeking to control chemical hazards in the work place, RM&S will first review the feasibility of engineering controls to eliminate the hazard. Secondly, administrative or work practice changes will be considered. When potential exposures are still foreseeable, personal protective equipment requirements will be implemented. The initiation of these evaluations will rely on effective communications with departmental supervisors.

## 3.2 Departments

It is the responsibility of the individual university departments to see that the following items are met:

**A. Scheduling of training**

It is the responsibility of each department to ensure that their employees receive annual Hazard Communication training. The supervisors shall contact RM&S to schedule the training session(s) for their employees and ensure that all of their employees attend the training.

**B. Addressing Employee Concerns**

It is essential that supervisors of affected employees listen to their employee concerns and address them as necessary. They may utilize the expertise of RM&S when needed. No safety related employee inquiries should go unanswered.

**C. Maintaining MSDS's**

It is the responsibility of the supervisory department to provide an updated MSDS book complete with all MSDS's for their employees to access. This includes the need for the department to request and receive an MSDS on all new products that are ordered from the Manufacturer or Distributor of each product. A copy of each new MSDS shall also be sent to RM&S for their records and review.

**D. Insuring That All Containers Are Labeled**

All chemical containers shall be labeled (see "Labeling" section 4.1).

**E. Notifying Risk Management And Safety (RM&S)**

Supervisory departments shall communicate important information when changes occur in their department. This includes the need to:

1) Notify RM&S when processes and protocols have changed.
2) Notify RM&S when new chemicals are being ordered and used, or are added to chemical inventories.
3) Notify RM&S when new employees are hired who need Hazard Communication training.

**F. Providing Necessary Protection**

It is the department's responsibility to ensure that employees are properly protected against potential chemical hazards. This shall be done at the expense of the department, in consultation with RM&S as protective needs are discovered. Such protective measures include but are not limited to (also see the University's Personal Protective Equipment Policy):

1) Gloves
2) Goggles
3) Safety glasses
4) Face shields
5) Protective clothing
6) Protective boots
7) Tools, equipment and barriers which minimize exposure

**G. Providing Emergency Contact Information.**

Each department is responsible for providing an updated list of all emergency contacts for their department to RM&S (See Appendix B, "Emergency Contact Information By Department"). The list shall include the person's name, job title, work phone and home phone.

**H. Providing translation.**

It is the responsibility of each department to provide translation to employees who cannot understand hazard information due to communication barriers such as inability to:

1) Understand the English language,
2) Read the English language,
3) See effectively,
4) Hear effectively, or
5) Have other barriers that interfere with communication

## 3.3 Employee Responsibilties

Often the first person who is in a position to identify a chemical hazard is the employee who performs the duties that involve the chemical itself. Because of this, it is critical that all affected employees pay attention to workplace hazards and continually try to identify the hazards before potential exposures or accidents occur. Employees are expected to apply the knowledge they receive from annual training to their workplace for the identification of potential hazards and are expected to notify their supervisor when such hazards exist. The following are the responsibilities of each affected employee:

**A. Attend Training**

The purpose of annual Hazard Communication training is to supply each employee with the tools necessary to identify and understand hazards and how to protect themselves from the hazards. Without the training, employees may lack such knowledge and may not be able to adequately protect themselves. It is with that idea that employees who do not attend their mandatory training will be held responsible for their own actions.

**B. Communicate with Supervisor**

It is essential that employees communicate hazards in the workplace with their supervisor so that the hazards may be appropriately addressed and proper protection supplied. In addition, employees shall inform their supervisor of other related concerns, such as PPE size needs, discomforts they are experiencing and communication barriers (including inability to read or understand the English laugage or visual and hearing problems) which interfere with his/her ability to understand the hazards in their workplace. Communication is also necessary by employees who witness other employees not following safe protocol in the workplace.

**C. Following Safe Procedures**

When departments implement safe work practices, it is a condition of employment that all affected employees follow the procedures and safe practices which have been communicated to him/her.

**D. Maintaining and Inspecting Personal Protective Equipment**

It is the employee's responsibility to properly maintain and store his/her assigned personal protective equipment and to inspect it before each use. Adequate training will be provided during annual Hazard Communication training. Also see the University's Personal Protective Equipment Policy which is available through RM&S.

# 4.0 Labeling and Hazard Identification

There are essentially four methods an employee can use to find hazard information about the chemicals he/she works with. The methods will be communicated to employees during annual training and they include referring to labels, MSDS's, supervisors and RM&S.

# 4.1 Labeling

The original containers of all chemicals shall have labels on them that indicate the chemical name and have hazard warning information. Employee training will provide employees with an understanding of what the hazard information means (see "Training" section 5.0).

Labels may be provided by chemical product manufacturers, chemical product suppliers, the supervising department or by RM&S. The following describes the labeling requirements for the four different types of containers:

A. **Primary Containers**: These are the original containers that arrived from the manufacturer or distributor and they must contain the following:

1) Chemical identity
2) Hazard warnings
3) Name and address of the manufacturer

B. **Secondary containers**: When chemicals are transferred from their original containers into a standard storage container (such as gas cans, chemical storage jugs, etc), the storage container is considered a secondary container and should contain the following:

1) Chemical identity
2) Hazard warnings or NFPA's hazard diamond

C. **Stationary Containers:** These are containers that store chemicals but stay stationary such as storage tanks, chemical process containers, vats, etc. These containers shall include the following:

1) Chemical identity
2) Hazard warnings or NFPA's Hazard Diamond

D. **Portable Containers:** When chemicals are transferred into smaller containers for purposes of it's work application, it is considered a portable chemical container and shall include the following:

1) Chemical identity
2) If it will not be emptied by the end of the user's shift, hazard warning information shall be identified.

## 4.2 Material Safety Data Sheets

Material Safety Data Sheets (MSDS's) are developed by the chemical manufacturer or by other accepted MSDS producing and managing companies and are required to have certain hazard information about the chemicals. Employee training will provide employees with an understanding of what the hazard information means (see "Training" section 5.0). As a resource to assist employees with an understanding of terminology used on MSDS's, Appendix A, "Definitions To Understand Hazard Information", has been provided in this policy.

MSDS's shall be maintained by each department in conjunction with RM&S and shall be located where all affected employees can access them and should be clearly marked and communicated to affected employees.

MSDS's shall include the following information in English:

- The name, address and telephone number of the chemical manufacturer
- The identity used on the label
- It's chemical and common name, if applicable
- The percentages of each hazardous chemical it contains
- Physical and chemical characteristics of the hazardous chemical(s) it contains (such as vapor pressure, flash points, etc)
- The health hazards on the contents, including signs and symptoms of over exposure, and medical conditions which are generally recognized as being aggravated by exposure to the chemical
- The physical hazards on the contents, including fire, explosion and reactivity potentials
- The primary route(s) of entry

- Emergency and first aid procedures
- The OSHA permissible exposure limits, ACGIH Threshold Limit Values, and other exposure limit used or recommended by the chemical manufacturer where available
- Notification of whether the chemical is listed in the National Toxicology Program (NTP) Annual Report on Carcinogens, or has been found to be a potential Carcinogen by OSHA
- Any applicable precautions for safe handling and use that are known to the manufacturer
- Any applicable control measures that are known by the chemical manufacturer, such as engineering controls, work practices, or PPE
- A date of the preparation of the MSDS or last change to it
- Spill and emergency response information
- Hazardous waste disposal method

## 4.3 Consulting with His/Her Supervisor

Supervisors shall be available to assist employees who seek information regarding the hazards associated with the chemicals they work with.

## 4.4 Consulting with Risk Management and Safety

RM&S shall be available to employees and their supervisors to assist with inquiries about chemicals they work with, their associated hazards and how to protect themselves from the hazards.

# 5.0 Training

Employee training is a critical component in the Hazard Communication Program and is designed to focus on communicating information about hazards and how employees can work safely in the presence of potential hazards. The training will be administered to affected employees on an annual basis and initial training shall take place before an affected employee begins working with chemicals. Such training shall be initiated by the employee's supervisor. The following items shall be covered during Hazard Communication training:

- The purpose of training
- The locations of where they can find information about chemical hazards in his/her work environment
- Review Material Safety Data Sheets, including the various different types of information found on an MSDS and their location
- Labeling requirements
- Definitions of terms used on labels and MSDS's

- Where employees can find the University's Hazard Communication Policy
- Employee rights and responsibilities
- The University's responsibilities
- Methods of protection against chemical hazards
- A review of Personal Protective Equipment Policy requirements
- A review of the proper use of employee personal protective equipment, including which PPE is needed, when it is needed, how to put it on and take it off, how to adjust and wear it, it's limitations, proper care and storage of it and how to dispose of it
- A description of the different types of physical hazards associated with chemicals in their workplace
- A description of the different types of health hazards associated with the chemicals in their workplace
- An explanation of the different routes of entry and chemical can take to enter the body
- Procedures to take in the event of emergencies involving chemicals
- An explanation of responsibilities for chemical spill clean ups
- For employees who work in buildings were asbestos containing building materials may be present, an explanation of it's hazards, potential locations for it, potential health effects of asbestos will be communicated. In addition, the purpose for asbestos warning signs will be discussed
- Hazardous waste disposal procedures

Employees shall always be given an opportunity to ask questions during or following training sessions.

