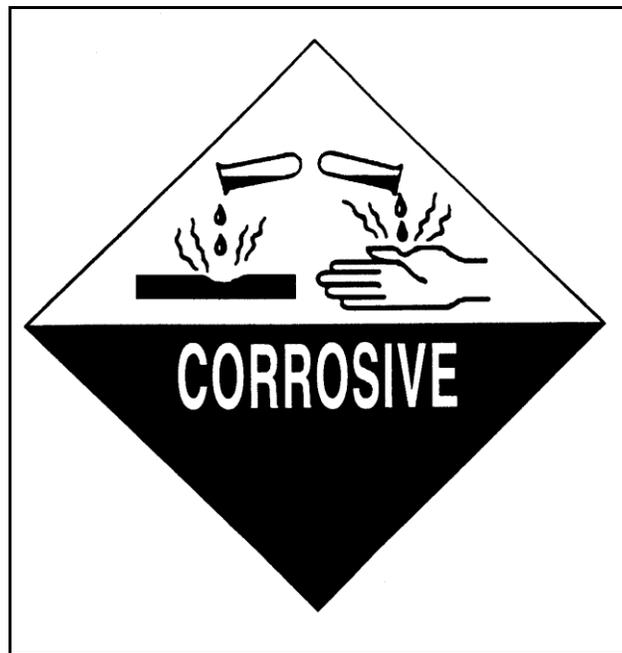


HAZARD COMMUNICATION



PROGRAM

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NOTES:

OSHA HAZARD COMMUNICATION STANDARD

(a) PURPOSE.

- (1) The purpose of this section is to ensure that the hazards of all chemicals produced or imported are evaluated, and that information concerning their hazards is transmitted to employers and employees. This transmittal of information is to be accomplished by means of comprehensive hazard communication programs, which are to include container labeling and other forms of warning, material safety data sheets and employee training.
- (2) This occupational safety and health standard is intended to address comprehensively the issue of evaluating the potential hazards of chemicals, and communicating information concerning hazards and appropriate protective measures to employees, and to preempt any legal requirements of a state, or political subdivision of a state, pertaining to this subject. Evaluating the potential hazards of chemicals, and communicating information concerning hazards and appropriate protective measures to employees, may include, for example, but is not limited to, provisions for: developing and maintaining a written hazard communication program for the workplace, including lists of hazardous chemicals present; labeling of containers of chemicals in the workplace, as well as of containers of chemicals being shipped to other workplaces; preparation and distribution of material safety data sheets to employees and downstream employers; and development and implementation of employee training programs regarding hazards of chemicals and protective measures. Under section 18 of the Act, no state or political subdivision of a state may adopt or enforce, through any court or agency, any requirement relating to the issue addressed by this Federal standard, except pursuant to a Federally-approved state plan.

(b) SCOPE AND APPLICATION.

- (1) This section requires chemical manufacturers or importers to assess the hazards of chemicals which they produce or import, and all employers to provide information to their employees about the hazardous chemicals to which they are exposed, by means of a hazard communication program, labels and other forms of warning, material safety data sheets, and information and training. In addition, this section requires distributors to transmit the required information to employers. (Employers who do not produce or import chemicals need only focus on those parts of this rule that deal with establishing a workplace program and communicating information to their workers. Appendix E of this section is a general guide for such employers to help them determine their compliance obligations under the rule.)
- (2) This section applies to any chemical which is known to be present in the workplace in such a manner that employees may be exposed under normal conditions of use or in a foreseeable emergency.
- (3) This section applies to laboratories only as follows:
 - (i) Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced;
 - (ii) Employers shall maintain any material safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are

readily accessible during each workshift to laboratory employees when they are in their work areas;

- (iii) Employers shall ensure that laboratory employees are provided information and training in accordance with paragraph (h) of this section, except for the location and availability of the written hazard communication program under paragraph (h)(2)(iii) of this section; and,
 - (iv) Laboratory employers that ship hazardous chemicals are considered to be either a chemical manufacturer or a distributor under this rule, and thus must ensure that any containers of hazardous chemicals leaving the laboratory are labeled in accordance with paragraph (f)(1) of this section, and that a material safety data sheet is provided to distributors and other employers in accordance with paragraphs (g)(6) and (g)(7) of this section.
- (4) In work operations where employees only handle chemicals in sealed containers which are not opened under normal conditions of use (such as are found in marine cargo handling, warehousing, or retail sales), this section applies to these operations only as follows:
- (i) Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced;
 - (ii) Employers shall maintain copies of any material safety data sheets that are received with incoming shipments of the sealed containers of hazardous chemicals, shall obtain a material safety data sheet as soon as possible for sealed containers of hazardous chemicals received without a material safety data sheet if an employee requests the material safety data sheet, and shall ensure that the material safety data sheets are readily accessible during each work shift to employees when they are in their work area(s); and,
 - (iii) Employers shall ensure that employees are provided with information and training in accordance with paragraph (h) of this section (except for the location and availability of the written hazard communication program under paragraph (h)(2)(iii) of this section), to the extent necessary to protect them in the event of a spill or leak of a hazardous chemical from a sealed container.
- (5) This section does not require labeling of the following chemicals:
- (i) Any pesticide as such term is defined in the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136 et seq.), when subject to the labeling requirements of that Act and labeling regulations issued under that Act by the Environmental Protection Agency;
 - (ii) Any chemical substance or mixture as such terms are defined in the Toxic Substances Control Act (15 U.S.C. 2601 et seq.), when subject to the labeling requirements of that Act and labeling regulations issued under that Act by the Environmental Protection Agency;
 - (iii) Any food, food additive, color additive, drug, cosmetic, or medical or veterinary device or product, including materials intended for use as ingredients in such products (e.g. flavors and fragrances), as such terms are defined in the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 et seq.) or the Virus-Serum-Toxin Act of 1913 (21 U.S.C. 151 et seq.), and regulations issued under those Acts, when they are subject to the labeling requirements under those Acts by either the Food and Drug Administration or the

Department of Agriculture;

- (iv) Any distilled spirits (beverage alcohols), wine, or malt beverage intended for nonindustrial use, as such terms are defined in the Federal Alcohol Administration Act (27 U.S.C. 201 et seq.) and regulations issued under that Act, when subject to the labeling requirements of that Act and labeling regulations issued under that Act by the Bureau of Alcohol, Tobacco, and Firearms;
 - (v) Any consumer product or hazardous substance as those terms are defined in the Consumer Product Safety Act (15 U.S.C. 2051 et seq.) and Federal Hazardous Substances Act (15 U.S.C. 1261 et seq.) respectively, when subject to a consumer product safety standard or labeling requirement of those Acts, or regulations issued under those Acts by the Consumer Product Safety Commission; and,
 - (vi) Agricultural or vegetable seed treated with pesticides and labeled in accordance with the Federal Seed Act (7 U.S.C. 1551 et seq.) and the labeling regulations issued under that Act by the Department of Agriculture.
- (6) This section does not apply to:
- (i) Any hazardous waste as such term is defined by the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6901 et seq.), when subject to regulations issued under that Act by the Environmental Protection Agency;
 - (ii) Any hazardous substance as such term is defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)(42 U.S.C. 9601 et seq.), when the hazardous substance is the focus of remedial or removal action being conducted under CERCLA in accordance with Environmental Protection Agency regulations;
 - (iii) Tobacco or tobacco products;
 - (iv) Wood or wood products, including lumber which will not be processed, where the chemical manufacturer or importer can establish that the only hazard they pose to employees is the potential for flammability or combustibility (wood or wood products which have been treated with a hazardous chemical covered by this standard, and wood which may be subsequently sawed or cut, generating dust, are not exempted);
 - (v) Articles (as that term is defined in paragraph (c) of this section);
 - (vi) Food or alcoholic beverages which are sold, used, or prepared in a retail establishment (such as a grocery store, restaurant, or drinking place), and foods intended for personal consumption by employees while in the workplace;
 - (vii) Any drug, as that term is defined in the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 et seq.), when it is in solid, final form for direct administration to the patient (e.g., tablets or pills); drugs which are packaged by the chemical manufacturer for sale to consumers in a retail establishment (e.g., over-the-counter drugs); and drugs intended for personal consumption by employees while in the workplace (e.g., first aid supplies);
 - (viii) Cosmetics which are packaged for sale to consumers in a retail establishment,

and cosmetics intended for personal consumption by employees while in the workplace;

- (ix) Any consumer product or hazardous substance, as those terms are defined in the Consumer Product Safety Act (15 U.S.C. 2051 et seq.) and Federal Hazardous Substances Act (15 U.S.C. 1261 et seq.) respectively, where the employer can show that it is used in the workplace for the purpose intended by the chemical manufacturer or importer of the product, and the use results in a duration and frequency of exposure which is not greater than the range of exposures that could reasonably be experienced by consumers when used for the purpose intended;
- (x) Nuisance particulates where the chemical manufacturer or importer can establish that they do not pose any physical or health hazard covered under this section;
- (xi) Ionizing and nonionizing radiation; and,
- (xii) Biological hazards.

(c) **DEFINITIONS.**

Article means a manufactured item other than a fluid or particle:

- (i) Which is formed to a specific shape or design during manufacture;
- (ii) Which has end use function(s) dependent in whole or in part upon its shape or design during end use; and
- (iii) Which under normal conditions of use does not release more than very small quantities, e.g., minute or trace amounts of a hazardous chemical (as determined under paragraph (d) of this section), and does not pose a physical hazard or health risk to employees.

Assistant Secretary means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

Chemical means any element, chemical compound or mixture of elements and/or compounds.

Chemical manufacturer means an employer with a workplace where chemical(s) are produced for use or distribution.

Chemical name means the scientific designation of a chemical in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS) rules of nomenclature, or a name which will clearly identify the chemical for the purpose of conducting a hazard evaluation.

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

Commercial account means an arrangement whereby a retail distributor sells hazardous chemicals to an employer, generally in large quantities over time and/or at costs that are below the regular retail price.

Common name means any designation or identification such as code name, code number, trade name, brand name or generic name used to identify a chemical other than by its

chemical name.

Compressed gas means:

- (i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70° F (21.1° C); or
- (ii) 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
- (iii) A liquid having a vapor pressure exceeding 40 psi at 100° F (37.8° C) as determined by ASTM D-323-72.

Container means any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical. For purposes of this section, pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle, are not considered to be containers.

Designated representative means any individual or organization to whom an employee gives written authorization to exercise such employee's rights under this section. A recognized or certified collective bargaining agent shall be treated automatically as a designated representative without regard to written employee authorization.

Director means the Director, National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, or designee.

Distributor means a business, other than a chemical manufacturer or importer, which supplies hazardous chemicals to other distributors or to employers.

Employee means a worker who may be exposed to hazardous chemicals under normal operating conditions or in foreseeable emergencies. Workers such as office workers or bank tellers who encounter hazardous chemicals only in non-routine, isolated instances are not covered.

Employer means a person engaged in a business where chemicals are either used, distributed, or are produced for use or distribution, including a contractor or subcontractor.

Explosive means 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 means that an employee is subjected in the course of employment to a chemical that is a physical or health hazard, and includes potential (e.g. accidental or possible) exposure. "Subjected" in terms of health hazards includes any route of entry (e.g. inhalation, ingestion, skin contact or absorption.)

Flammable means a chemical that falls into one of the following categories:

- (i) **Aerosol, flammable** means an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;
- (ii) **Gas, flammable** means:
 - (A) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of thirteen (13) percent by volume or less; or
 - (B) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than twelve (12) percent by volume, regardless of the lower limit;
- (iii) **Liquid, flammable** means any liquid having a flashpoint below 100° F (37.8°

C), except any mixture having components with flashpoints of 100° F (37.8° C) or higher, the total of which make up 99 percent or more of the total volume of the mixture.

- (iv) **Solid, flammable** means 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 chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

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

- (i) Tagliabue Closed Tester (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24-1979 (ASTM D 56-79)) for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100° F (37.8° C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or
- (ii) Pensky-Martens Closed Tester (See American National Standard Method of Test for Flash Point by Pensky-Martens Closed Tester, Z11.7-1979 (ASTM D 93-79)) for liquids with a viscosity equal to or greater than 45 SUS at 100° F (37.8° C), or that contain suspended solids, or that have a tendency to form a surface film under test; or
- (iii) Setaflash Closed Tester (see American National Standard Method of Test for Flash Point by Setaflash Closed Tester (ASTM D 3278-78)).

Organic peroxides, which undergo auto accelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above.

Foreseeable emergency means 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.

Hazardous chemical means any chemical which is a physical hazard or a health hazard.

Hazard warning means any words, pictures, symbols, or combination thereof appearing on a label or other appropriate form of warning which convey the specific physical or health hazard(s), including target organ effects, of the chemical(s) in the container(s). (See the definitions for “physical hazard” and “health hazard” to determine the hazards which must be covered.)

Health hazard means a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term “health hazard” includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes. Appendix A provides further definitions and explanations of the scope of health hazards covered by this section, and Appendix B describes the criteria to be used to determine whether or not a chemical is to be considered hazardous for purposes of this standard.

Identity means any chemical or common name which is indicated on the material safety data sheet (MSDS) for the chemical. The identity used shall permit cross-references to be made among the required list of hazardous chemicals, the label and the MSDS.

Immediate use means that the hazardous chemical will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.

Importer means the first business with employees within the Customs Territory of the United States which receives hazardous chemicals produced in other countries for the purpose of supplying them to distributors or employers within the United States.

Label means any written, printed, or graphic material displayed on or affixed to containers of hazardous chemicals.

Material safety data sheet (MSDS) means written or printed material concerning a hazardous chemical which is prepared in accordance with paragraph (g) of this section.

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

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

Oxidizer means a chemical other than a blasting agent or explosive as defined in § 1910.109(a), that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

Physical hazard 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.

Produce means to manufacture, process, formulate, blend, extract, generate, emit, or repackage.

Pyrophoric means a chemical that will ignite spontaneously in air at a temperature of 130° F (54.4° C) or below.

Responsible party means someone who can provide additional information on the hazardous chemical and appropriate emergency procedures, if necessary.

Specific chemical identity means the chemical name, Chemical Abstracts Service (CAS) Registry Number, or any other information that reveals the precise chemical designation of the substance.

Trade secret means any confidential formula, pattern, process, device, information or compilation of information that is used in an employer's business, and that gives the employer an opportunity to obtain an advantage over competitors who do not know or use it. Appendix D sets out the criteria to be used in evaluating trade secrets.

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

Use means to package, handle, react, emit, extract, generate as a byproduct, or transfer.

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

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

Workplace means an establishment, job site, or project, at one geographical location containing one or more work areas.

(d) HAZARD DETERMINATION.

- (1) Chemical manufacturers and importers shall evaluate chemicals produced in their workplaces or imported by them to determine if they are hazardous. Employers are not required to evaluate chemicals unless they choose not to rely on the evaluation performed by the chemical manufacturer or importer for the chemical to satisfy this requirement.
- (2) Chemical manufacturers, importers or employers evaluating chemicals shall identify and consider the available scientific evidence concerning such hazards. For health hazards, evidence which is statistically significant and which is based on at least one positive study conducted in accordance with established scientific principles is considered to be sufficient to establish a hazardous effect if the results of the study meet the definitions of health hazards in this section. Appendix A shall be consulted for the scope of health hazards covered, and Appendix B shall be consulted for the criteria to be followed with respect to the completeness of the evaluation, and the data to be reported.
- (3) The chemical manufacturer, importer or employer evaluating chemicals shall treat the following sources as establishing that the chemicals listed in them are hazardous:
 - (i) 29 CFR part 1910, subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA); or,
 - (ii) Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment, American Conference of Governmental Industrial Hygienists (ACGIH) (latest edition). The chemical manufacturer, importer, or employer is still responsible for evaluating the hazards associated with the chemicals in these source lists in accordance with the requirements of this standard.
- (4) Chemical manufacturers, importers and employers evaluating chemicals shall treat the following sources as establishing that a chemical is a carcinogen or potential carcinogen for hazard communication purposes:
 - (i) National Toxicology Program (NTP), Annual Report on Carcinogens (latest edition);
 - (ii) International Agency for Research on Cancer (IARC) Monographs (latest editions); or
 - (iii) 29 CFR part 1910, subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration. Note: The Registry of Toxic Effects of Chemical Substances published by the National Institute for Occupational Safety and Health indicates whether a chemical has been found by NTP or IARC to be a potential carcinogen.

NOTE: The Registry of Toxic Effects of Chemical Substances published by the National Institute for Occupational Safety and Health indicates whether a chemical has been found by NTP or IARC to be a potential carcinogen.

- (5) The chemical manufacturer, importer or employer shall determine the hazards of mixtures of chemicals as follows:
- (i) If a mixture has been tested as a whole to determine its hazards, the results of such testing shall be used to determine whether the mixture is hazardous;
 - (ii) If a mixture has not been tested as a whole to determine whether the mixture is a health hazard, the mixture shall be assumed to present the same health hazards as do the components which comprise one percent (by weight or volume) or greater of the mixture, except that the mixture shall be assumed to present a carcinogenic hazard if it contains a component in concentrations of 0.1 percent or greater which is considered to be a carcinogen under paragraph (d)(4) of this section;
 - (iii) If a mixture has not been tested as a whole to determine whether the mixture is a physical hazard, the chemical manufacturer, importer, or employer may use whatever scientifically valid data is available to evaluate the physical hazard potential of the mixture; and,
 - (iv) If the chemical manufacturer, importer, or employer has evidence to indicate that a component present in the mixture in concentrations of less than one percent (or in the case of carcinogens, less than 0.1 percent) could be released in concentrations which would exceed an established OSHA permissible exposure limit or ACGIH Threshold Limit Value, or could present a health risk to employees in those concentrations, the mixture shall be assumed to present the same hazard.
- (6) Chemical manufacturers, importers, or employers evaluating chemicals shall describe in writing the procedures they use to determine the hazards of the chemical they evaluate. The written procedures are to be made available, upon request, to employees, their designated representatives, the Assistant Secretary and the Director. The written description may be incorporated into the written hazard communication program required under paragraph (e) of this section.

(e) WRITTEN HAZARD COMMUNICATION PROGRAM.

- (1) Employers shall develop, implement, and maintain at each workplace, a written hazard communication program which at least describes how the criteria specified in paragraphs (f), (g), and (h) of this section for labels and other forms of warning, material safety data sheets, and employee information and training will be met, and which also includes the following:
- (i) A list of the hazardous chemicals known to be present using an identity that is referenced on the appropriate material safety data sheet (the list may be compiled for the workplace as a whole or for individual work areas); and,
 - (ii) The methods the employer will use to inform employees of the hazards of non-routine tasks (for example, the cleaning of reactor vessels), and the hazards associated with chemicals contained in unlabeled pipes in their work areas.
- (2) Multi-employer workplaces. Employers who produce, use, or store hazardous chemicals at a workplace in such a way that the employees of other employer(s) may be exposed (for example, employees of a construction contractor working on-site) shall additionally ensure that the hazard communication programs developed and implemented under this paragraph (e) include the following:

- (i) The methods the employer will use to provide the other employer(s) on-site access to material safety data sheets for each hazardous chemical the other employer(s)' employees may be exposed to while working;
 - (ii) The methods the employer will use to inform the other employer(s) of any precautionary measures that need to be taken to protect employees during the workplace's normal operating conditions and in foreseeable emergencies; and,
 - (iii) The methods the employer will use to inform the other employer(s) of the labeling system used in the workplace.
- (3) The employer may rely on an existing hazard communication program to comply with these requirements, provided that it meets the criteria established in this paragraph (e).
- (4) The employer shall make the written hazard communication program available, upon request, to employees, their designated representatives, the Assistant Secretary and the Director, in accordance with the requirements of 29 CFR 1910.1020 (e).
- (5) Where employees must travel between workplaces during a workshift, i.e., their work is carried out at more than one geographical location, the written hazard communication program may be kept at the primary workplace facility.

(f) LABELS AND OTHER FORMS OF WARNING.

- (1) The chemical manufacturer, importer, or distributor shall ensure that each container of hazardous chemicals leaving the workplace is labeled, tagged or marked with the following information:
- (i) Identity of the hazardous chemical(s);
 - (ii) Appropriate hazard warnings; and
 - (iii) Name and address of the chemical manufacturer, importer, or other responsible party.
- (2)
- (i) For solid metal (such as a steel beam or a metal casting), solid wood, or plastic items that are not exempted as articles due to their downstream use, or shipments of whole grain, the required label may be transmitted to the customer at the time of the initial shipment, and need not be included with subsequent shipments to the same employer unless the information on the label changes;
 - (ii) The label may be transmitted with the initial shipment itself, or with the material safety data sheet that is to be provided prior to or at the time of the first shipment; and,
 - (iii) This exception to requiring labels on every container of hazardous chemicals is only for the solid material itself, and does not apply to hazardous chemicals used in conjunction with, or known to be present with, the material and to which employees handling the items in transit may be exposed (for example, cutting fluids or pesticides in grains).
- (3) Chemical manufacturers, importers, or distributors shall ensure that each container

- of hazardous chemicals leaving the workplace is labeled, tagged, or marked in accordance with this section in a manner which does not conflict with the requirements of the Hazardous Materials Transportation Act (49 U.S.C. 1801 et seq.) and regulations issued under that Act by the Department of Transportation.
- (4) If the hazardous chemical is regulated by OSHA in a substance-specific health standard, the chemical manufacturer, importer, distributor or employer shall ensure that the labels or other forms of warning used are in accordance with the requirements of that standard.
 - (5) Except as provided in paragraphs (f)(6) and (f)(7) of this section, the employer shall ensure that each container of hazardous chemicals in the workplace is labeled, tagged or marked with the following information:
 - (i) Identity of the hazardous chemical(s) contained therein; and,
 - (ii) Appropriate hazard warnings, or alternatively, words, pictures, symbols, or combination thereof, which provide at least general information regarding the hazards of the chemicals, and which, in conjunction with the other information immediately available to employees under the hazard communication program, will provide employees with the specific information regarding the physical and health hazards of the hazardous chemical.
 - (6) The employer may use signs, placards, process sheets, batch tickets, operating procedures, or other such written materials in lieu of affixing labels to individual stationary process containers, as long as the alternative method identifies the containers to which it is applicable and conveys the information required by paragraph (f)(5) of this section to be on a label. The written materials shall be readily accessible to the employees in their work area throughout each work shift.
 - (7) The employer is not required to label portable containers into which hazardous chemicals are transferred from labeled containers, and which are intended only for the immediate use of the employee who performs the transfer. For purposes of this section, drugs which are dispensed by a pharmacy to a health care provider for direct administration to a patient are exempted from labeling.
 - (8) The employer shall not remove or deface existing labels on incoming containers of hazardous chemicals, unless the container is immediately marked with the required information.
 - (9) The employer shall ensure that labels or other forms of warning are legible, in English, and prominently displayed on the container, or readily available in the work area throughout each work shift. Employers having employees who speak other languages may add the information in their language to the material presented, as long as the information is presented in English as well.
 - (10) The chemical manufacturer, importer, distributor or employer need not affix new labels to comply with this section if existing labels already convey the required information.
 - (11) Chemical manufacturers, importers, distributors, or employers who become newly aware of any significant information regarding the hazards of a chemical shall revise the labels for the chemical within three months of becoming aware of the new information. Labels on containers of hazardous chemicals shipped after that time shall contain the new information. If the chemical is not currently produced or

imported, the chemical manufacturer, importers, distributor, or employer shall add the information to the label before the chemical is shipped or introduced into the workplace again.

(g) MATERIAL SAFETY DATA SHEETS.