It is up to the individual department to provide translation to employees who are unable to understand the English language or are unable to read, see or understand MSDS's, labels, signage, training quizzes or training sessions and insure that they understand safety information.

Employees shall demonstrate that they have retained knowledge that was communicated to them regarding the Hazard Communication Program. This may be conducted through any of a number of different methods, including Personal Protective Equipment demonstrations and written training quizzes.

# 6.0 Chemical Emergency Procedures

An emergency is any incident resulting from the use of hazardous chemicals that presents or threatens to present an internal or external chemical hazard to personnel. In an emergency, the primary concern must always be the protection of human life and health. The secondary concern is the confinement or abatement of chemical contamination to the local area of the accident, if possible. To ensure that the proper steps are taken, the following is the general procedure:

A. **First Response:**

In the event of an emergency (spill or personal contamination), the supervisor of the employee involved shall be notified as soon as reasonably possible. If additional emergency assistance is necessary, call 911. Then take the following steps for each of the respective types of emergency:

**1) Personal Contamination:**

a) In the event of a serious life threatening injury or if the victim is not responsive, 911 shall be called and the victim will be transported to the appropriate medical facility.

a) The site of the personal contamination shall be flushed with water for at least 15minutes.

b) His/Her supervisor shall be notified

c) The supervisor shall send the employee to University Health Services along with a completed "authorization to treat" form (see RM&S web site, www.nd.edu/~riskman/, for a copy).

d) The supervisor fills out an "Indiana First Report of Injury" form (the worker compensation form) and faxes it to RM&S after the employee has been sent for medical evaluation (see RM&S's web site, www.nd.edu/~riskman/, for a copy).

e) When victims refuse medical treatment, the supervisor shall still complete an "Near Miss Report" form, and shall document that the employee was offered evaluation and treatment but refused, and forward the form to RM&S.

**2) Facility Contamination:**

a) In the event of a chemical spill in a facility, the employee involved, or who discovered the spill, shall immediately notify his/her supervisor.

b) If an imminent danger is present (ie; two chemicals being accidently mixed creating an unknown chemical, chemicals that are overhead, chemicals of large quantity, etc), call 911 (Security) to report the spill.

c) The employee involved or his/her supervisor shall contain and clean up the spill if it is a chemical that they are familiar with and are responsible for and it is not creating and imminent danger (See Section 6.0 part B "Chemical Spill Clean Up").

d) In the event of fires, toxic releases or explosions, immediately leave the area and call 911 to report the incident.

**B. Chemical Spill Clean Up:**

Spill control begins by spreading an absorbent material, like vermiculite, on the spill. Spill cleanup kits are superior alternatives to vermiculite. Kits are made specifically for acids, alkalies, organic solvents and mercury and are available through RM&S or chemical supply companies. These kits have many times the absorbent capacity of vermiculite. Absorbent clays may also be used as a substitute for vermiculite.

**Each department shall have appropriate spill absorbents available for the types of chemicals that are stored or used.**

After allowing the chemical to absorb, scoop up the vermiculite and deposit it into a plastic disposal bag. Wipe up the contaminated surface with soap and water and a sponge and place in the disposal bag. Tie the bag and label it with a chemical discard tag. Call RM&S (1-5037) for disposal procedures or pickup. If in doubt about the proper spill cleanup procedures, call RM&S.

# 7.0 Chemical Disposal

Many of the chemicals that are used cannot be thrown into regular trash. Contact your supervisor or RM&S regarding the chemicals you want to dispose of. Each person has a responsibility to see that all wastes are disposed of properly.

A. If the chemical is dangerous and needs to be disposed of by RM&S:

1) Each container must be labeled with a completed chemical discard tag prior to pick up.
2) Once labeled, call RM&S (1-5037) to schedule a pick up.
3) RM&S will make every attempt to pick up the waste within 72 business hours of the call.

B. The following special considerations shall be followed:

1) **Broken glass:**
   Broken beakers, pipettes, etc., should be promptly swept up and disposed of in a puncture resistant container labeled "GLASS".
2) **Infectious waste:**
   Infectious waste disposal procedures are outlined in "Guidelines for the Collection, Handling and Disposal of Infectious Waste." See the Bloodborne Pathogens Exposure Control Policy or contact RM&S for a copy.
3) **Radioactive Waste:**
   Radioactive waste storage and disposal procedures are outlined in the Radiation Safety Manual.

4) **Used Fluorescent Light Bulbs:**

Fluorescent light bulbs cannot go into the regular trash. They must be placed in a box that is taped shut, labeled "USED LAMPS CONTAINING MERCURY" and then picked up by Building Services for recycling.

# Appendix A

## Definitions
## To Understand Hazard Information

Adopted from "MSDS Pocket Dictionary" by J.J. Keller & Associates, Inc.

**Affected Employee**: Affected employee, for purposes of this policy, is a Notre Dame employee who, by virtue of his/her work, may reasonably be exposed to potential chemical hazards (this definition was not adopted from J.J. Keller & Associates, Inc.)

**Absolute**: A Chemical substance relatively free of impurities.

**Absolute Pressure**: The total pressure within a vessel, pipe, etc., not offset by external atmospheric pressure. See psia, psig.

**Absorb**: To soak up. The incorporation of a liquid into a solid substance, as by capillary, osmotic, solvent, or chemical action. See Adsorb.

**ACGIH**: American Conference of Governmental Industrial Hygienists. An Organization of professionals in governmental agencies or educational institutions engaged in occupational safety and health programs. ACGIH develops and publishes recommended occupational exposure limits for chemical substances and physical agents.

**Acid**: An Inorganic or organic compound that: 1) is usually corrosive to human tissue and must be handled with care: 2) has pH of less than 7.0: 3)neutralizes bases (alkalis) to form salts:4)dissociates in water yielding hydrogen or hydronium ions; 5)may react with metals to yield hydrogen; and 6)turns litmus paper red.

**Acidosis:** A condition of decreased alkalinity of the blood and tissues. Symptoms may include sickly sweet breath, headache, nausea, vomiting, visual disturbances; usually the result of excessive acid production. Tissues and CNS functions are disturbed.

**Acrid:** Irritating and bitter (usually referring to smell).

**Action Level**: The exposure level (concentration in air) at which OSHA regulations to protect employees take effect.

**Acute Exposure**: Exposure of short duration, usually to relatively high concentrations or amounts of material.

**Acute Health Effect:** An adverse effect on a human or animal body, with symptoms developing rapidly.

**Active Ingredient:** The ingredient of a product that actually does what the product is designed to do.

**Acute Lethality:** The death of animals immediately or within 14 days after a single dose of or exposure to a toxic substance.

**Acute Toxicity:** Adverse health effects resulting form brief exposure to a chemical.

**Administrative Controls:** A number of measures used to reduce worker exposure, including work practices, labeling and working devices, training, environmental monitoring, assignment scheduling, housekeeping, maintenance, and management.

**Adsorb:** To attract and retain gas or liquid molecules on the surface of another material. See Absorb.

**Aerosol:** A fine suspension in air or other gas of liquid (mist, fog) or solid (dust, fume, smoke) particles small enough to stay suspended.

**Agent:** Any substance, force, radiation, organism, or influence affecting the body.

**ALARA**: Acronym for "as low as reasonably achievable."

**Alkali:** An inorganic or organic chemical that:1)is usually corrosive to human tissue and must be handled with care; 2)has a pH of more than 7.0:30 neutralizes acids to form salts; 4)dissociates in water yielding hydroxide ions; 5)turns litmus paper blue.

**Allergen:** A substance that causes an allergic reaction.

**Allergy:** A condition in which an initial symptomless exposure to a specific allergen later gives rise to a sensitivity to further exposure. Symptoms may be exhibited in a variety of ways, usually by respiratory distress of skin eruptions.

**Alopecia:** Loss of hair.

**Ambient:** Usual or surrounding conditions of temperature, humidity, etc.

**Analgesia:** Reduced sensitivity to pain.

**Anesthesia:** Loss of sensation, including loss of touch, pain, vibration sense, and/or temperature sense.

**Anhydride:** A compound derived from another compound (e.g., an acid) by removing the elements that compose water.

**Anhydrous:** "Without water." Describes a substance in which no water molecules are present in the form of a hydrate or as water of crystallization.

**Anorexia:** Loss of appetite.

**Anosmia:** Loss of the sense of smell.

**Anoxia:** A lack of oxygen in blood or tissues.

**ANSI**: American National Standards Institute. A privately funded organization that identifies industrial/public national consensus standards and coordinates their development. Many ANSI standards relate to safe design/performance of equipment and safe practices or procedures.