- (1) Chemical manufacturers and importers shall obtain or develop a material safety data sheet for each hazardous chemical they produce or import. Employers shall have a material safety data sheet in the workplace for each hazardous chemical, which they use.
- (2) Each material safety data sheet shall be in English (although the employer may maintain copies in other languages as well), and shall contain at least the following information:
 - (i) The identity used on the label, and, except as provided for in paragraph (i) of this section on trade secrets:
 - (A) If the hazardous chemical is a single substance, its chemical and common name(s);
 - (B) If the hazardous chemical is a mixture which has been tested as a whole to determine its hazards, the chemical and common name(s) of the ingredients which contribute to these known hazards, and the common name(s) of the mixture itself; or,
 - (C) If the hazardous chemical is a mixture which has not been tested as a whole:
 - (1) The chemical and common name(s) of all ingredients which have been determined to be health hazards, and which comprise 1% or greater of the composition, except that chemicals identified as carcinogens under paragraph (d) of this section shall be listed if the concentrations are 0.1% or greater; and,
 - (2) The chemical and common name(s) of all ingredients which have been determined to be health hazards, and which comprise less than 1% (0.1% for carcinogens) of the mixture, if there is evidence that the ingredient(s) could be released from the mixture in concentrations which would exceed an established OSHA permissible exposure limit or ACGIH Threshold Limit Value, or could present a health risk to employees; and,
 - (3) The chemical and common name(s) of all ingredients which have been determined to present a physical hazard when present in the mixture;
 - (ii) Physical and chemical characteristics of the hazardous chemical (such as vapor pressure, flash point);
 - (iii) The physical hazards of the hazardous chemical, including the potential for fire, explosion, and reactivity;
 - (iv) The health hazards of the hazardous chemical, including signs and symptoms

of exposure, and any medical conditions which are generally recognized as being aggravated by exposure to the chemical;

- (v) The primary route(s) of entry;
 - (vi) The OSHA permissible exposure limit, ACGIH Threshold Limit Value, and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the material safety data sheet, where available;
 - (vii) Whether the hazardous chemical is listed in the National Toxicology Program (NTP) Annual Report on Carcinogens (latest edition) or has been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest editions), or by OSHA;
 - (viii) Any generally applicable precautions for safe handling and use which are known to the chemical manufacturer, importer or employer preparing the material safety data sheet, including appropriate hygienic practices, protective measures during repair and maintenance of contaminated equipment, and procedures for clean-up of spills and leaks;
 - (ix) Any generally applicable control measures which are known to the chemical manufacturer, importer or employer preparing the material safety data sheet, such as appropriate engineering controls, work practices, or personal protective equipment;
 - (x) Emergency and first aid procedures;
 - (xi) The date of preparation of the material safety data sheet or the last change to it; and,
 - (xii) The name, address and telephone number of the chemical manufacturer, importer, employer or other responsible party preparing or distributing the material safety data sheet, who can provide additional information on the hazardous chemical and appropriate emergency procedures, if necessary
- (3) If no relevant information is found for any given category on the material safety data sheet, the chemical manufacturer, importer or employer preparing the material safety data sheet shall mark it to indicate that no applicable information was found.
- (4) Where complex mixtures have similar hazards and contents (i.e. the chemical ingredients are essentially the same, but the specific composition varies from mixture to mixture), the chemical manufacturer, importer or employer may prepare one material safety data sheet to apply to all of these similar mixtures.
- (5) The chemical manufacturer, importer or employer preparing the material safety data sheet shall ensure that the information recorded accurately reflects the scientific evidence used in making the hazard determination. If the chemical manufacturer, importer or employer preparing the material safety data sheet becomes newly aware of any significant information regarding the hazards of a chemical, or ways to protect against the hazards, this new information shall be added to the material safety data sheet within three months. If the chemical is not currently being produced or imported the chemical manufacturer or importer shall add the information to the material safety data sheet before the chemical is introduced into the workplace again.

- (6)
- (i) Chemical manufacturers or importers shall ensure that distributors and employers are provided an appropriate material safety data sheet with their initial shipment, and with the first shipment after a material safety data sheet is updated;
 - (ii) The chemical manufacturer or importer shall either provide material safety data sheets with the shipped containers or send them to the distributor or employer prior to or at the time of the shipment;
 - (iii) If the material safety data sheet is not provided with a shipment that has been labeled as a hazardous chemical, the distributor or employer shall obtain one from the chemical manufacturer or importer as soon as possible; and,
 - (iv) The chemical manufacturer or importer shall also provide distributors or employers with a material safety data sheet upon request.
- (7)
- (i) Distributors shall ensure that material safety data sheets, and updated information, are provided to other distributors and employers with their initial shipment and with the first shipment after a material safety data sheet is updated;
 - (ii) The distributor shall either provide material safety data sheets with the shipped containers, or send them to the other distributor or employer prior to or at the time of the shipment;
 - (iii) Retail distributors selling hazardous chemicals to employers having a commercial account shall provide a material safety data sheet to such employers upon request, and shall post a sign or otherwise inform them that a material safety data sheet is available;
 - (iv) Wholesale distributors selling hazardous chemicals to employers over-the-counter may also provide material safety data sheets upon the request of the employer at the time of the over-the-counter purchase, and shall post a sign or otherwise inform such employers that a material safety data sheet is available;
 - (v) If an employer without a commercial account purchases a hazardous chemical from a retail distributor not required to have material safety data sheets on file (i.e., the retail distributor does not have commercial accounts and does not use the materials), the retail distributor shall provide the employer, upon request, with the name, address, and telephone number of the chemical manufacturer, importer, or distributor from which a material safety data sheet can be obtained;
 - (vi) Wholesale distributors shall also provide material safety data sheets to employers or other distributors upon request; and,
 - (vii) Chemical manufacturers, importers, and distributors need not provide material safety data sheets to retail distributors that have informed them that the retail distributor does not sell the product to commercial accounts or open the sealed container to use it in their own workplaces.
- (8) The employer shall maintain in the workplace copies of the required material safety

data sheets for each hazardous chemical, and shall ensure that they are readily accessible during each work shift to employees when they are in their work area(s). (Electronic access, microfiche, and other alternatives to maintaining paper copies of the material safety data sheets are permitted as long as no barriers to immediate employee access in each workplace are created by such options.

- (9) Where employees must travel between workplaces during a workshift, i.e., their work is carried out at more than one geographical location, the material safety data sheets may be kept at the primary workplace facility. In this situation, the employer shall ensure that employees can immediately obtain the required information in an emergency.
- (10) Material safety data sheets may be kept in any form, including operating procedures, and may be designed to cover groups of hazardous chemicals in a work area where it may be more appropriate to address the hazards of a process rather than individual hazardous chemicals. However, the employer shall ensure that in all cases the required information is provided for each hazardous chemical, and is readily accessible during each work shift to employees when they are in their work area(s).
- (11) Material safety data sheets shall also be made readily available, upon request, to designated representatives and to the Assistant Secretary, in accordance with the requirements of 29 CFR 1910.1020(e). The Director shall also be given access to material safety data sheets in the same manner.

(h) EMPLOYEE INFORMATION AND TRAINING.

- (1) Employers shall provide employees with effective information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new physical or health hazard the employees have not previously been trained about is introduced into their work area. Information and training may be designed to cover categories of hazards (e.g., flammability, carcinogenicity) or specific chemicals. Chemical-specific information must always be available through labels and material safety data sheets.
- (2) Information. Employees shall be informed of:
 - (i) The requirements of this section;
 - (ii) Any operations in their work area where hazardous chemicals are present; and,
 - (iii) The location and availability of the written hazard communication program, including the required list(s) of hazardous chemicals, and material safety data sheets required by this section.
- (3) Training. Employee training shall include at least:
 - (i) Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);
 - (ii) The physical and health hazards of the chemicals in the work area;
 - (iii) The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect

employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used; and,

- (iv) The details of the hazard communication program developed by the employer, including an explanation of the labeling system and the material safety data sheet, and how employees can obtain and use the appropriate hazard information.

(i) TRADE SECRETS.

- (1) The chemical manufacturer, importer, or employer may withhold the specific chemical identity, including the chemical name and other specific identification of a hazardous chemical, from the material safety data sheet, provided that:

- (i) The claim that the information withheld is a trade secret can be supported;
- (ii) Information contained in the material safety data sheet concerning the properties and effects of the hazardous chemical is disclosed;
- (iii) The material safety data sheet indicates that the specific chemical identity is being withheld as a trade secret; and,
- (iv) The specific chemical identity is made available to health professionals, employees, and designated representatives in accordance with the applicable provisions of this paragraph.

- (2) Where a treating physician or nurse determines that a medical emergency exists and the specific chemical identity of a hazardous chemical is necessary for emergency or first-aid treatment, the chemical manufacturer, importer, or employer shall immediately disclose the specific chemical identity of a trade secret chemical to that treating physician or nurse, regardless of the existence of a written statement of need or a confidentiality agreement. The chemical manufacturer, importer, or employer may require a written statement of need and confidentiality agreement, in accordance with the provisions of paragraphs (i) (3) and (4) of this section, as soon as circumstances permit.

- (3) In non-emergency situations, a chemical manufacturer, importer, or employer shall, upon request, disclose a specific chemical identity, otherwise permitted to be withheld under paragraph (i)(1) of this section, to a health professional (i.e. physician, industrial hygienist, toxicologist, epidemiologist, or occupational health nurse) providing medical or other occupational health services to exposed employee(s), and to employees or designated representatives, if:

- (i) The request is in writing;
- (ii) The request describes with reasonable detail one or more of the following occupational health needs for the information:
 - (A) To assess the hazards of the chemicals to which employees will be exposed;
 - (B) To conduct or assess sampling of the workplace atmosphere to determine employee exposure levels;
 - (C) To conduct pre-assignment or periodic medical surveillance of exposed employees;

- (D) To provide medical treatment to exposed employees;
 - (E) To select or assess appropriate personal protective equipment for exposed employees;
 - (F) To design or assess engineering controls or other protective measures for exposed employees; and,
 - (G) To conduct studies to determine the health effects of exposure.
- (iii) The request explains in detail why the disclosure of the specific chemical identity is essential and that, in lieu thereof, the disclosure of the following information to the health professional, employee, or designated representative, would not satisfy the purposes described in paragraph (i)(3)(ii) of this section:
- (A) The properties and effects of the chemical;
 - (B) Measures for controlling workers' exposure to the chemical;
 - (C) Methods of monitoring and analyzing worker exposure to the chemical; and,
 - (D) Methods of diagnosing and treating harmful exposures to the chemical;
- (iv) The request includes a description of the procedures to be used to maintain the confidentiality of the disclosed information; and,
- (v) The health professional, and the employer or contractor of the services of the health professional (i.e. downstream employer, labor organization, or individual employee), employee, or designated representative, agree in a written confidentiality agreement that the health professional, employee, or designated representative, will not use the trade secret information for any purpose other than the health need(s) asserted and agree not to release the information under any circumstances other than to OSHA, as provided in paragraph (i)(6) of this section, except as authorized by the terms of the agreement or by the chemical manufacturer, importer, or employer.
- (4) The confidentiality agreement authorized by paragraph (i)(3)(iv) of this section:
- (i) May restrict the use of the information to the health purposes indicated in the written statement of need;
 - (ii) May provide for appropriate legal remedies in the event of a breach of the agreement, including stipulation of a reasonable pre-estimate of likely damages; and,
 - (iii) May not include requirements for the posting of a penalty bond.
- (5) Nothing in this standard is meant to preclude the parties from pursuing non-contractual remedies to the extent permitted by law.
- (6) If the health professional, employee, or designated representative receiving the trade secret information decides that there is a need to disclose it to OSHA, the chemical manufacturer, importer, or employer who provided the information shall be informed

by the health professional, employee, or designated representative prior to, or at the same time as, such disclosure.

- (7) If the chemical manufacturer, importer, or employer denies a written request for disclosure of a specific chemical identity, the denial must:
 - (i) Be provided to the health professional, employee, or designated representative, within thirty days of the request;
 - (ii) Be in writing;
 - (iii) Include evidence to support the claim that the specific chemical identity is a trade secret;
 - (iv) State the specific reasons why the request is being denied; and,
 - (v) Explain in detail how alternative information may satisfy the specific medical or occupational health need without revealing the specific chemical identity.
- (8) The health professional, employee, or designated representative whose request for information is denied under paragraph (i)(3) of this section may refer the request and the written denial of the request to OSHA for consideration.
- (9) When a health professional, employee, or designated representative refers the denial to OSHA under paragraph (i)(8) of this section, OSHA shall consider the evidence to determine if:
 - (i) The chemical manufacturer, importer, or employer has supported the claim that the specific chemical identity is a trade secret;
 - (ii) The health professional, employee, or designated representative has supported the claim that there is a medical or occupational health need for the information; and,
 - (iii) The health professional, employee or designated representative has demonstrated adequate means to protect the confidentiality.
- (10)
 - (i) If OSHA determines that the specific chemical identity requested under paragraph (i)(3) of this section is not a bona fide trade secret, or that it is a trade secret, but the requesting health professional, employee, or designated representative has a legitimate medical or occupational health need for the information, has executed a written confidentiality agreement, and has shown adequate means to protect the confidentiality of the information, the chemical manufacturer, importer, or employer will be subject to citation by OSHA.
 - (ii) If a chemical manufacturer, importer, or employer demonstrates to OSHA that the execution of a confidentiality agreement would not provide sufficient protection against the potential harm from the unauthorized disclosure of a trade secret specific chemical identity, the Assistant Secretary may issue such orders or impose such additional limitations or conditions upon the disclosure of the requested chemical information as may be appropriate to assure that the occupational health services are provided without an undue risk of harm to the chemical manufacturer, importer, or employer.
- (11) If a citation for a failure to release specific chemical identity information is contested

by the chemical manufacturer, importer, or employer, the matter will be adjudicated before the Occupational Safety and Health Review Commission in accordance with the Act's enforcement scheme and the applicable Commission rules of procedure. In accordance with the Commission rules, when a chemical manufacturer, importer, or employer continues to withhold the information during the contest, the Administrative Law Judge may review the citation and supporting documentation in camera or issue appropriate orders to protect the confidentiality of such matters.