**Antagonism:** When the effect of one chemical or material counteracts (works against) the effect of another.

**Antidote:** A remedy to counteract a poison's toxic effects; it may act to eliminate, absorb, or neutralize the poison.

**Anuria:** Absence or defective excretion of urine.

**Apnea:** Temporary stoppage of breathing.

**Appearance:** A material's physical state (solid, gas, or liquid), its color, and other visual attributes. If there is a difference between a material's appearance and that listed on the MSDS, contact your supervisor.

**AQTX, Aquatic Toxicity:** The adverse effects on fresh or salt water life forms that result from exposure to a toxic substance.

**Aqueous, aq:** Describes a water-based solution or suspension. Frequently describes a gaseous compound dissolved in water.

**Argyria:** Local or generalized gray-blue colored impregnation of body (skin) tissue with silver.

**Article:** A manufactured item that is specifically shaped or formed with its function dependent on its shape or design.

**Asbestosis:** Chronic lung disease caused by inhaling airborne asbestos fibers.

**Asphyxia:** Lack of oxygen or inability of cells to use oxygen; simple asphyxia is suffocation caused by a lack of oxygen in the inhaled air (e.g. displacement by nitrogen); chemical asphyxia poisons the bloods ability to carry oxygen (carbon monoxide) or the cell's ability to use oxygen (cyanide).

**Asphyxiant:** A vapor or gas that can cause unconsciousness or death by suffocation (lack of oxygen).

**Asphyxiation:** A condition that causes asphyxia or suffocation.

**Aspiration Hazard:** The danger of drawing material into the lungs, leading to an inflammatory response that can be fatal.

**Asthma:** A medical disorder which causes attacks of wheezing, chest tightness, shortness of breath, and/or coughing due to spasmodic contraction of the air passages.

**ASTM:** American Society of Testing and Materials. An organization that devises consensus standards for materials characterization and use.

**Asymptomatic**: Not exhibiting symptoms. Ataxia. A loss of muscular coordination of gait or movement.

**atm:** Atmosphere. A unit of pressure equal to the average pressure that air exerts at sea level**.** 1

**atm** $= 1.013 \times 10^5 N/m^2$, or 760mm Hg or 10/kPa. Generally used I connection with high pressures.

**Atrophy:** Reduction in size or function of tissue, organs, or the entire body caused by lack of use.

**Autoignition Temperature:** The minimum temperature at which a substance ignites without application of a flame or spark. Do not heat materials to greater than 80% of this temperature.

**Base:** An alkali. See Alkali

**BEI, Biological Exposure Indexes**: Numerical values based on procedures to determine the amount of a material the human body absorbs by measuring the material or its metabolic products in tissues, fluid, or exhaled air.

**Bioconcentration:** The process by which a chemical is passed through the food chain form soil to plants and animals where it accumulates and is ultimately passed to humans.

**Biodegradable:** An organic materials capacity for decomposition as a result of attack by microorganisms.

**Biological Monitoring:** Analysis of body substances, such as blood or urine, to determine the extent of hazardous material absorption or accumulation.

**BLEVE, Boiling Liquid Expanding Vapor Explosion:** Used when describing fires involving compressed gases in cylinders which rupture due to extreme pressures and proceed to burn rapidly.

**BOD, Biochemical Oxygen Demand:** Amount of oxygen needed by bacterial to stabilize organic matter under aerobic conditions. Used to estimate degree of contamination in water supplies.

**Body Burden:** The total toxic material a person has ingested or inhaled from an sources over time and retained in the body.

**Boiling Point, BP:** The temperature at which a liquid's vapor pressure equals the surrounding atmospheric pressure so that the liquid rapidly vaporizes.

**Bonding:** A safety practice where two objects (tanks, cylinders, etc.) are interconnected with clamps and wire. This equalizes the electrical potential between the objects and helps prevent static sparks that can ignite flammable materials transferred between tanks.

**Bradycardia:** Slowed heartbeat (less than 60 beats per minute.

**Bronchitis:** An inflammatory condition of the airways (bronchial tubes) resulting in coughing up of sputum.

**Btu:** British thermal unit. The quantity of heat required to raise the temperature of 1 lb of water from 17C (63F) to 18C (64F). Compare to Calorie.

**Buffer:** A substance that reduces the change in hydrogen ion concentration (pH) otherwise produced by adding acids or bases to a solution. A pH stabilizer.

**Bulk Density:** The mass (weight) per unit volume of a solid particulate material as it is normally packed, with voids between particulates containing air. Usually expressed as $lb/ft^3$

**Burning Rate:** The time it takes a specified sized sample of solid material (e.g., 1 in by 1 in ) to burn a designated distance. The rate is given in units of distance/time.

**C:** Degrees Celsius (centigrade). Metric temperature scale on which 0=water's freezing point and 100=it's boiling point.

**CAA:** Clean Air Act. Public Law PL 91-604, 40 CFR 50-80. EPA has jurisdiction. Effective Dec. 31, 1970, and significantly amended several times, most recently in 1990.

**Calorie:** Unit of heat. The amount of heat required to raise 1 g of water to 1 C. See Btu.

**Cancer:** An abnormal multiplication of cells that tends to infilt rate other tissues and metastasize (spread).

**Carcinogen:** A material that either causes cancer in humans, or because it causes cancer in animals, is considered capable of causing cancer in humans.

**Cardiovascular:** System of the human body involving the heart and blood vessels.

**CAS Number (CAS Registration Number):** An assigned number used to identify a chemical. CAS stands for Chemical Abstracts Service, an organization that indexes information published in Chemical Abstracts by The American Chemical Society and that provides index guides by which information about particular substances may be located in the abstracts.

**Catalyst:** A substance that modifies (slows, or more often quickens) a chemical reaction without being consumed in the reaction.

**Cataract:** A loss of transparency in the eye's crystalline lens or its capsule.

**Caustic:** See Alkali.

**CC:** Closed cup. Identifies one of the methods used to measure flash points of flammable liquids.

**cc, $cm^3$:** Cubic centimeter.

**Ceiling Limit, C:** The concentration not to exceed at any time. :" An employee's exposure [to a hazardous material] shall at no time exceed the ceiling value" (OSHA).

**Celsius:** See C.

**Centigrade:** See C. Celsius is now this temperature scale's preferred name.

**Centimeter, cm:** 1/100 meter. A cm = approximately 0.4in.

**Centipoise, cP:** A metric (cgs) unit of viscosity equal to 1/100 poise. The viscosity of water at 20 C (68F) is almost 1 centipoise.

**Central Nervous System (CNS):** The brain and spinal cord.

**Central Nervous System (CHS) Depression:** Drowsiness, dizziness, and headache caused by a chemical acting on the brain; higher doses can cause unconsciousness, death or coma.

**CEPA, (Canada) Environmental Protection Act:** Federal legislation, administered by Environment Canada, designed to protect the environment.

**CERCLA:** The Comprehensive Environmental Response, Compensation, and Liability Act. The Superfund Law, Public Law PL 96-510.

**CFC:** Chlorofluorocarbon. Associated with damage to the Earth's ozone layer.

**CFR:** Code of Federal Regulations. A collection of the regulations established by law. Contact the agency that issued the regulation for details, interpretations, etc.

**cgs:** Metric units of measure based upon centimeter, gram, and second.

**Chelating Agent:** A substance (e.g. EDTA) which can remove heavy metal toxins (such as lead, mercury, or arsenic) from the blood by complexing them and allowing their excretion in urine.

**Chemical Cartridge Respirator:** A respirator using various chemical substances to purify inhaled air of certain contaminative gases and vapors. Approved for concentrations no more than 10 times the TLV for a half facepiece and 100 times the TLV for a full facepiece, provided the contaminant has warning properties (odor or irritation) near the TLV.

**Chemical Family:** A group of single elements or compounds of a common general type .

**Chemical Formula:** The number and kind of atoms comprising a molecule of a material. Water's chemical formula is $H_2O$. Each water molecule consists of 2 atoms of hydrogen and 1 atom of oxygen.

**Chemical Hygiene Officer:** Per 29 CFR 1910.1450; OSHA regulation, "Occupational Exposures to Hazardous Chemicals in Laboratories." The designated, qualified employee who assists in the development and implementation of the CHP. See CHP.

**Chemical Name:** A chemical's scientific name. Complex chemicals may have more than one name, corresponding to different naming systems.

**Chemical Pneumonitis:** Inflammation of the lungs caused by inhaling a chemical that is irritating or otherwise toxic to the lungs.

**Chemical Reactivity:** A chemical's tendency to react with other materials, Undesirable and dangerous effects such as heat, explosions, or production of noxious substances can result.

**Chemiluminescence:** Emission of light during a chemical reaction other than burning.

**CHEMTREC:** Chemical Transportation Emergency Center. Established in Washington, DC, by the Chemical Manufacturers Association (CMA) to provide emergency information on materials involved in transportation accidents. 24-hour number: (800)424-9300. In Washing, DC, Alaska, and Hawaii call (202)483-7616.

**Chloracne:** A severe form of skin acne caused by exposure to certain chlorinated chemical compounds.

**CHP, Chemical Hygiene Plan:** Per 29 CFR 1910.1450, OSHA standard;"Occupational Exposures to Hazardous Chemicals in Laboratories."

**Chronic Exposure:** Continuous or intermittent exposure extending over a long time period, usually applies to relatively low material amounts or concentrations.

**Chronic Health Effect:** An adverse effect on a human or animal body with symptoms that develop slowly over a long time period and persist or that recur frequently.

**Chronic Toxicity:** Adverse health effects resulting from long-term exposure to a chemical.

**Clastogenic:** An agent that causes damage to genetic material.

**Closed System:** Equipment designed and used so that there is no release of the chemical into the surrounding environment.

**CO, Carbon Monoxide:** A colorless, odorless, flammable, and very toxic gas produced by incomplete combustion of carbon compounds and as a by-product of many chemical processes. A chemical asphyxiant, it reduces the blood's ability to carry oxygen. Hemoglobin absorbs CO 200 times more readily than it does oxygen.

**$CO_2$, Carbon Dioxide:** A dense, colorless gas produced by combustion and decomposition of organic substances and as a by-product of many chemical processes. $CO_2$ does not burn and is relatively nontoxic and unreactive. High concentrations, especially in confined places, can create hazardous oxygen-deficient environments that can cause asphyxiation. $CO_2$ is 1.5 times as dense as air, making it useful as a fire-extinguishing agent to block oxygen and smother a fire.

**COD, Chemical Oxygen Demand:** The amount of oxygen required under designated test conditions to oxidate.

**Code of Federal Regulations:** See CFR.

**Coefficient of Water/Oil Distribution:** Also called the partition coefficient, it is the ratio of the solubility of a chemical in water to its solubility in oil.

**Coma:** Extended loss of consciousness due to an injury, illness, or poison.

**Combustible:** A term the NFPA, DOT, and others use to classify certain materials with low flash points that ignite easily. The DOT defines combustible liquids as having a flash point of above141 F (60.5C) and below 200 F (93C).

**Common Name:** A designation for a material other than its chemical names, such as code name or code number or trade , brand, or generic name.

**Compressed Gas:** Any material which is a gas at normal temperature and pressure, and contained under pressure as a dissolved gas or liquefied by compression or refrigeration.

**conc:** Concentration

**Conjunctivitis:** Irritation and inflammation of the lining of the eye and eyelids.

**Consumer Products Safety Commission:** See CPSC.

**Convulsions:** Violent body spasms; fits or seizures.

**Cornea:** Transparent structure of the eyeball's external layer.

**Corrosion Rate:** Expressed in inches or millimeters of steel (or other defined material per year, at a stated temperature.

**Corrosive:** A chemical that causes visible destruction of or irreversible alterations in living tissue by chemical action at the site of contact, or which causes a severe corrosion rate in steel or aluminum.

**cP:** See Centipoise.

**CPSC:** Consumer Products Safety Commission. A Federal agency responsible for regulation hazardous materials when they are used in consumer goods per the Hazardous Substances Act and Poison Prevention Packaging Act of 1970.

**Critical Pressure/Critical Temperature:** A temperature above which a gas cannot be liquefied by pressure. The critical pressure is that pressure required to liquefy a gas at its critical temperature.

**Cryogenic:** Relating to extremely low temperature.

**cu ft, $ft^3$:** Cubic foot. Cu ft is more usual.

**Cu m, $m^3$:** Cubic meter. $m^3$ is preferred.

**Cutaneous:** Pertaining to the skin (dermal).

**CVS:** Cardiovascular System (heart and blood vessels).

**CWA:** Clean Water Act. Public Law PL 92-500. Found at 40 CFR 100-140 and 400-470. Effective Nov. 18, 1972, and amended significantly since then. EPA and Army Corps of Engineers have jurisdiction. CWA regulates the discharge of nontoxic and toxic pollutants into surface waters.

**Cyanosis:** A dark blue to purplish coloration of the skin and the mucous membrane caused by lack of oxygen utilization by the body.

**Dangerously Reactive Material:** A material that can react by itself (e.g. polymerize) or with air or water to produce a hazardous condition.

**Dec, Decomp:** Decompose, Decomposition. Breakdown of a material into parts, elements, or simpler compounds.

**Deliquescent:** A term used to characterize water-soluble salts (usually powdered) and tend to absorb as a result. See Hygroscopic; Hydrophilic.

**Demulcent:** A material capable of soothing or protection inflamed, irritated mucous membranes.

**Density:** Ration of weight (mass) to volume of a material, usually in grams per cubic centimeter or pounds per gallon.

**Dermal:** Pertaining to the skin (cutaneous).

**Dermal Toxicity:** Adverse effects resulting from a material's absorption through skin. Ordinarily used to denote effects on experimental animals.

**Dermatitis:** Skin rash; inflammation of the skin.

Designated Area: **An area of (or device within) a lab to be used for work with select carcinogens, reproductive toxins, and other materials which have a high degree of acute toxicity.**

**Diaphoresis:** Perspiration, especially profuse.

**Dilution Ventilation:** See General Ventilation.

**DOT, U.S. Dept. of Transportation:** Regulates transportation of materials to protect the public as well as fire, law enforcement, and other emergency-response personnel.

**DOT Identification Numbers:** Four-digit numbers used to identify particular materials for regulation of their transportation.

**Dust:** Solid particles suspended in air, often produced by some mechanical process such as crushing, grinding, abrading, or blasting.

**Dysplasia:** Abnormal growth or development or organs or cells.

**Dyspnea:** A sense of difficulty in breathing; shortness of breath.

**Dysuria:** Difficult or painful urination.

**$EC_{50}$:** (Median) effective concentration. The concentration of a material expressed in ppm or ppb in the environment (usually water), a single dose of which is expected to cause a biological effect on 50% of a group of test animals.

**Eczema:** A skin rash characterized by redness, itching, sometimes blistering; may become scaly or crusty.

**$ED_{50}$:** (Median) effective dose, usually expressed in mg/kg, that produced a specified effect in 50% of the test population.

**Edema:** Swelling due to accumulation of fluid in tissues.

**EEC:** European Economic Community.

**Electrolyte:** A substance (as an acid, base, salt) that dissociates into ions when in aqueous solution and that provides ionic conductivity.

**Embolism:** Obstruction of a blood vessel by a transported clot, a mass of bacteria, etc.

**Embryo:** An organism in the early stages of development before birth. In humans, the developing child is considered an embryo from conception to the end of the second month of pregnancy.

**Embryotoxin :** A material harmful to a developing embryo at a concentration that has no adverse effect on the pregnant female.

**Emetic:** An agent, such as syrup of ipecac, which induces vomiting.

**Emphysema:** An irreversible lung condition in which the alveolar walls lose resiliency, resulting in excessively reduced lung capacity.

**Endothermic:** A chemical reaction that absorbs heat.

**Engineering Controls:** Engineering control systems reduce potential hazards by isolating the worker from the hazard or by removing the hazard form the work environment. Methods include substitution, ventilation, isolation, and enclosure.

**EP:** Extreme pressure.

**EPA, (U.S.) Environmental Protection Agency:** A Federal agency with environmental protection regulatory and enforcement authority.

**Epidemiology:** The study of the relationships between diseases and the various factors that could determine their frequency and distribution in populations.

**Epiphora:** Excessive flow of tears.

**Epistaxis:** Nosebleed.

**Ergonomics:** The study of human characteristics for appropriate design of living and work environments.

**Erythema:** Redness of the skin; usually due to a local increase in blood flow.

**Etiology:** All factors that contribute to the cause of a disease or an abnormal condition.

**Evaporation Rate:** The rate at which a material vaporizes (volatilizes, evaporates) from the liquid of solid state when compared to a know material's vaporization rate. Evaporation rate can be useful in evaluating

**Explosive:** A material that produces a sudden, almost instantaneous release of pressure, gas and heat when subjected to abrupt shock, high temperature, or an ignition source.

**Explosive Limits:** See Flammable Limits.

**Exposure Limits:** The concentration in workplace air of a chemical deemed the maximum acceptable. This means that most workers can be exposed at given levels or lower without harmful effects.

**Exothermic:** A chemical reaction that gives off heat.

**Extinguishing Media, Agents:** A type of fire extinguisher or extinguishing method appropriate for a specific material. Some chemicals react violently in the presence of water, so other methods, such as the use of foam or $CO_2$, should be followed.