- (12) Notwithstanding the existence of a trade secret claim, a chemical manufacturer, importer, or employer shall, upon request, disclose to the Assistant Secretary any information which this section requires the chemical manufacturer, importer, or employer to make available. Where there is a trade secret claim, such claim shall be made no later than at the time the information is provided to the Assistant Secretary so that suitable determinations of trade secret status can be made and the necessary protections can be implemented.
- (13) Nothing in this paragraph shall be construed as requiring the disclosure under any circumstances of process or percentage of mixture information, which is a trade secret.

(j) EFFECTIVE DATES.

Chemical manufacturers, importers, distributors, and employers shall be in compliance with all provisions of this section by March 11, 1994.

APPENDIX A - HEALTH HAZARD DEFINITIONS (MANDATORY)

Although safety hazards related to the physical characteristics of a chemical can be objectively defined in terms of testing requirements (e.g. flammability), health hazard definitions are less precise and more subjective. Health hazards may cause measurable changes in the body-such as decreased pulmonary function. These changes are generally indicated by the occurrence of signs and symptoms in the exposed employees-such as shortness of breath, a non-measurable, subjective feeling. Employees exposed to such hazards must be apprised of both the change in body function and the signs and symptoms that may occur to signal that change. The determination of occupational health hazards is complicated by the fact that many of the effects or signs and symptoms occur commonly in non-occupationally exposed populations, so that effects of exposure are difficult to separate from normally occurring illnesses. Occasionally, a substance causes an effect that is rarely seen in the population at large, such as angiosarcomas caused by vinyl chloride exposure, thus making it easier to ascertain that the occupational exposure was the primary causative factor. More often, however, the effects are common, such as lung cancer. The situation is further complicated by the fact that most chemicals have not been adequately tested to determine their health hazard potential, and data do not exist to substantiate these effects. There have been many attempts to categorize effects and to define them in various ways. Generally, the terms "acute" and "chronic" are used to delineate between effects on the basis of severity or duration. "Acute" effects usually occur rapidly as a result of short-term exposures, and are of short duration. "Chronic" effects generally occur as a result of long-term exposure, and are of long duration. The acute effects referred to most frequently are those defined by the American National Standards Institute (ANSI) standard for Precautionary Labeling of Hazardous Industrial Chemicals (Z129.1-1988)-irritation, corrosivity, sensitization and lethal dose. Although these are important health effects, they do not adequately cover the considerable range of acute effects which may occur as a result of occupational exposure, such as, for example, narcosis. Similarly, the term chronic effect is often used to cover only carcinogenicity, teratogenicity, and mutagenicity. These effects are obviously a concern in the workplace, but again, do not adequately cover the area of chronic effects, excluding, for example, blood dyscrasias (such as anemia), chronic bronchitis and liver

atrophy. The goal of defining precisely, in measurable terms, every possible health effect that may occur in the workplace as a result of chemical exposures cannot realistically be accomplished. This does not negate the need for employees to be informed of such effects and protected from them. Appendix B, which is also mandatory, outlines the principles and procedures of hazard assessment. For purposes of this section, any chemicals which meet any of the following definitions, as determined by the criteria set forth in Appendix B are health hazards. However, this is not intended to be an exclusive categorization scheme. If there are available scientific data that involve other animal species or test methods, they must also be evaluated to determine the applicability of the HCS.

1. Carcinogen: 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.

2. 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 U.S. Department of Transportation 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.

3. Highly toxic: A chemical falling within any of the following categories:
 - (a) A chemical that has a median lethal dose (LD_{50}) 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 that has a median lethal dose (LD_{50}) 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 rabbits weighing between two and three kilograms each.
 - (c) A chemical that has a median lethal concentration (LC_{50}) 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 one hour) to albino rats weighing between 200 and 300 grams each.

4. 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 four hours exposure or by other appropriate techniques, it results in an empirical score of five or more. A chemical is an eye irritant if so determined under the procedure listed in 16 CFR 1500.42 or other appropriate techniques.

5. 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.

6. 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 (LC_{50}) 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 one hour) to albino rats weighing between 200 and 300 grams each.

7. Target organ effects. The following is a target organ categorization of effects which may occur, including examples of signs and symptoms and chemicals which have been found to cause such effects. 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 are not intended to be all-inclusive.
 - a. Hepatotoxins: Chemicals which produce liver damage
Signs & Symptoms: Jaundice; liver enlargement
Chemicals: Carbon tetrachloride; nitrosamines
 - b. Nephrotoxins: Chemicals which produce kidney damage
Signs & Symptoms: Edema; proteinuria
Chemicals: Halogenated hydrocarbons; uranium
 - c. Neurotoxins: Chemicals which produce their primary toxic effects on the nervous system
Signs & Symptoms: Narcosis; behavioral changes; decrease in motor functions
Chemicals: Mercury; carbon disulfide
 - d. Agents which act on the blood or hemato-poietic system: Decrease hemoglobin function; deprive the body tissues of oxygen
Signs & Symptoms: Cyanosis; loss of consciousness
Chemicals: Carbon monoxide; cyanides
 - e. Agents which damage the lung: Chemicals which irritate or damage pulmonary tissue
Signs & Symptoms: Cough; tightness in chest; shortness of breath
Chemicals: Silica; asbestos
 - f. Reproductive toxins: Chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis)
Signs & Symptoms: Birth defects; sterility
Chemicals: Lead; DBCP
 - g. Cutaneous hazards: Chemicals which affect the dermal layer of the body
Signs & Symptoms: Defatting of the skin; rashes; irritation
Chemicals: Ketones; chlorinated compounds

- h. Eye hazards: Chemicals which affect the eye or visual capacity
Signs & Symptoms: Conjunctivitis; corneal damage
Chemicals: Organic solvents; acids

APPENDIX B - HAZARD DETERMINATION (MANDATORY)

The quality of a hazard communication program is largely dependent upon the adequacy and accuracy of the hazard determination. The hazard determination requirement of this standard is performance-oriented. Chemical manufacturers, importers, and employers evaluating chemicals are not required to follow any specific methods for determining hazards, but they must be able to demonstrate that they have adequately ascertained the hazards of the chemicals produced or imported in accordance with the criteria set forth in this Appendix.

Hazard evaluation is a process which relies heavily on the professional judgment of the evaluator, particularly in the area of chronic hazards. The performance-orientation of the hazard determination does not diminish the duty of the chemical manufacturer, importer or employer to conduct a thorough evaluation, examining all relevant data and producing a scientifically defensible evaluation. For purposes of this standard, the following criteria shall be used in making hazard determinations that meet the requirements of this standard.

1. Carcinogenicity: As described in paragraph (d)(4) of this section and Appendix A of this section, a determination by the National Toxicology Program, the International Agency for Research on Cancer, or OSHA that a chemical is a carcinogen or potential carcinogen will be considered conclusive evidence for purposes of this section. In addition, however, all available scientific data on carcinogenicity must be evaluated in accordance with the provisions of this Appendix and the requirements of the rule.
2. Human data: Where available, epidemiological studies and case reports of adverse health effects shall be considered in the evaluation.
3. Animal data: Human evidence of health effects in exposed populations is generally not available for the majority of chemicals produced or used in the workplace. Therefore, the available results of toxicological testing in animal populations shall be used to predict the health effects that may be experienced by exposed workers. In particular, the definitions of certain acute hazards refer to specific animal testing results (see Appendix A).
4. Adequacy and reporting of data. The results of any studies which are designed and conducted according to established scientific principles, and which report statistically significant conclusions regarding the health effects of a chemical, shall be a sufficient basis for a hazard determination and reported on any material safety data sheet. In vitro studies alone generally do not form the basis for a definitive finding of hazard under the HCS since they have a positive or negative result rather than a statistically significant finding.

The chemical manufacturer, importer, or employer may also report the results of other scientifically valid studies which tend to refute the findings of hazard.

APPENDIX C - INFORMATION SOURCES (ADVISORY)

Appendix C to 29 CFR 1910.1200 was removed on March 7, 1996, effective May 6, 1996.

APPENDIX D - DEFINITION OF “TRADE SECRET” (MANDATORY)

The following is a reprint of the Restatement of Torts section 757, comment b (1939):

b. Definition of trade secret.

A trade secret may consist of any formula, pattern, device or compilation of information which is used in one's business, and which gives him an opportunity to obtain an advantage over competitors who do not know or use it. It may be a formula for a chemical compound, a process of manufacturing, treating or preserving materials, a pattern for a machine or other device, or a list of customers. It differs from other secret information in a business (see §759 of the Restatement of Torts which is not included in this Appendix) in that it is not simply information as to single or ephemeral events in the conduct of the business, as, for example, the amount or other terms of a secret bid for a contract or the salary of certain employees, or the security investments made or contemplated, or the date fixed for the announcement of a new policy or for bringing out a new model or the like. A trade secret is a process or device for continuous use in the operations of the business. Generally it relates to the production of goods, as, for example, a machine or formula for the production of an article. It may, however, relate to the sale of goods or to other operations in the business, such as a code for determining discounts, rebates or other concessions in a price list or catalogue, or a list of specialized customers, or a method of bookkeeping or other office management.

Secrecy.

The subject matter of a trade secret must be secret. Matters of public knowledge or of general knowledge in an industry cannot be appropriated by one as his secret. Matters which are completely disclosed by the goods which one markets cannot be his secret. Substantially, a trade secret is known only in the particular business in which it is used. It is not requisite that only the proprietor of the business know it. He may, without losing his protection, communicate it to employees involved in its use. He may likewise communicate it to others pledged to secrecy. Others may also know of it independently, as, for example, when they have discovered the process or formula by independent invention and are keeping it secret. Nevertheless, a substantial element of secrecy must exist, so that, except by the use of improper means, there would be difficulty in acquiring the information. An exact definition of a trade secret is not possible. Some factors to be considered in determining whether given information is one's trade secret are:

- (1) The extent to which the information is known outside of his business;
- (2) The extent to which it is known by employees and others involved in his business;
- (3) The extent of measures taken by him to guard the secrecy of the information;
- (4) The value of the information to him and his competitors;
- (5) The amount of effort or money expended by him in developing the information;
- (6) The ease or difficulty with which the information could be properly acquired or duplicated by others.

Novelty and prior art.

A trade secret may be a device or process which is patentable; but it need not be that. It may be a device or process which is clearly anticipated in the prior art or one which is merely a mechanical improvement that a good mechanic can make. Novelty and invention are not requisite for a trade secret as they are for patentability. These requirements are essential to patentability because a patent protects against unlicensed use of the patented device or process even by one who discovers it properly through independent research. The patent monopoly is a reward to the inventor. But such is not the case with a trade secret. Its protection is not based on a policy of rewarding or otherwise encouraging the development of secret processes or devices. The protection is merely against breach of faith and reprehensible means of learning another's secret. For this limited protection it is not

appropriate to require also the kind of novelty and invention which is a requisite of patentability. The nature of the secret is, however, an important factor in determining the kind of relief that is appropriate against one who is subject to liability under the rule stated in this Section. Thus, if the secret consists of a device or process which is a novel invention, one who acquires the secret wrongfully is ordinarily enjoined from further use of it and is required to account for the profits derived from his past use. If, on the other hand, the secret consists of mechanical improvements that a good mechanic can make without resort to the secret, the wrongdoer's liability may be limited to damages, and an injunction against future use of the improvements made with the aid of the secret may be inappropriate.

APPENDIX E - GUIDELINES FOR EMPLOYER COMPLIANCE (ADVISORY)

The Hazard Communication Standard (HCS) is based on a simple concept—that employees have both a need and a right to know the hazards and identities of the chemicals they are exposed to when working. They also need to know what protective measures are available to prevent adverse effects from occurring. The HCS is designed to provide employees with the information they need.

Knowledge acquired under the HCS will help employers provide safer workplaces for their employees. When employers have information about the chemicals being used, they can take steps to reduce exposures, substitute less hazardous materials, and establish proper work practices. These efforts will help prevent the occurrence of work-related illnesses and injuries caused by chemicals.

The HCS addresses the issues of evaluating and communicating hazards to workers. Evaluation of chemical hazards involves a number of technical concepts, and is a process that requires the professional judgment of experienced experts. That's why the HCS is designed so that employers who simply use chemicals, rather than produce or import them, are not required to evaluate the hazards of those chemicals. Hazard determination is the responsibility of the producers and importers of the materials. Producers and importers of chemicals are then required to provide the hazard information to employers that purchase their products.

Employers that don't produce or import chemicals need only focus on those parts of the rule that deal with establishing a workplace program and communicating information to their workers. This appendix is a general guide for such employers to help them determine what's required under the rule. It does not supplant or substitute for the regulatory provisions, but rather provides a simplified outline of the steps an average employer would follow to meet those requirements.

1. Becoming Familiar With The Rule.

OSHA has provided a simple summary of the HCS in a pamphlet entitled “Chemical Hazard Communication,” OSHA Publication Number 3084. Some employers prefer to begin to become familiar with the rule's requirements by reading this pamphlet. A copy may be obtained from your local OSHA Area Office, or by contacting the OSHA Publications Office at (202) 523-9667.

The standard is long, and some parts of it are technical, but the basic concepts are simple. In fact, the requirements reflect what many employers have been doing for years. You may find that you are already largely in compliance with many of the provisions, and will simply have to modify your existing programs somewhat. If you are operating in an OSHA-approved State Plan State, you must comply with the State's requirements, which may be different than those of the Federal rule. Many of the State Plan States had hazard communication or “right-to-know” laws prior to promulgation of the Federal rule. Employers in State Plan

States should contact their State OSHA offices for more information regarding applicable requirements.

The HCS requires information to be prepared and transmitted regarding all hazardous chemicals. The HCS covers both physical hazards (such as flammability), and health hazards (such as irritation, lung damage, and cancer). Most chemicals used in the workplace have some hazard potential, and thus will be covered by the rule.

One difference between this rule and many others adopted by OSHA is that this one is performance-oriented. That means that you have the flexibility to adapt the rule to the needs of your workplace, rather than having to follow specific, rigid requirements. It also means that you have to exercise more judgment to implement an appropriate and effective program.

The standard's design is simple. Chemical manufacturers and importers must evaluate the hazards of the chemicals they produce or import. Using that information, they must then prepare labels for containers, and more detailed technical bulletins called material safety data sheets (MSDS).

Chemical manufacturers, importers, and distributors of hazardous chemicals are all required to provide the appropriate labels and material safety data sheets to the employers to which they ship the chemicals. The information is to be provided automatically. Every container of hazardous chemicals you receive must be labeled, tagged, or marked with the required information. Your suppliers must also send you a properly completed material safety data sheet (MSDS) at the time of the first shipment of the chemical, and with the next shipment after the MSDS is updated with new and significant information about the hazards.

You can rely on the information received from your suppliers. You have no independent duty to analyze the chemical or evaluate the hazards of it.

Employers that “use” hazardous chemicals must have a program to ensure the information is provided to exposed employees. “Use” means to package, handle, react, or transfer. This is an intentionally broad scope, and includes any situation where a chemical is present in such a way that employees may be exposed under normal conditions of use or in a foreseeable emergency.

The requirements of the rule that deal specifically with the hazard communication program are found in this section in paragraphs (e), written hazard communication program; (f), labels and other forms of warning; (g), material safety data sheets; and (h), employee information and training. The requirements of these paragraphs should be the focus of your attention. Concentrate on becoming familiar with them, using paragraphs (b), scope and application, and (c), definitions, as references when needed to help explain the provisions.

There are two types of work operations where the coverage of the rule is limited. These are laboratories and operations where chemicals are only handled in sealed containers (e.g., a warehouse). The limited provisions for these workplaces can be found in paragraph (b) of this section, scope and application. Basically, employers having these types of work operations need only keep labels on containers as they are received; maintain material safety data sheets that are received, and give employees access to them; and provide information and training for employees. Employers do not have to have written hazard communication programs and lists of chemicals for these types of operations.

The limited coverage of laboratories and sealed container operations addresses the obligation of an employer to the workers in the operations involved, and does not affect the employer's duties as a distributor of chemicals. For example, a distributor may have warehouse operations where employees would be protected under the limited sealed container provisions. In this situation, requirements for obtaining and maintaining MSDSs are limited to providing

access to those received with containers while the substance is in the workplace, and requesting MSDSs when employees request access for those not received with the containers. However, as a distributor of hazardous chemicals, that employer will still have responsibilities for providing MSDSs to downstream customers at the time of the first shipment and when the MSDS is updated. Therefore, although they may not be required for the employees in the work operation, the distributor may, nevertheless, have to have MSDSs to satisfy other requirements of the rule.

2. Identify Responsible Staff.

Hazard communication is going to be a continuing program in your facility. Compliance with the HCS is not a “one shot deal.” In order to have a successful program, it will be necessary to assign responsibility for both the initial and ongoing activities that have to be undertaken to comply with the rule. In some cases, these activities may already be part of current job assignments. For example, site supervisors are frequently responsible for on-the-job training sessions. Early identification of the responsible employees, and involvement of them in the development of your plan of action, will result in a more effective program design. Evaluation of the effectiveness of your program will also be enhanced by involvement of affected employees.

For any safety and health program, success depends on commitment at every level of the organization. This is particularly true for hazard communication, where success requires a change in behavior. This will only occur if employers understand the program, and are committed to its success, and if employees are motivated by the people presenting the information to them.

3. Identify Hazardous Chemicals in the Workplace.

The standard requires a list of hazardous chemicals in the workplace as part of the written hazard communication program. The list will eventually serve as an inventory of everything for which an MSDS must be maintained. At this point, however, preparing the list will help you complete the rest of the program since it will give you some idea of the scope of the program required for compliance in your facility.

The best way to prepare a comprehensive list is to survey the workplace. Purchasing records may also help, and certainly employers should establish procedures to ensure that in the future purchasing procedures result in MSDSs being received before a material is used in the workplace.

The broadest possible perspective should be taken when doing the survey. Sometimes people think of “chemicals” as being only liquids in containers. The HCS covers chemicals in all physical forms-liquids, solids, gases, vapors, fumes, and mists-whether they are “contained” or not. The hazardous nature of the chemical and the potential for exposure are the factors which determine whether a chemical is covered. If it's not hazardous, it's not covered. If there is no potential for exposure (e.g., the chemical is inextricably bound and cannot be released), the rule does not cover the chemical.

Look around. Identify chemicals in containers, including pipes, but also think about chemicals generated in the work operations. For example, welding fumes, dusts, and exhaust fumes are all sources of chemical exposures. Read labels provided by suppliers for hazard information. Make a list of all chemicals in the workplace that are potentially hazardous. For your own information and planning, you may also want to note on the list the location(s) of the products within the workplace, and an indication of the hazards as found on the label. This will help you as you prepare the rest of your program.

Paragraph (b) of this section, scope and application, includes exemptions for various

chemicals or workplace situations. After compiling the complete list of chemicals, you should review paragraph (b) of this section to determine if any of the items can be eliminated from the list because they are exempted materials. For example, food, drugs, and cosmetics brought into the workplace for employee consumption are exempt. So rubbing alcohol in the first aid kit would not be covered.

Once you have compiled as complete a list as possible of the potentially hazardous chemicals in the workplace, the next step is to determine if you have received material safety data sheets for all of them. Check your files against the inventory you have just compiled. If any are missing, contact your supplier and request one. It is a good idea to document these requests, either by copy of a letter or a note regarding telephone conversations. If you have MSDSs for chemicals that are not on your list, figure out why. Maybe you don't use the chemical anymore. Or maybe you missed it in your survey. Some suppliers do provide MSDSs for products that are not hazardous. These do not have to be maintained by you.

You should not allow employees to use any chemicals for which you have not received an MSDS. The MSDS provides information you need to ensure proper protective measures are implemented prior to exposure.

4. Preparing and Implementing a Hazard Communication Program.

All workplaces where employees are exposed to hazardous chemicals must have a written plan which describes how the standard will be implemented in that facility. Preparation of a plan is not just a paper exercise—all of the elements must be implemented in the workplace in order to be in compliance with the rule. See paragraph (e) of this section for the specific requirements regarding written hazard communication programs. The only work operations which do not have to comply with the written plan requirements are laboratories and work operations where employees only handle chemicals in sealed containers. See paragraph (b) of this section, scope and application, for the specific requirements for these two types of workplaces.

The plan does not have to be lengthy or complicated. It is intended to be a blueprint for implementation of your program—an assurance that all aspects of the requirements have been addressed.

Many trade associations and other professional groups have provided sample programs and other assistance materials to affected employers. These have been very helpful to many employers since they tend to be tailored to the particular industry involved. You may wish to investigate whether your industry trade groups have developed such materials.

Although such general guidance may be helpful, you must remember that the written program has to reflect what you are doing in your workplace. Therefore, if you use a generic program it must be adapted to address the facility it covers. For example, the written plan must list the chemicals present at the site, indicate who is to be responsible for the various aspects of the program in your facility, and indicate where written materials will be made available to employees.

If OSHA inspects your workplace for compliance with the HCS, the OSHA compliance officer will ask to see your written plan at the outset of the inspection. In general, the following items will be considered in evaluating your program.

The written program must describe how the requirements for labels and other forms of warning, material safety data sheets, and employee information and training, are going to be met in your facility. The following discussion provides the type of information compliance officers will be looking for to decide whether these elements of the hazard communication program have been properly addressed:

A. Labels and Other Forms of Warning.

In-plant containers of hazardous chemicals must be labeled, tagged, or marked with the identity of the material and appropriate hazard warnings. Chemical manufacturers, importers, and distributors are required to ensure that every container of hazardous chemicals they ship is appropriately labeled with such information and with the name and address of the producer or other responsible party. Employers purchasing chemicals can rely on the labels provided by their suppliers. If the material is subsequently transferred by the employer from a labeled container to another container, the employer will have to label that container unless it is subject to the portable container exemption. See paragraph (f) of this section for specific labeling requirements.

The primary information to be obtained from an OSHA-required label is an identity for the material, and appropriate hazard warnings. The identity is any term which appears on the label, the MSDS, and the list of chemicals, and thus links these three sources of information. The identity used by supplier may be a common or trade name ("Black Magic Formula"), or a chemical name (1,1,1-trichloroethane). The hazard warning is a brief statement of the hazardous effects of the chemical ("flammable," "causes lung damage"). Labels frequently contain other information, such as precautionary measures ("do not use near open flame"), but this information is provided voluntarily and is not required by the rule. Labels must be legible, and prominently displayed. There are no specific requirements for size or color, or any specified text.

With these requirements in mind, the compliance officer will be looking for the following types of information to ensure that labeling will be properly implemented in your facility:

1. Designation of person(s) responsible for ensuring labeling of in-plant containers;
2. Designation of person(s) responsible for ensuring labeling of any shipped containers;
3. Description of labeling system(s) used;
4. Description of written alternatives to labeling of in-plant containers (if used); and,
5. Procedures to review and update label information when necessary.

Employers that are purchasing and using hazardous chemicals-rather than producing or distributing them-will primarily be concerned with ensuring that every purchased container is labeled. If materials are transferred into other containers, the employer must ensure that these are labeled as well, unless they fall under the portable container exemption (paragraph (f)(7) of this section). In terms of labeling systems, you can simply choose to use the labels provided by your suppliers on the containers. These will generally be verbal text labels, and do not usually include numerical rating systems or symbols that require special training. The most important thing to remember is that this is a continuing duty-all in-plant containers of hazardous chemicals must always be labeled. Therefore, it is important to designate someone to be responsible for ensuring that the labels are maintained as required on the containers in your facility, and that newly purchased materials are checked for labels prior to use.

B. Material Safety Data Sheets.

Chemical manufacturers and importers are required to obtain or develop a material safety data sheet for each hazardous chemical they produce or import. Distributors are responsible for ensuring that their customers are provided a copy of these MSDSs. Employers must have an MSDS for each hazardous chemical which they use. Employers may rely on the information received from their suppliers. The specific requirements for material safety data sheets are in paragraph (g) of this section.

There is no specified format for the MSDS under the rule, although there are specific

information requirements. OSHA has developed a non-mandatory format, OSHA Form 174, which may be used by chemical manufacturers and importers to comply with the rule. The MSDS must be in English. You are entitled to receive from your supplier a data sheet which includes all of the information required under the rule. If you do not receive one automatically, you should request one. If you receive one that is obviously inadequate, with, for example, blank spaces that are not completed, you should request an appropriately completed one. If your request for a data sheet or for a corrected data sheet does not produce the information needed, you should contact your local OSHA Area Office for assistance in obtaining the MSDS.