**F ;** Degrees Fahrenheit. See C.

**f/cc:** Fibers per cubic centimeter of air.

**Fasciculation:** Muscular twitching.

**Federal Register (U.S.):** See FR.

**Fiber:** A basic form of matter, usually crystalline, with a high ratio of length to diameter,

**Fibrosis:** Scarring; scarring in the lungs may affect oxygenation of blood.

**FIFRA:** The Federal Insecticide, Fungicide, and Rodenticide Act.

**Fines:** Finely crushed or powdered material or fibers; especially those smaller than the average in a mix of various sizes.

**Fire Diamond (NFPA Hazard Rating):** The National Fire Protection Agency (NFPA) visual rating system that addresses the health, flammability, reactivity, and related hazards of a material which may exist due to a short-term, acute exposure caused by a fire, spill, or similar emergency.

**Fire Point:** The lowest temperature at which a liquid produces sufficient vapor to flash near its surface and continues to burn.

**First Aid:** Immediate measures that can be taken by the victim or others in order to reduce or eliminate the potential effects of a chemical exposure or other injury.

**Flammable:** Describes any solid, liquid, vapor, or gas that ignites easily and burns rapidly. See Combustible and Inflammable.

**Flammable Aerosol:** A material is considered a flammable aerosol if it is packaged in an aerosol container and can release a flammable material.

**Flammable Gas:** A gas that at normal atmospheric pressure forms a flammable mixture with air at a concentration of 13% by volume or less; or over a concentration range greater than 12% by volume, regardless of lower limit.

**Flammable Limits (Flammability Limits, Explosive Limits):** Minimum and maximum concentrations of a flammable gas or vapor Between which ignition can occur. Concentrations between the lower flammable limit (LFL) are too lean to burn, while concentrations above the upper flammable limit (UFL) are too rich. All concentrations between LFL and UFL are in the flammable range, and special precautions are needed to prevent ignition or explosion.

**Flammable Liquid:** Gives off vapors readily ignitable at room temperature. Defined by DOT as a flammable liquid with a flash point at or above 100 F (37.8 C) and not more that 141 F (60.5 C).

**Flammable Solid:** A solid, other than an explosive or blasting agent, that, ignites readily and continues to burn so vigorously and persistently that it creates a serious hazard.

**Flash Back:** Occurs when a distant spark or ignition source ignites a trail of flammable material (e.g., gasoline vapor). The flame then travels along the trail of the material back to its source.

**Flash Point, FP:** Lowest temperature at which a flammable liquid gives off sufficient vapor to form an ignitable mixture with air near its surface or within a vessel. Combustion does not continue.

**Foam:** Fire-fighting material consisting of water and foaming agents into which air is blown, producing a voluminous, stable blanket of bubbles.

**Fog**: A visible suspension of fine droplets of liquid in a gas; e.g., water in air.

**Formula Mass:** The sum of atomic weights of the atoms in a molecule. For example, water ($H_2O$) has a formula mass of 18.0, the atomic weights being [hydrogen: 2(1.0) + oxygen: 16] = 18.0.

**FR:** Federal Register, A daily publication that lists and discusses Federal regulations. Available from the Government Printing Office.

**Freezing Point:** The temperature at which a material changes form a liquid to a solid state upon cooling. This information is important because a frozen material may burst its container or the hazards could change.

**Fugitive Emission:** Gas, liquid, solid, vapor, fume, mist, fog, or dust that escapes from process equipment or a product.

**Full Protective Clothing:** Fully protective gear that prevents skin contact with, inhalation of, or ingestion of gases, vapor, liquids, and solids (dusts, etc.) . Includes SCBA (self-contained breathing apparatus).

**Fumes:** Tiny solid particles formed by the vaporization of a solid which then condenses in air; particles are usually of a size which readily reach the air sacs (alveoli) of the lungs.

**g:** Gram. Metric unit of weight. See kg.

**Gangrene:** Death of tissue leading to its rotting.

**Gas:** A formless fluid which disperses in air; often found in tanks or cylinders and may be created by a chemical reaction. It can be changed to it's liquid or solid state only by increased pressure and/or decreased temperature.

**Gastric Lavage:** Washing out the stomach with a tube and fluids. Pumping the stomach.

**Gastroenteritis:** Stomach and intestine inflammation.

**Gastrointestinal Tract (GI tract):** The stomach and intestine as a functional unit.

**Gavage:** Feeding by means of a stomach tube.

**General Ventilation:** Also known as dilution ventilation. The removal of contamination air and it's replacement with clean air form the general workplace area as opposed to local ventilation, which is specific air changing in the immediate area of a contamination source.

**Generic Name:** A common, possibly chemical, name applied generally to a substance.

**Gestation:** the development of the fetus in the womb from conception to birth (i.e. pregnancy).

**Gingivitis:** Inflammation of the gums.

**GRAS:** Generally recognized as safe. A phrase applied to food additives approved by the Food and Drug Administration (FDA).

**Grounding:** A safety practice to conduct any electrical charge to the ground, preventing sparks that could ignite a flammable material. See Bonding.

**h, hr(s):** Hour(s)

**Hazard Communication Rule:** Requires chemical manufacturers and importers to assess the hazards associated with the materials in their workplace.

**Hazardous Chemical, Material:** In a broad sense, any substance or mixture of substances having properties capable of producing adverse effects on the health or safety of a human.

**Hazardous Decomposition:** A breaking down or separation of a substance into its constituent parts, elements, or into simpler compounds accompanied by the release of heat, gas, or hazardous materials.

**Hazardous Decomposition Products:** Hazardous products resulting from decomposition of a material. For example, vinyl chloride, a compound used to make plastics, releases poisonous hydrogen gases when burned.

**Hazard Warning:** Defined by OSHA as "any words, pictures, symbols, or combination thereof appearing on a label or other appropriate form of warning which convey the hazard(s) of the chemical(s) in the container(s)."

**Hazardous Waste Number:** An identification number assigned by the EPA, per the RCRA law.

**Health Surveillance:** The continuing scrutiny of specific individuals for the purpose of identifying disorders or health states, especially those which may relate to exposure to hazardous materials

**Hematuria:** Blood in the urine.

**Hemolysis:** Destruction of red blood cells leading to release of hemoglobin.

**HEPA:** High-efficiency particulate air filter. Also called absolute, Has a 99.97% removal efficiency for 0.3-micron particles.

**Hepatic:** Pertaining to the liver.

**HMIS:** The hazardous materials identification system developed by the National Paint and Coatings Association (NPCA) to provide information on the acute health, reactivity, and flammability hazards encountered in the workplace.

**Hydrolysis:** Process by which chemical compounds are decomposed by reaction with water.

**Hydrophilic:** Describing materials having large molecules that tend to absorb and retain water, causing them to swell and frequently to gel. See Deliquescent.

**Hyperemia:** Congestion of blood in a body part.

**Hypergolic:** Self-igniting upon contact of its components without a spark or external aid; especially rocket fuel or a propellant that consists of combinations of fuels and oxidizers.

**Hypocalcemia:** Calcium deficiency of the blood.

**Hypoxia:** Insufficient oxygen reaching the tissues of the body. See Anoxia.

**I:** Intermittent.

**IARC:** International Agency for Research on Cancer. One of the three sources that OSHA refers to for data on the materials' carcinogenicity.

**IDLH:** Immediately dangerous to life and health. The maximum concentration from which one could escape within 30 min without any escape-impairing symptoms or irreversible health effects. Used to determine respirator selection.

**Ignition Temperature**: The lowest temperature at which a combustible material ignites in air and continues to burn independently of the heat source.

**Impervious:** Describes a material that does not allow another substance to penetrate or pass through it; impermeable.

**Incompatible:** Describes materials that could cause dangerous reactions and the release of energy from direct contact with one another.

**Inert Ingredients:** Anything other than the active ingredient in a product; not having active properties. Inert ingredients may be hazardous.

**Inflammation:** A local response to cellular injury due to trauma, infection, or chemical irritation; symptoms include swelling, redness, pain, tenderness, and loss of function.

**Ingestion:** Swallowing a chemical substance; may inadvertently result from eating, drinking, or smoking in the workplace or with contaminated hands.

**Inhalation:** Entry of a chemical substance to the lungs by breathing.

**Inhibitor:** A material added to another to prevent an unwanted reaction; e.g., polymerization.

**Inorganic Materials:** Compounds derived from other than vegetable or animal sources that do not generally contain carbon atoms.

**Insol:** Insoluble.

**Interstitial Fibrosis:** Scarring of the lungs.

**Intraperitoneal:** A route of administration for toxicological studies. A material is injected into the peritoneal (abdominal/pelvic) cavity.

**Iodism:** An abnormal condition resulting from prolonged (chronic) exposure to iodine or it's compounds- characterized by emaciation, skin eruptions, headache, excess salivation, runny nose, and sneezing.