The role of MSDSs under the rule is to provide detailed information on each hazardous chemical, including its potential hazardous effects, its physical and chemical characteristics, and recommendations for appropriate protective measures. This information should be useful to you as the employer responsible for designing protective programs, as well as to the workers. If you are not familiar with material safety data sheets and with chemical terminology, you may need to learn to use them yourself. A glossary of MSDS terms may be helpful in this regard. Generally speaking, most employers using hazardous chemicals will primarily be concerned with MSDS information regarding hazardous effects and recommended protective measures. Focus on the sections of the MSDS that are applicable to your situation.

MSDSs must be readily accessible to employees when they are in their work areas during their workshifts. This may be accomplished in many different ways. You must decide what is appropriate for your particular workplace. Some employers keep the MSDSs in a binder in a central location (e.g., in the pick-up truck on a construction site). Others, particularly in workplaces with large numbers of chemicals, computerize the information and provide access through terminals. As long as employees can get the information when they need it, any approach may be used. The employees must have access to the MSDSs themselves—simply having a system where the information can be read to them over the phone is only permitted under the mobile worksite provision, paragraph (g)(9) of this section, when employees must travel between workplaces during the shift. In this situation, they have access to the MSDSs prior to leaving the primary worksite, and when they return, so the telephone system is simply an emergency arrangement.

In order to ensure that you have a current MSDS for each chemical in the plant as required, and that employee access is provided, the compliance officers will be looking for the following types of information in your written program:

1. Designation of person(s) responsible for obtaining and maintaining the MSDSs;
2. How such sheets are to be maintained in the workplace (e.g., in notebooks in the work area(s) or in a computer with terminal access), and how employees can obtain access to them when they are in their work area during the work shift;
3. Procedures to follow when the MSDS is not received at the time of the first shipment;
4. For producers, procedures to update the MSDS when new and significant health information is found; and,
5. Description of alternatives to actual data sheets in the workplace, if used.

For employers using hazardous chemicals, the most important aspect of the written program in terms of MSDSs is to ensure that someone is responsible for obtaining and maintaining the MSDSs for every hazardous chemical in the workplace. The list of hazardous chemicals required to be maintained as part of the written program will serve as an inventory. As new chemicals are purchased, the list should be updated. Many companies have found it convenient to include on their purchase orders the name and address of the person designated in their company to receive MSDSs.

C. Employee Information and Training.

Each employee who may be “exposed” to hazardous chemicals when working must be provided information and trained prior to initial assignment to work with a hazardous chemical, and whenever the hazard changes. “Exposure” or “exposed” under the rule means that “an employee is subjected to a hazardous chemical in the course of employment through any route of entry (inhalation, ingestion, skin contact or absorption, etc.) and includes potential (e.g., accidental or possible) exposure.” See paragraph (h) of this section for specific requirements. Information and training may be done either by individual chemical, or by categories of hazards (such as flammability or carcinogenicity). If there are only a few chemicals in the workplace, then you may want to discuss each one individually. Where there are large numbers of chemicals, or the chemicals change frequently, you will probably want to train generally based on the hazard categories (e.g., flammable liquids, corrosive materials, carcinogens). Employees will have access to the substance-specific information on the labels and MSDSs.

Information and training is a critical part of the hazard communication program. Information regarding hazards and protective measures are provided to workers through written labels and material safety data sheets. However, through effective information and training, workers will learn to read and understand such information, determine how it can be obtained and used in their own workplaces, and understand the risks of exposure to the chemicals in their workplaces as well as the ways to protect themselves. A properly conducted training program will ensure comprehension and understanding. It is not sufficient to either just read material to the workers, or simply hand them material to read. You want to create a climate where workers feel free to ask questions. This will help you to ensure that the information is understood. You must always remember that the underlying purpose of the HCS is to reduce the incidence of chemical source illnesses and injuries. This will be accomplished by modifying behavior through the provision of hazard information and information about protective measures. If your program works, you and your workers will better understand the chemical hazards within the workplace. The procedures you establish regarding, for example, purchasing, storage, and handling of these chemicals will improve, and thereby reduce the risks posed to employees exposed to the chemical hazards involved. Furthermore, your workers' comprehension will also be increased, and proper work practices will be followed in your workplace.

If you are going to do the training yourself, you will have to understand the material and be prepared to motivate the workers to learn. This is not always an easy task, but the benefits are worth the effort. More information regarding appropriate training can be found in OSHA Publication No. 2254 which contains voluntary training guidelines prepared by OSHA's Training Institute. A copy of this document is available from OSHA's Publications Office at (202) 219-4667.

In reviewing your written program with regard to information and training, the following items need to be considered:

1. Designation of person(s) responsible for conducting training;
2. Format of the program to be used (audiovisuals, classroom instruction, etc.);
3. Elements of the training program (should be consistent with the elements in paragraph (h) of this section); and,
4. Procedure to train new employees at the time of their initial assignment to work with a hazardous chemical, and to train employees when a new hazard is introduced into the workplace.

The written program should provide enough details about the employer's plans in this area to assess whether or not a good faith effort is being made to train employees. OSHA does not expect that every worker will be able to recite all of the information about each chemical in the workplace. In general, the most important aspects of training under the HCS are to

ensure that employees are aware that they are exposed to hazardous chemicals, that they know how to read and use labels and material safety data sheets, and that, as a consequence of learning this information, they are following the appropriate protective measures established by the employer. OSHA compliance officers will be talking to employees to determine if they have received training, if they know they are exposed to hazardous chemicals, and if they know where to obtain substance-specific information on labels and MSDSs.

The rule does not require employers to maintain records of employee training, but many employers choose to do so. This may help you monitor your own program to ensure that all employees are appropriately trained. If you already have a training program, you may simply have to supplement it with whatever additional information is required under the HCS. For example, construction employers that are already in compliance with the construction training standard (29 CFR 1926.21) will have little extra training to do.

An employer can provide employees information and training through whatever means are found appropriate and protective. Although there would always have to be some training on-site (such as informing employees of the location and availability of the written program and MSDSs), employee training may be satisfied in part by general training about the requirements of the HCS and about chemical hazards on the job which is provided by, for example, trade associations, unions, colleges, and professional schools. In addition, previous training, education and experience of a worker may relieve the employer of some of the burdens of informing and training that worker. Regardless of the method relied upon, however, the employer is always ultimately responsible for ensuring that employees are adequately trained. If the compliance officer finds that the training is deficient, the employer will be cited for the deficiency regardless of who actually provided the training on behalf of the employer.

D. Other Requirements.

In addition to these specific items, compliance officers will also be asking the following questions in assessing the adequacy of the program:

- Does a list of the hazardous chemicals exist in each work area or at a central location?
- Are methods the employer will use to inform employees of the hazards of non-routine tasks outlined?
- Are employees informed of the hazards associated with chemicals contained in unlabeled pipes in their work areas?
- On multi- employer worksites, has the employer provided other employers with information about labeling systems and precautionary measures where the other employers have employees exposed to the initial employer's chemicals?
- Is the written program made available to employees and their designated representatives?

If your program adequately addresses the means of communicating information to employees in your workplace, and provides answers to the basic questions outlined above, it will be found to be in compliance with the rule.

5. Checklist for Compliance.

The following checklist will help to ensure you are in compliance with the rule:

Obtained a copy of the rule.	
Read and understood the requirements.	
Assigned responsibility for tasks.	
Prepared an inventory of chemicals.	
Ensured containers are labeled.	
Obtained MSDS for each chemical.	
Prepared written program.	
Made MSDSs available to workers.	
Conducted training of workers.	
Established procedures to maintain current program.	
Established procedures to evaluate effectiveness.	

6. Further Assistance.

If you have a question regarding compliance with the HCS, you should contact your local OSHA Area Office for assistance. In addition, each OSHA Regional Office has a Hazard Communication Coordinator who can answer your questions. Free consultation services are also available to assist employers, and information regarding these services can be obtained through the Area and Regional offices as well. The telephone number for the OSHA office closest to you should be listed in your local telephone directory. If you are not able to obtain this information, you may contact OSHA's Office of Information and Consumer Affairs at (202) 219-8151 for further assistance in identifying the appropriate contacts.

NOTES:

STEPS TO COME INTO COMPLIANCE

Introduction

About 32 million workers are potentially exposed to one or more chemical hazards. There are an estimated 575,000 existing chemical products, and hundreds of new ones are being introduced annually. This poses a serious problem for exposed workers and their employers. Chemical exposure may cause or contribute to many serious health effects such as heart ailments, kidney and lung damage, sterility, cancer, burns, and rashes. Some chemicals may also be safety hazards and have the potential to cause fires and explosions and other serious accidents.

Because of the seriousness of these safety and health problems, and because many employers and employees know little or nothing about them, the Occupational Safety and Health Administration (OSHA) issued, in 1983, a rule called "Hazard Communication" that applies to employers in the manufacturing sector of industry. The scope of the rule was expanded in 1987 to include employers in the non-manufacturing sector. (See Appendix 1 for a copy of the final rule promulgated on August 24, 1987. Further explanation is contained in the Federal Register 52(163): 31852-31886, August 24, 1987.)

The basic goal of the standard is to ensure that employers and employees know about chemical hazards and how to protect themselves. This knowledge, in turn, should help to reduce the incidence of chemical source illnesses and injuries.

What the Standard Requires

The Hazard Communication Standard establishes uniform requirements to assure that the hazards of all chemicals imported into, produced or used in U.S. workplaces are evaluated, and that the resultant hazard information and associated protective measures are transmitted to affected employers and potentially exposed employees.

Chemical manufacturers and importers must convey the hazard information they learn from their evaluations to downstream employers by means of labels on containers and material safety data sheets (MSDS's). In addition, all covered employers must have a hazard communication program to get this information to their employees through labels on containers, MSDS's, and training.

This program ensures that all employers receive the information they need to inform and train their employees properly and to design and put in place employee protection programs. It also provides necessary hazard information to employees, so they can participate in, and support, the protective measures in place at their workplaces.

How to Comply with the Standard

The following steps should aid you in complying with the standard and in developing your hazard communication program. (See sample program, Tab B.)

1. Read the standard.
 - Make sure you understand the provisions of the standard.
 - Know your responsibility as an employer.
2. List the hazardous chemicals in the workplace.

- Walk around the workplace, read all container labels, and list the identity of all materials that may be hazardous; the manufacturer's product, name, location, and telephone number; and the work area where the product is used. Be sure to include hazardous chemicals that are generated in the work operation but are not in a container (e.g. welding fumes).
 - Check with your purchasing department to ensure that all hazardous chemicals purchased are included on your list.
 - Review your list and determine whether any substances are exempt (see paragraph (b) of the rule for exemptions).
 - Establish a file on hazardous chemicals used in your workplace, and include a copy of the latest MSDS's, and any other pertinent information.
 - Develop procedures to keep your list current. When new substances are used, add them to your list.
3. Obtain material safety data sheets for all chemical substances.
- If you do not have an MSDS for a hazardous substance in your workplace, request a copy from the chemical manufacturer, distributor, or importer as soon as possible. (See Tab H for a sample letter requesting an MSDS.) An MSDS must accompany or precede the shipment and must be used to obtain identifying information such as the chemical name and the hazards of a particular substance.
 - Review each MSDS to be sure that it is complete and clearly written. The MSDS must contain the physical and chemical properties of a substance, as well as the physical and health hazards, routes of exposure, precautions for safe handling and use, emergency and first-aid procedures, and control measures. (See Tab F for a sample MSDS and other information.)
 - If the MSDS is incomplete or unclear, contact the manufacturer or importer to get clarification on the missing information.
 - Make sure the MSDS is available to employees, designated representatives, and to the Assistant Secretary for Occupational Safety and Health.
4. Make sure that all containers are labeled.
- The manufacturer, importer or distributor is responsible for labeling containers, but the employer must adhere to the following:
 - Ensure that all containers of hazardous substances in the workplace are labeled, tagged or marked and include the identity of the hazardous chemical, and the appropriate hazard warnings. Container labels for purchased chemicals must also include the name and address of the chemical manufacturer, importer, or other responsible party.
 - Check all incoming shipments of hazardous chemicals to be sure that they are labeled.
 - If a container is not labeled, obtain a label or the label information from the manufacturer, importer, or other responsible party or prepare a label using information obtained from these sources. Employers are responsible for ensuring that containers in the workplace are labeled, tagged, or marked.