**Iridocyclitis:** Inflammation of both the eye's iris and its ciliary body

**Irritant:** A substance capable of causing a reversible or irreversible inflammatory effect on living tissue by chemical action at the site of contact as a function of concentration or duration of exposure.

**Isomers:** Chemical compounds with the same molecular weight and atomic composition but differing molecular structure.

**I.V. Intravenous:** Injection of a substance into a vein.

**Jaundice:** Yellowish discoloration of tissue (skin), whites of eyes (sclera), and bodily fluids with bile pigment (bilirubin) cause by liver damage, gall bladder disease, or hemolysis.

**Ketosis:** the condition marked by excessive production or accumulation of ketone bodies in the body caused by disturbed carbohydrate metabolism.

**kg, kilogram:** 1000 gram

**L, l. Liter:** Basic metric unit of volume. One liter of water weighs 1 kg and is equal to 1.057 quarts.

**Label:** Any written, printed, or graphic sign or symbol displayed on or affixed to containers of hazardous chemicals.

**Laboratory:** Per 29 CFR 1910.1450, a facility where laboratory use of hazardous chemicals occurs; where relatively small quantities of hazardous chemicals are used on a non-production basis.

**Laboratory-type Scale (Activity):** The work involves containers of substances used for reactions and transfers that are designed for easy and safe handling by one person.

**Laboratory-type Hood:** An enclosed laboratory cabinet with a moveable sash or fixed access port on the front, connected to a ventilating system which may incorporate air scrubbing or filtering facilities.

**Lacrimation:** Secretion and discharge of tears.

**Lacrimator:** A material that upon exposure to it causes tears.

**Landfill:** Disposal of trash and waste products at a controlled location that is then sealed and buried under earth.

**Latency Period:** Time that elapses between exposure and first manifestations of disease or illness.

**Lavage:** Rinse with water.

**Lay Language:** Language that is easily understood by the general public without specialized training.

**$LC_{50}$:** Lethal concentration 50, median lethal concentration. The concentration of a material in air that on the basis of laboratory test.

**$LC_{Lo}$:** Lethal concentration low. Lowest concentration of a substance in air reported to have caused death in humans or animals.

**$LD_{50}$:** Lethal does 50. The single dose of a substance that causes the death of 50% of an animal population from exposure to the substance by any route other than inhalation.

**$LD_{Lo}$:** Lethal dose low. The lowest does of a substance introduced by any route, other than inhalation, reported to have caused death in humans or animals.

**Leaching:** The movement of a substance down through or out of soil as a result of its mixing and moving with water.

**LEL:** See Lower Explosive Limit, Lower Flammable Limit.

**Lesion:** An abnormal change, injury, or damage to tissue or to an organ.

**Leukemia:** A progressive, malignant disease of the blood-forming organs.

**LFL:** See Lower Flammable Limits, Lower Explosive Limit.

**LFM** or **lfm**: Linear feet per minute.

**Limits of Flammability:** See Flammable Limits.

**Lipid Granola: A** mass of chronically inflamed tissue that is usually infective.

**Lipid Pneumonia: A** chronic condition caused by aspiration of oily substances into the lungs.

**Local Ventilation: The** drawing off of contaminated air directly from Its source. This type of ventilation is recommended for hazardous airborne materials. Treatment of exhausted air to remove contaminants may be required.

**Lower Explosive Limit, Lower Flammable Limit:** Refers to the lowest concentration of gas or vapor (% by volume in air) that burns or explodes if an ignition source is present at ambient temperatures. See Flammable Limits.

**m:** Meter. The basic metric measure of length equivalent to 39.371in.

**$m^3$** or **cu m**: Cubic meter, $m^3$ is preferred.

**Malaise**: A vague, generalized, ill feeling.

**Material Safety Data Sheet:** See MSDS.

**Maximum Safe Storage Temperature (MSST):** See SADT(Self-Accelerating Decomposition Temperature).

**Melting Point:** The temperature above which a solid changes to a liquid upon heating.

**Mercaptans:** A group of organic compounds resembling alcohols, but with sulfur replacing the oxygen of the hydroxyl group.

**Metabolism:** The process of change some chemicals go through after absorption by the body.

**Metastasis:** The transmission of a disease from one part of the body to another.

**Meter (m):** The basic metric measure of length, equivalent to 39.371in.

**Methemoglobinemia:** The presence of methemoglobin in the bloodstream caused by the reaction of materials with the hemoglobin in red blood cells

**mg:** Milligram (1/1000, $10^{-3}$, of a gram.

**mg/kg:** Milligram per kilogram. Dosage used in toxicology testing to indicate a dose administered per kg of body weight.

**$mg/m^3$:** Milligram per cubic meter of air. $mg/m^3 = ppm \times MW/24.45$
at 25 C.

**Microgram:** (ug) One-millionth ($10^{-6}$) of a gram.

**Micrometer:** (um) One-millionth ($10^{-6}$) of a meter; often referred to as a micron.

**Micron:** (u) See micrometer.

**Millimeter:** (mm) 1/1000 ($10^{-3}$) of a meter.

**min:** Minute

**Mine Safety and Health Administration:** See MSHA

**Miscible:** When two liquids or two gases are completely soluble in each other in all proportions. While gases mix with one another in all proportions, the miscibility of liquids depends on their chemical natures.

**Mist:** Suspended liquid droplets in the air generated by condensation from the gaseous to the liquid state or by mechanically breaking up a liquid by splashing or atomizing.

**Mixture:** A heterogeneous association of material that cannot be represented by a chemical formula and that does not undergo chemical change due to interaction among the mixed materials.

**ml:** Milliliter. One thousand of a liter. A metric unit of capacity, for all practical purposes equal to 1 cubic centimeter. One cubic inch is about 16 ml.

**MLD:** Mild irritation effects.

**mm Hg:** A measure of pressure in millimeters of a mercury column above a reservoir, or difference of level in a U-tube. See atm.

**MOD:** Moderate irritation effects.

**Mole or mol:** The quantity of a chemical substance that has a mass in grams numerically equal to the formula mass.

**Molecular Weight:** See Formula Mass.

**Molecule:** Smallest representative particle of a covalently bonded chemical compound.

**mppcf:** Millions of particles per cubic foot of air, based on impinger samples counted by light field techniques (OSHA).

**MSDS:** Material safety data sheet. A fact sheet summarizing information about material identification; hazards ingredients; health, physical, and fire hazards first aid; chemical reactivates and incompatibilities; spill, leak, an disposal procedures; and protective measures required for safe handling and storage.

**MSHA**: (Maximum Safe Storage) See SADT (Self-Accelerating Decomposition Temperature).

**Mucous Membrane:** The mucous-secreting membrane lining the hollow organs of the body.

**Mutagen**: A material that induces genetic changes (mutations) in the DNA of chromosomes.

**M W:** See Molecular Weight.

**N (Newton):** The metric unit of force, approximately equal to the weight of a 102.5 g mass.

**n- Normal:** A chemical name prefix signifying a straight-chain structure.

**NA, ND**: Not applicable, not available; not determined.

**Narcosis:** Sleepiness or a state of unconsciousness caused by a chemical.

**National Fire Protection Association:** See NFPA.

**National Toxicology Program:** See NTP.

**Nausea:** A tendency to vomit; a feeling of sickness in the stomach.

**NCI:** National Cancer Institute. A part of the National Institutes of Health that studies cancer.

**Necrosis:** Localized death of tissue.

**Neoplasm**: A new or abnormal tissue growth that is uncontrollable and progressive.

**Nephrotoxic:** Poisonous to kidney

**Neuritis**: Inflammation of the nerves.

**Neutralize:** To render less chemically reactive; to change the pH to about 7 (neutral) by adding acid to a basic compound or base to an acidic compound.

**NFPA:** National Fire Protection Association. An international voluntary membership organization formed to promote/improve fire protection and prevention and establish safeguards against loss of life and property by fire.

**NFPA Hazard Rating:** See Fire Diamond.

**NIOSH:** National Institute of Occupational Safety Health. The agency of the Public Health Service that test and certifies respiratory and air-sampling devices.

**NLM:** National Library of Medicine. A government library in Bethesda, Maryland containing medical documents.

**NOC:** Not otherwise classified.

**NOEL:** No observable effect level.

**Nonflammable:** Incapable of easy ignition. Does not burn, or burns very slowly.

**NOR:** Not otherwise regulated

**NOS:** Not otherwise specified.

**NOx:** A general formula for oxides of nitrogen (NO, $NO_2$). They react with moisture in the respiratory tract to produce acids that corrode and irritate tissue, causing congestion and pulmonary edema.

**NPCA:** National Paint and Coating Association. The trade association of manufacturers that developed the HMIS labeling system.

**NRC:** National Respond Center. A notification center that must be called if a RQ (Reportable Quantity) is released, or an oil or chemical spill or other environmental accident occurs.

**NTP:** National Toxicology Program. Federal activity overseen by the Department of Health and Human Services with resources from the National Institutes of Health, the Food and Drug Administration, and the Centers for Disease Control.

**Nuisance Particulates :** Dusts that do not produce signification organic disease or toxic effect from "reasonable" concentrations and exposures.

**Nystagmus:** Rapid, rhythmic, involuntary horizontal movements of the eyes.

**Occupational Exposure:** See Action Level.

**Occupational Safety and Health Act:** See OSH Act.

**Occupational Safety and Health Administration.** See OSHA.

**Odor Threshold:** The lowest concentration detectable by odor.

**OEL:** Occupational Exposure Limit. See Exposure Limits.

**Oliguria:** Scanty or low volume of urine.

**Opaque:** Impervious to light rays.

**Open Transfer:** Any transfer that at any time involves contact of a moving fluid with atmosphere, air, or oxygen.

**Oral:** An exposure route "through the mouth."

**Organic Materials:** Compounds composed of carbon, hydrogen, and other elements with chain or ring structures.

**Organic Peroxide:** A compound containing the bivalent - O - O - structure and which is a structural derivative of hydrogen peroxide ($H_2O_2$) where one of both hydrogen atoms are replaced by an organic radical. These compounds tend to be reactive and unstable.

**ORM:** Other regulated material. DOT hazard classification of a particular hazardous material to label it in transport.

**OHSA:** The Occupational Safety and Health Administration. Part of the U.S. Dept of Labor. The regulatory and enforcement agency for safety and health in most U.S. industrial sectors.

**OSH Act:** The Occupational Safety and Health Act of 1970. Effective April 28, 1971. Public Law 91-596. Found at 29CFR 1910, 1915, 1918, 1926. OSHA jurisdiction.

**OSHA Flammable/Combustible Liquid Classification:** (29 CFR 1910. 106) Flammable/combustible liquid is a standard classification used to identify the risks of fire or explosion associated with a liquid.

**Oxidation:** A reaction in which a substance combines with oxygen or another oxidizer.

**Oxide Pox:** Dermatitis caused by contact with metal oxides under poor personal hygienic conditions.

**Oxidizer:** The DOT defines an oxidizer or oxidizing material as a substance that yields oxygen readily to cause or enhance the combustion (oxidation) of other materials.

**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) receive electrons being transferred from the substance undergoing oxidation.

**PAH:** See Polycyclic Aromatic Hydrocarbons.

**Palpitation:** Irregular, rapid heartbeat.

**Parenthesis:** Altered sensations of the skin, often numbness, and tingling, or "pins and needles" sensation.

**Partition Coefficient:** See Coefficient of Water/Oil Distribution.

**PCB:** Polychlorinated biphenyl. A family of compounds used as a heat-transfer medium.

**PEL:** Permissible exposure limit. Established by OSHA. This may be expressed as a time-weighted average (TWA) limit.

**Pensky-Martens Closed Cup or Closed Tester:** See PMCC.

**Percent Volatile:** Percent volatile by volume. The percentage of liquid or solid (by volume) that evaporates at an ambient temperature of 70 F.

**Percutaneous:** Through the skin; often referring to absorption of a chemical.

**Peripheral Nervous System: (PNS)** Nerves outside of the brain and spinal cord, including motor nerves to control the function of muscles, sensory nerves to carry sensations to the brain, and autonomic nerves to control a variety of organ. functions.

**Peripheral Neuropathy:** An abnormal or degenerative state involving the nerves of the extremities (hands, feet, arms, legs).

**Personal Hygiene:** Precautionary measures taken to maintain good health when exposed to potentially harmful materials.

**Personal Protective Equipment:** See PPE

**pH:** Hydrogen ion exponent, a measure of hydrogen ion concentration of a solution. A scale (0to14) representing an aqueous solutions acidity or alkalinity.

**Phlegm:** Thick mucous from respiratory passage.

**Photophobia:** Intolerance to light.

**Physical Hazard:** A substance for which there is valid evidence that it is a combustible liquid, compressed gas, explosive, flammable, organic peroxide, oxidizer, pyrophoric, unstable (reactive), or water reactive.

**Physical State:** Condition of a material; i.e., solid, liquid, or gas, at room temperature.

**PIN:** Product identification number. A four-digit number, prefaced by UN or NA, used in Canada under the Transportation of Dangerous Goods Regulation for use be emergency personnel to identify a material in the event of an accident.

**PMCC:** Pensky-Martens closed cup. One of several types of apparatus for determining flash points.

**Pneumoconiosis:** A respiratory tract and lung condition caused by inhalation and retention of irritant mineral or metallic particles.

**Pneumonia:** Inflammatory lung disease caused by microorganisms, virus, and chemical or physical irritants.

**PNCO**: An ACGIH term for "particulates, not otherwise classified.

**PNOR:** An OSHA term for "particulates not otherwise regulated."

**Poison Control Center:** Provides medical information on a 24-hr basis for accidents involving ingestion of potentially poisonous material.

**Poisonous Material:** A material, other than a gas, which is known (on the basis of animal tests) to be so toxic to humans or causes such extreme irritation as to afford a hazard to health during transportation.

**Polycyclic Aromatic Hydrocarbons (PAH):** A family of chemical compounds containing only carbon and hydrogen, in which molecules consist of three or more carbon ring structures fused so that some carbon atoms are common to two or three rings.

**Polymerization:** A chemical reaction in which one or more small molecules combine to form larger molecules.

**Pour, Point:** The temperature at which a liquid either congeals or ceases to flow.

**POx:** A general term for the several oxides of phosphorus.

**ppb:** Parts per billion.

**PPE:** Personal protective equipment. Devices or clothing worn to help isolate a worker from direct exposure to hazardous materials.

**ppm:** Parts per million. " Parts of vapor or gas per million parts of air by volume at 25 C. ppm = ($mg/m^3$ x 24.45) divided by molecular weight.

**ppt:** Parts per trillion.

**Precordial:** In front of the heart, stomach.

**Prostration:** A state of total mental or physical exhaustion.

**Protective Laboratory Practices & Equipment:** As defined by OSHA 1910.1450 Lab Standard, those laboratory procedures, practices, and equipment that laboratory health and safety experts accept as effective, or that the employer can show are effective, in minimizing the potential for employee exposure to hazardous chemicals.

**Proteinuria:** Presence of protein in the urine.

**psia:** Pounds per square inch absolute.

**psig:** Pounds per square inch gauge (i.e., above atmospheric pressure)

**Psychotropic, PSY:** Acting on the mind.

**Pulmonary Edema:** Fluid in the lungs.

**Purge:** To clean, clear, or empty of material; a bleed of air or inert gas into a vessel to remove or exclude contaminants.

**Pyrolysis:** Chemical decomposition or breaking apart of molecules produced by heating.

**Pyrophoric:** Describes materials that ignite spontaneously in air below 54 C (130 F).

**RCRA:** Resource Conservation and Recovery Act, 94-580. Found at 40 CFR 240-271. EPA has jurisdiction. Enacted November 21, 1976, and amended since. RCRA's major emphasis is the control all solid-waste disposal. It controls all solid-waste disposal and encourages recycling and alternative energy sources.

**RCRA Hazardous Waste:** A material designated by RCRA as a hazardous waste and assigned a number to be used in record keeping and reporting compliance.

**Reactive Flammable Material:** A chemical which is a fire hazard because it reacts readily with air or water. Included are materials which: 1)spontaneously ignite in air or water;2)react vigorously with air;and3)give off flammable gas on reaction with water.

**Reactive Material:** A chemical substance or mixture that vigorously polymerizes, decomposes, condenses, or becomes self-reactive due to shock, pressure, or temperature.

**Reactivity:** A substance's tendency to undergo chemical reaction either by itself or with other materials with the release of energy.

**Reagent:** Substance used in a chemical reaction to aid in qualitative or quantitative analysis of another substance.

**Recommended Exposure Limit:** See REL.

**Reducing Agent:** In a reduction reaction (which always occurs simultaneously with an oxidation reaction), the reducing agent is the chemical or substance that 1)combines with oxygen or 2)loses electrons to the reaction. See Oxidat ion; Oxidizing Agent.

**REL:** The NIOSH REL (Recommended Exposure Limit) is the highest allowable airborne concentration that is not expected to injure a worker. It may be expressed as a ceiling limit or as a time-weighted average (TWA)
usually for 10-hr work shifts.

**Reportable Quantity:** See RQ.

**Reproductive Health Hazard/Toxin:** Any agent with a harmful effect on the adult male or female reproductive systems or on the developing fetus or child. Such hazards affect people in many ways, including loss of sexual drive, mental disorders, impotence, infertility, sterility, mutagenic effects on the fetus, and transplacental carcinogenesis.

**Resource Conservation and Recovery Act:** See RCRA.

**Respirator:** A variety of devices that limit inhalation of toxic materials. They range from disposable dust masks to self-contained breathing apparatus.