- Do not remove or deface existing labels on containers unless the container is immediately marked with the required information.
- Instruct employees on the importance of labeling portable receptacles into which they have poured hazardous substances. If the portable container is for their immediate use, then the container does not have to be labeled.

5. Develop and implement a written hazard communication program.

This program must include:

- container labeling and other forms of warnings;
- material safety data sheets;
- employee training based on the list of chemicals, MSDS's, and labeling information; and,
- methods for communicating hazards and protective measures to employees and others.

The following sections of this kit will discuss each of these steps in more detail and provide you with samples of the material discussed as well as lists of products, services, and other resources.

CHECKLIST

	YES	NO
1. Listed all of the hazardous chemicals in our workplace.		
2. Established a file for information on hazardous chemicals.		
3. Obtained an MSDS for each hazardous chemical in use.		
4. Developed a system to ensure that all incoming hazardous chemicals are labeled.		
5. Reviewed each MSDS to be sure it is complete.		
6. Made sure that MSDS's are available where necessary.		
7. Developed a written hazard communication program.		
8. Developed a method to communicate hazards to employees and others.		
9. Informed employees of protective measures for hazardous chemicals used in the workplace.		
10. Alerted employees to other forms of warning that may be used.		

Hazardous Chemicals List

How to Identify Hazardous Chemicals

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 material safety data sheets (MSDS's). To prepare a list of the chemicals in your facility that are covered by the rule, walk around and write down the names of the chemicals that have a label indicating a potential hazard (e.g., "flammable" or "causes skin irritation"). Don't limit yourself to chemicals in containers, however. Be aware of substances generated in work operations such as fumes or dusts, as these may be covered too.

Chemicals considered to be hazardous are those

- regulated by OSHA in 29 CFR Part 1910, Subpart Z, Toxic and Hazardous Substances;
- included in the American Conference of Governmental Industrial Hygienists (ACGIH) latest edition of Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment; and
- found to be suspected or confirmed carcinogens by the National Toxicology Program in the latest edition of the **Annual Report on Carcinogens**, or by the International Agency for Research on Cancer (IARC) in the latest edition of their **IARC Monographs**.

Once you have a complete list, you will want to review it to determine if any of the items are exempted. In paragraph (b)(6) of the rule, OSHA has listed a number of items that are excluded. For example, rubbing alcohol maintained in a first-aid station would be exempt under paragraph (b)(6)(vi) because it is intended for personal use by employees. To be prudent, some employers include all chemicals even if they are exempted. In general, if there is any question regarding a particular chemical, it is best to include that chemical in the hazard communication program.

How to List Chemicals in the Workplace

All hazardous chemicals known to be present in your workplace should be listed using an identity that appears on the appropriate MSDS and label for the chemical. The list may also include common or trade names, Chemical Abstract Service (CAS) Registry numbers, MSDS reference numbers, etc. (See sample form included in the Tab.) The list can be compiled for the entire workplace, or for individual work areas in various sections of the facility.

The list is to be an inventory of everything for which a material safety data sheet must be obtained. It will be part of the written program, and must be made available to employees upon request.

HAZARDOUS CHEMICALS

PHYSICAL HAZARDS

Combustible Liquids

Compressed Gases

Explosives

Flammable Aerosols

Flammable Gases

Flammable Liquids

Flammable Solids

Organic Peroxides

Oxidizers

Pyrophorics

Unstable Reactive

Water Reactive

HEALTH HAZARDS

Carcinogens

Toxic Agents

Highly Toxic Agents

Reproductive Toxins

Irritants

Corrosives

Sensitizers

Hepatotoxins

Nephrotoxins

Neurotoxins

Hematopoietic System
Toxins

Damage Lungs

Damage Skin

Damage Eyes

Damage Mucous
Membranes

NOTES:

MATERIAL SAFETY DATA SHEETS (MSDS)

Introduction

The material Safety Data Sheet (MSDS) is a detailed information bulletin prepared by the manufacturer or importer of a chemical that describes the physical and chemical properties, physical and health hazards, routes of exposure, precautions for safe handling and use, emergency and first-aid procedures, and control measures. Information on an MSDS aids in the selection of safe products and helps prepare employers and employees to respond effectively to daily exposure situations as well as to emergency situations.

The MSDS's are a comprehensive source of information for all types of employers. There may be information on the MSDS that is not useful to you or not important to the safety and health in your particular operation. Concentrate on the information that is applicable to your situation. Generally, hazard information and protective measures should be the focus of concern.

This kit contains a glossary of terms used on MSDS's (see Appendix II). Some employers who are not very familiar with chemical terminology may find this helpful in reading and understanding MSDS's.

OSHA Requirements

Employers must maintain a complete and accurate MSDS for each hazardous chemical that is used in the facility. They are entitled to obtain this information automatically upon purchase of the material. When new and significant information becomes available concerning a product's hazards or ways to protect against the hazards, chemical manufacturers, importers, or distributors must add it to their MSDS for each hazardous chemical used in the workplace. If there are multiple suppliers of the same chemical, there is no need to retain multiple MSDS's for that chemical.

While MSDS's are not required to be physically attached to a shipment, they must accompany or precede the shipment. When the manufacturer/supplier fails to send an MSDS with a shipment labeled as a hazardous chemical, the employer must obtain one from the chemical manufacturer, importer, or distributor as soon as possible. Similarly, if the MSDS is incomplete or unclear, the employer should contact the manufacturer or importer to get clarification or obtain missing information. (See Tab H for sample letters requesting an MSDS, or additional information.)

When an employer is unable to obtain an MSDS from a supplier or manufacturer, he/she should submit a written complaint, with complete background information, to the nearest OSHA area office. (Although written complaints do not have to be submitted on an OSHA-7 Form, one is included on p. F-7 and may be reproduced for your convenience.) OSHA will then, at the same time, call and send a certified letter to the supplier or manufacturer to obtain the needed information. If the supplier or manufacturer still fails to respond within a reasonable amount of time, OSHA will inspect the supplier or manufacturer and take appropriate enforcement action.

Sections of an MSDS and Their Significance

OSHA specifies the information to be included on an MSDS, but does not prescribe the precise format for an MSDS. A non-mandatory MSDS form (See blank OSHA Form 174 at the end of this section) that meets the Hazard Communication Standard requirements has been

issued and can be used as is or expanded as needed. The MSDS must be in English and must include at least the following information.

Section I. Chemical Identity

- The chemical and common name(s) must be provided for single chemical substances.
- An identity on the MSDS must be cross-reference to the identity found on the label.

Section II. Hazardous Ingredients

- For a hazardous chemical mixture that has been tested as a whole to determine its hazards, the chemical and common names of the ingredients that are associated with the hazards, and the common name of the mixture must be listed.
- If the chemical is a mixture that has not been tested as a whole, the chemical and common names of all ingredients determined to be health hazards and comprising 1 percent or greater of the composition must be listed.
- Chemical and common names of carcinogens must be listed if they are present in the mixture at levels of 0.1 percent or greater.
- All components of a mixture that have been determined to present a physical hazard must be listed.
- Chemical and common names of all ingredients determined to be health hazards and comprising less than 1 percent (0.1 percent for carcinogens) of the mixture must also be listed if they can still exceed an established Permissible Exposure Limit (PEL) or Threshold Limit Value (TLV) or present a health risk to exposed employees in these concentrations.

Section III. Physical and Chemical Characteristics

- The physical and chemical characteristics of the hazardous substance must be listed. These include items such as boiling and freezing points, density, vapor pressure, specific gravity, solubility, volatility, and the product's general appearance and odor. These characteristics provide important information for designing safe and healthful work practices.

Section IV. Fire and Explosion Hazard Data

- The compound's potential for fire and explosion must be described. Also, the fire hazards of the chemical and the conditions under which it could ignite or explode must be identified. Recommended extinguishing agents and fire-fighting methods must be described.

Section V. Reactivity Data

- This section presents information about other chemicals and substances with which the chemical is incompatible, or with which it reacts. Information on any hazardous decomposition products, such as carbon monoxide, must be included.

Section VI. Health Hazards

- The acute and chronic health hazards of the chemical, together with signs and symptoms of exposure, must be listed. In addition, any medical conditions that are aggravated by

exposure to the compound, must be included. The specific types of chemical health hazards defined in the standard include carcinogens, corrosives, toxins, irritants, sensitizers, mutagens, teratogens, and effects on target organs (i.e., liver, kidney, nervous system, blood, lungs, mucous membranes, reproductive system, skin, eyes, etc.).

- The route of entry section describes the primary pathway by which the chemical enters the body. There are three principle routes of entry: inhalation, skin, and ingestion.
 - This section of the MSDS supplies the OSHA PEL, the ACGIH TLV, and other exposure levels used or recommended by the chemical manufacturer.
 - If the compound is listed as a carcinogen (cancer-causing agent) by OSHA, the National Toxicology Program (NTP), or the International Agency for Research on Cancer (IARC), this information must be indicated on the MSDS.
- Section VII. Precaution for Safe Handling and Use

Section VII. Precaution for Safe Handling and Use

- The standard requires the preparer to describe the precautions for safe handling and use. These include recommended industrial hygiene practices, precautions to be taken during repair and maintenance of equipment, and procedures for cleaning up spills and leaks. Some manufacturers also use this section to include useful information not specifically required by the standard, such as EPA waste disposal methods and state and local requirements.

Section VIII. Control Measures

- The standard requires the preparer of the MSDS to list any generally applicable control measures. These include engineering controls, safe handling procedures, and personal protective equipment. Information is often included on the use of goggles, gloves, body suits, respirators, and face shields.

Employer Responsibilities

Employers must ensure that each employee has a basic knowledge of how to find information on an MSDS and how to properly make use of that information. Employers must ensure the following:

- Complete and accurate MSDS's are made available during each work shift to employees when they are in their work areas.
- Information is provided for each hazardous chemical.

MATERIAL SAFETY DATA SHEET CHECKLIST

You must ensure that each MSDS contains the following information:

1. Product or chemical identity used on the label.	
2. Manufacturer's name and address.	
3. Chemical and common names of each hazardous ingredient.	
4. Name, address, and phone number for hazard and emergency information.	
5. Preparation or revision date.	
6. The hazardous chemical's physical and chemical characteristics, such as vapor pressure and flashpoint.	
7. Physical hazards, including the potential for fire, explosion, and reactivity.	
8. Known health hazards.	
9. OSHA permissible exposure limit (PEL), ACGIH threshold limit value (TLV) or other exposure limits.	
10. Emergency and first-aid procedures.	
11. Whether OSHA, NTP or IARC lists the ingredient as a carcinogen.	
12. Precautions for safe handling and use.	
13. Control measures such as engineering controls, work practices, hygienic practices or personal protective equipment required.	
14. Primary routes of entry.	
15. Procedures for spills, leaks, and clean-up.	

SECTION V - Reactivity Data

Stability	Unstable		Conditions to Avoid
	Stable		

Incompatibility (Materials to Avoid)

Hazardous Decomposition or Byproducts

Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur		

SECTION VI - Health Hazard Data

Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
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Carcinogenicity:	NTP?	IARC Monographs?	OSHA Regulated?
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Signs and Symptoms of Exposure

Medical Conditions
Generally Aggravated by Exposure

Emergency and First Aid Procedures

SECTION VII - Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled

Waste Disposal Method

Precautions to Be Taken in Handling and Storage

Other Precautions

SECTION VIII - Control Measures

Respiratory Protection (Specify Type)

Ventilation	Local Exhaust	Special
	Mechanical (General)	Other

Protective Gloves	Eye Protection
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Other Protective Clothing or Equipment

Work/Hygienic Practices

SAMPLE LETTER REQUESTING AN MSDS

Blitz Manufacturing Company
1923 Oak Grove Lane
Springfield, Massachusetts 02110

Dear Sir:

The Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (29 Cfr 1920.1200) requires employers be provided Material Safety Data Sheets (MSDS's) for all hazardous substances used in their facility, and to make these MSDS's available to employees potentially exposed to these hazardous substances.

We, therefore, request a copy of the MSDS for your product listed as Stock Number _____ . We did not receive an MSDS with the initial shipment of the Blitz Solvent 90 we received from you on October 1st. We also request any additional information, supplemental MSDS's, or any other relevant data that your company or supplier has concerning the safety and health aspects of this product.

Please consider this letter as a standing request to your company for any information concerning the safety and health aspects of using this product that may become known in the future.

The MSDS and any other relevant information should be sent to us within 10, 20, 30, days (select appropriate time). Delays in receiving the MSDS information may prevent use of your product. Please send the requested information to Mr. Robert Smith, Safety and Health Manager, XYZ Company, Boston, Massachusetts 02109.