**Respiratory System:** The breathing system, including the lungs, and air passages.

**Route of Entry or Route of Exposure:** The way a chemical enters the body; inhalation, skin contact, eye contact, and ingestion.

**RQ:** Reportable Quantity. The amount of a material that, when spilled, must be reported to the DOT (Section 311 of the Clean Water Act).

**RTECS:** Registry of Toxic Effects of Chemical Substances, published by NIOSH. Presents basic toxicity data on thousands of materials.

**SADT, Self-Accelerating Decomposition Temperature:** A test that determines an organic peroxide's minimum unsafe storage temperature.

**Saint Andrew's Cross: X:** Used in packaging for transp ort; means harmful – stow away from foodstuffs.

**SARA:** Superfund Amendments and Reauthorization Act. Signed into law October 17, 1986. Title III of SARA is know as the Emergency Planning and Community Right-to-Know Act of 1986.

**SCBA:** See Self-Contain ed Breathing Apparatus.

**SCC:** See SETA, SETAFLASH Closed Tester

**Sclera:** The tough, white, fibrous covering of the eyeball.

**Select Carcingen:** See Self-contained Breathing.

**Self-Accelerating Decomposition Temperature:** See Carcinogen.

**Self-Contained Breathing Apparatus**: (SCBA) A respirator which contains its own air supply that the user carries, usually in a tank on his or her back.

**Sensitization:** A state of immune-response reaction in which exposure to a material elicits an immune or allergic response.

**Sensitizer:** A state of immune-respond reaction in which little or no reaction in humans or test animals but upon repeated exposure may cause a marked response not necessarily limited to the contact site.

**SETA, SETAFLASH Closed Tester:** Apparatus used to measure flash points in liquids in the 0 C to 110 C (32 F to 230 F) range.

**Siderosis:** Pneumoconiosis caused by inhalation of iron particles.

**Silicosis:** A condition of massive fibrosis of the lungs causing shortness of breath because of prolonged inhalation of silica dusts.

**Skin:** A notation to exposure limits (TLVs) indication possible significant contribution to overall exposure to a material by way of absorption through the skin, mucous membranes, and eyes by direct or airborne.

**Slurry:** A pourable mixture of solid and liquid

**Smoke:** Dry particles and droplets (usually carbon or soot) generated by incomplete combustion of an organic material combined with and suspended in gases from combustion.

**Solubility in Water:** A term expressing the percentage of a material (by weight) that dissolves in water at ambient temperature.

**Solution, Soln:** A uniformly dispersed single-phase mixture of a solvent (water or other fluid) and a dissolved substance, called the solute.

**Solvent:** A material that can dissolve other materials to form a uniform single-phase mixture. Water is the most common solvent.

**Soot:** Fine particles, usually black, formed by combustion (complete or incomplete) and consisting chiefly of carbon.

**$SO_x$:** Oxides of sulfur where x equals the number of oxygen atoms.

**Spasm:** An involuntary, convulsive muscular contraction.

**SPCC:** Spill Prevention, Control, and Counter-measure plan.

**Specific Gravity:** The ratio of the density of a substance to the density of a reference substance, at a specified temperature.

**Spontaneously Combustible Material:** A material which undergoes self-heating to the point of ignition without requiring heat from another source.

**Stability:** The ability of a material to remain unchanged.

**STEL:** Short-term exposure limit; ACGIH terminology. See TLV-STEL.

**Stomatitis:** Inflammation of the mucous membrane of the mouth.

**Stupor:** Partial or near complete unconsciousness.

**Subcutaneous:** Beneath the skin.

**Sublime:** To change from the solid to the vapor phase without passing through the liquid phase.

**Subpart Z:** See Z List.

**Superfund Amendments and Reauthorization Act:** See SARA, CERCLA.

**Synergism:** A combined action of two or more toxic substances to give an effect greater that the sum of their activity when each toxic substance is alone.

**Synonyms:** Alternative names by which a material may be known.

**Systemic Toxicity:** Adverse effects induced by a substance which affects the body in a general manner rather than locally.

**Tachycardia:** Excessively rapid heartbeat, usually with a pulse rate above 100 beats per minute.

**Tachypnea:** Increased rate of respiration.

**Tag Closed Cup:** See TCC or TCT

**Tag Open Tester:** Open-tank tester for liquids with low flash points. See TCC or TCT.

**Target Organ Effects:** Chemically caused effects from exposure to a material on specific listed organs and systems.

**TCC or TCT:** Tag (Tagliabue) closed cup or tag closed tester. One of several types of apparatus for determining flash points.

**$TC_{Lo}$:** Toxic concentration low. The lowest concentration of a substance in air to which humans or animals have been exposed for any given period of time that has produced any toxic effect in humans or produced a tumorigenic or reproductive effect in animals or humans.

**$TD_{Lo}$:** The lowest dose of a substance introduced by any route other than inhalation over any given period of time and reported to produce any toxic
Effect in humans or to produce tumorigenic or reproductive effects in animals or humans.

**Temp:** Temperature.

**Teratogen:** An agent or material causing physical defects in a developing embryo.

**Threshold Limit Value:** See TLV.

**Threshold Planning Quantity (TPQ):** Per 40 CFR 302. The amount of material at a facility notification per CERCLA.

**Time-Weighted Average:** See TLV.

**Tinnitus:** A ringing sound in the ears.

**TLm:** Median tolerance limit. Designates a toxic material's concentration at which 50% of the test organisms, usually aquatic, survive.

**TLV:** Threshold limit value. A term ACGIH uses to express the maximum airborne concentration of a material to which most workers can be exposed during a normal daily and weekly work schedule without adverse effects.

**TLV-Ceiling Limit:** TLV-C. The ceiling exposure limit or concentration not to exceed at any time, even for very brief times.

**TLV-Skin:** See skin.

**TOC:** Tag open-cup test method.

**torr:** A unit of pressure, equal to 1 mm Hg. See atm (atmosphere)

**Toxic:** Poisonous; having properties of causing adverse health effects
when the body is exposed.

**Toxicology:** The study of the nature, effects and detection of poisons in living organisms.

**Toxic Substance:** Any chemical or material that 1)has evidence of an acute or chronic health hazard and 2)is listed in the NIOSH Registry of Toxic Effects of Chemical Substances.

**Toxic Substances Control Act:** See TSCA

**TPQ:** See Threshold Planning Quantity.

**Tradename:** A name, usually not the chemical name, given to a product by the manufacturer or supplier and usually protected as a Registered Trademark.

**TSCA:** Toxic Substances Control Act. Public Law PL 94-469. Found
In 40 CFR 700-799. EPA has jurisdiction. Effective Jan. 1, 1977. Controls the exposure to and use of raw industrial chemicals not subject to other laws.

**Tumor:** A growth of tissue without physiological function. May be benign (noninvasive) or cancerous. See Cancer, Neoplasm.

**TWA:** Time-weight average. See TLV TWA.

**UEL:** See Upper Explosive Limit, Upper Flammable Limit.

**UFL:** See Upper Flammable Limit, Upper Explosive Limit.

**Ulcer:** Loss or death of tissue resulting in an open sore on the skin or on a surface of an internal organ, such as the stomach.

**UN Number:** See DOT Identification Numbers: PIN.

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

**Upper Explosive Limit, Upper Flammable Limit: UEL, UFL:**
The highest concentration of a material in air that produces an explosion or fire or that ignites when it contacts an ignition source (high, heat, electric arc, spark, or flame). Any concentration above the **UEL** in air is too rich to be ignited. See Flammable Limits.

**Urticaria:** Hives caused by a systemic allergic reaction.

**UV:** Ultraviolet (light).

**Vapor:** The gaseous state of a material normally encountered as liquid or solid.

**Vapor Density:** The ratio of the formula mass (FM) of the compound to the average formula mass of the gases in air(29 grams per mole).

**Vapor Pressure:** The pressure a saturated vapor exerts above its own liquid in a closed container.

**Vertigo:** A feelin g of revolving in space; dizziness, giddiness.

**Viscosity:** Measurement of a fluid's thickness or resistance to flow.

**VOC:** Volatile organic compounds. Used in coatings and paint because they evaporate very rapidly.

**Volatility:** Measure of a material's tendency to vaporize or evaporate at ambient routine conditions.

**VP:** See Vapor Pressure.

**Water Reactive:** Describes a material that reacts with water to release a flammable gas or to present a health hazard.

**Working Alone:** Performance of any work by an individual out of audio or visual range of another individual for more that a few minutes.

**Zinc Fume Fever**: Caused by inhalation of zinc oxide fume and characterized by flu-like symptoms: metallic taste in mouth, coughing, weakness, fatigue, muscular pain, and nausea, followed by fever and chills.

**Z List:** OSHA'S Toxic and Hazardous Substances Tables Z-1, Z-2, and Z-3 of air contaminants, (29 CFR 1910. 1000).