Please be advised that if we do not receive the MSDS on the above chemical by (date), we may have to notify OSHA of our inability to obtain this information. It is our intent to comply with all provisions of the Hazard Communication Standard (1910.1200) and the MSDS's are integral to this effort.

Your cooperation is greatly appreciated. Thank you for your timely response to this request. If you have any questions concerning this matter, please contact Mr. Smith at (617)223-9460.
Sincerely,

George Rogers, President
XYZ Company

SAMPLE LETTER REQUESTING ADDITIONAL MSDS INFORMATION

Date:

ACE Chemical Company, Incorporated
214 Capitol Drive
Richmond, Virginia 23230

Dear Mr. Winston:

In an effort to comply with the Occupational Safety and Health Administration's (OSHA) Hazard Communication Standard, my company is seeking additional information on a chemical produced by ACE Chemical Company. The MSDS's forwarded to us appear to be deficient as follows:

1. Clear-VU 210 - no health effects listed.
2. Clean-up 34 - Solvent - no physical hazard listed.

Please be advised that for us to comply with the Hazard Communication Standard and to provide adequate training for our employees we must have complete MSDS's, particularly with reference to the above-identified items. Your cooperation will be appreciated.

Sincerely,

Robert Stevens
Purchasing Agent
XYZ Company

MSDS GLOSSARY

The following glossary presents brief explanations of acronyms and common terms frequently used by chemical manufacturers in their MSDS's

ACGIH American Conference of Governmental Industrial Hygienists is 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.

Adhesion A union of two surfaces that are normally separate.

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.

Amenorrhea Absence of menstruation.

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.

Appearance A description of a substance at normal room temperature and normal atmospheric conditions. Appearance includes the color, size, and consistency of the material.

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.

Atm Atmosphere, a unit of pressure equal to 760 mmHg (mercury) at sea level.

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.

BCM Blood-clotting mechanism effects.

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.

BLD Blood 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

BOM, or BuMines Bureau of Mines, U.S. Department of Interior.

Bonding The interconnecting of two objects by means of a clamp and bare wire. Its purpose is 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.

ca Approximately.

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.

Carcinogenicity The ability to produce cancer.

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 Air Act See CAA

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.

CO₂ 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. CO₂ 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.

Conc See Concentration.

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.

Conditions to Avoid Conditions encountered during handling or storage that could cause a substance to become unstable.

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.

Container Any bag, barrel, bottle, can, cylinder, drum, reactions a hazardous chemical. For the purposes of MSDS or HCS, pipes or piping systems are not considered to be containers.

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.

Curettage Cleansing of a diseased surface.

Cutaneous Toxicity See "Dermal Toxicity."

CWA Clean Water ACT was enacted to regulate/reduce water pollution. It is administered by EPA.

Cyst A sac containing a liquid. Most cysts are harmless.

Cytology The scientific study of cells.

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 Relating to the skin.

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.

Dike A barrier constructed to control or confine hazardous substances and prevent them from entering sewers, ditches, streams, or other flowing waters.

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.

Dysmenorrhea Painful menstruation.

Dysplasia An abnormality of development.

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

Ectopic Pregnancy The fertilized ovum becomes implanted outside of the uterus.

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

Endocrine Glands Glands that regulate body activity by secreting hormones.

Endometrium The mucous membrane lining the uterus.

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.

Eye Protection Recommended safety glasses, chemical splash goggles, face shield, etc. to be utilized when handling a hazardous material.

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

f/cc Fibers per cubic centimeter of air.

FDA U.S. Food and Drug Administration.

Fetal Pertaining to the fetus.

Fetus The developing young in the uterus from the seventh week of gestation until birth.

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.

First Aid Emergency measures to be taken when a person is suffering from overexposure to a hazardous material, before regular medical help can be obtained.

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 °C (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

H₂O, sulfuric acid is H₂SO₄, sulfur dioxide is SO₂).

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

g Gram is a metric unit of weight. One ounce U.S. (avoirdupois) is about 28.4 grams.

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.

Gestation The development of the fetus in the uterus from conception to birth; pregnancy.

g/kg Grams per kilogram is an expression of dose used in oral and dermal toxicology testing to denote grams of a substance dosed per kilogram of animal body weight. Also see "kg" (kilogram).

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.

Gynecology The study of the reproductive organs in women.

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.

Hematoma A blood clot under the surface of the skin.

Hematopoietic System The blood-forming mechanism of the human body.

Hematuria The presence of blood in the urine.

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 (LD_{50}) 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 (LD_{50}) 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 (LC_{50}) 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.

Hormones Act as chemical messengers to body organs.

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.

Inhal See Inhalation.

Inhalation Breathing in of a substance in the form of a gas, vapor, fume, mist, or dust.

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

Insol See Insoluble.

Insoluble Incapable of being dissolved in a liquid.

Intrauterine Within the uterus.

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.

kg Kilogram is a metric unit of weight, about 2.2 U.S. pounds. Also see "g/kg", "g", and "mg".

L Liter is a metric unit of capacity. A U.S. quart is about 9/10 of a liter.

Lacrimation Secretion and discharge of tears.

Label Notice attached to a container, bearing information concerning its contents.

Lactation The secretion of milk by the breasts.

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.

LC₅₀ 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.

LD Lethal dose is the quantity of a substance being tested the will kill.

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

LD₅₀ A single dose of material expected to kill 50 percent of a group of test animals. The LD₅₀ 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.

Lfm Linear feet per minute, a unit of air velocity.

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.

M Meter is a unit of length in the metric system. One meter is about 39 inches.

M³ Cubic meter is a metric measure of volume, approximately 35.3 cubic feet or 1.3 cubic yards.

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.

Mammary Pertaining to the breast.

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.

Menorrhagia Excessive menstruation.

Menstruation Periodic discharge of blood from the vagina of a nonpregnant uterus.

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.

Meter A unit of length; equivalent to 39.37 inches.

mg Milligram is a metric unit of weight that is one-thousandth of a gram.

mg/kg Milligrams of a substance per kilogram of body weight is an expression of toxicological dose.

mg/m³ Milligrams per cubic meter is a unit for expressing concentrations of dusts, gases, or mists in air.

Micron (Micrometer) A unit of length equal to one-millionth of a meter; approximately 0.000039 of an inch.

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.

Mld Mild.

ml Milliliter is a metric unit of capacity, equal in volume to 1 cubic centimeter (cc), or approximately one-sixteenth of a cubic inch. One-thousandth of a liter.

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/m³.

MSDS Material Safety Data Sheet.

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.

MW See Molecular Weight.

N₂ 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.

Neo See Neoplasia.

Neonatal The first four weeks after 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.

ng nanogram, one-billionth of a gram.

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'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.

Olfactory Relating to the sense of smell.

Oral Used in or taken into the body through the mouth.

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 -O-O 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.

Ovary The female sex gland in which ova are formed.

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.

Placenta A structure that grows on the wall of the uterus during pregnancy, through which the fetus is nourished.

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 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.

Prenatal Preceding birth.

psi Pounds per square inch (for MSDS 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.

Pul See Pulmonary.

Pulmonary Relating to, or associated with, the lungs.

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 by-products-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.

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

Skn Skin.

"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.

Species On the MSDS's, species refers to the test animals-usually rats, mice, or rabbits-used to obtain the toxicity test data reported.

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 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.

Sys System or systemic.

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 Effects The following is a target organ categorization of effects that may occur, including examples of signs and symptoms and chemicals that have been found to cause such effects. 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.

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.

Temp Temperature.

Ter See Teratogen.

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

Tfx Toxic effect(s).

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.

TOC Tag Open Cup. See Flashpoint.

Torr A unit of pressure, equal to 1/760 atmosphere.

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 (LC_{50}) 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.

ug Microgram, one-millionth of a gram.

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'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'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.

SAMPLE TRAINING PROGRAM

Introduction

Training is an integral part of your hazard communication program, as identified in Tab A.

Under the Hazard Communication Standard, effective May 23, 1988, each employer is required to inform and train employees at the time of their initial assignment to a work area where hazardous chemicals are present and whenever a new hazard is introduced into the work area.

While the outline of topics to be presented in employee information and training programs is the same for all employers, the actual information presented must be based on the specific hazard information conveyed by labels and MSDS's for that particular workplace or work area.

These are the topics to be covered in all information and training programs:

- The provisions of the Hazard Communication Standard
- Any operations in employees' work areas where hazardous chemicals are present
- The location and availability of the company's written hazard communication program, including the required list(s) of hazardous chemicals and MSDS's required by the Hazard Communication Standard.
- Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area
- The physical and health hazards of the chemical in the work area
- The measures employees can take to protect themselves from these hazards, including information on work practices, emergency procedures and personal protective equipment required by the employer
- The details of the employer's written hazard communication program, including an explanation of the labeling system used by the employer, MSDS's, and how employees can obtain and use the appropriate hazard information on the labels and in the MSDS's.

The following sections illustrate how a typical training program might be designed. Following the sample program is a non-mandatory training guide developed by OSHA for conducting any effective training program. Using the sample and the guidelines, together with establishment-specific label and MSDS information, employers can develop effective employee training programs that achieve the objective of the Hazard Communication Standard.

Know the Provisions of the Hazard Communication Standard

- Be familiar with the requirements of the standard
- Know your responsibilities under the law
- Inform all employees of the law and their rights under the law.

Identify Those Employees to be Trained

- Assess actual and potential employee exposure to hazardous chemicals
- Determine training needs based on this exposure during both normal use of hazardous chemicals and during emergencies
- Determine appropriate way in which to train new employees and supervisors
- Train employees and supervisors on the specific chemicals in your workplace and their hazards.

Know the Hazardous Chemicals in Your Workplace

- Define hazardous chemicals: Any chemical that is a physical or health hazard.
- "Physical hazard" is one for which there is scientifically valid evidence that the chemical is a combustible liquid, a compressed gas, an explosive, a flammable substance, an organic peroxide, an oxidizer, a pyrophoric, or an unstable (reactive) or water-reactive substance.
- "Health hazard" is one that includes cancer-causing, 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. (Include additional information from Appendices A and B of the standard)..

Make a List of the Hazardous Chemicals in Your Workplace

- Your list should include the names of the chemicals, their hazards, any protective measures to be taken, and emergency and first-aid procedures.
- Identify the process or operation where the chemicals are used, and the name and address of the manufacturer.
- Make sure there is a material safety data sheet (MSDS) for each chemical and that the list references the corresponding MSDS for each chemical.
- Make the list readily available to your employees (or to other employers at your worksite at their request).
- Make sure employees understand the information regarding the chemicals listed in the workplace.

Instruct Employees on How to Use and Interpret MSDS's

- Make sure you have an MSDS for each hazardous chemical product you package, handle, or transfer. (See Tab F.)
- Check each MSDS you receive to ensure that it contains all the information required by the standard. (See checklist at end of this Tab.)
- Obtain MSDS's or information where necessary (i.e., when MSDS not received from the manufacturer, importer or supplier, or when MSDS is incomplete.) (See Tab H for sample letter requesting MSDS information.)

Instruct Employees on Labeling Requirements

- Check each container entering the workplace for appropriate labeling (i.e., identity of chemicals, hazard warnings, name and address of manufacturer/importer/responsible party).
- Explain the importance of reading labels and of following directions for the safe handling of chemicals.
- Label, tag, or mark containers into which hazardous chemicals are transferred with the chemical identity and hazard warnings.
- Hazard warning must convey specific physical and health hazards of the chemicals. Explain that words such as "caution", "danger", "harmful if absorbed by skin", etc. are precautionary statements and do not identify specific hazards.
- Explain the labeling exemptions for portable and stationary process containers.
- Label portable containers when they are not for "immediate use". (Note: Portable containers require no labels when chemicals are transferred into them from labeled containers and when the chemicals will be used immediately by the employee transferring the chemicals.)
- In lieu of labels, process sheets, batch tickets, standard operating procedures, or other written materials may be used on stationary process equipment if they contain the same information as a label and are readily available to employees in the work area or station.
- Cross-reference chemical identifiers on labels to MSDS's and the lists of hazardous chemicals.
- Be aware of other hazardous chemicals that may have specific labeling requirements under other standards (e.g., asbestos, lead, etc.)

Review Existing Methods of Controlling Workplace Exposures

- Engineering Controls: changes in machinery, work operations, or plant layout that reduce or eliminate the hazard (e.g., ventilation controls, process enclosures/hoods, isolation, etc.).
- Administrative Controls: good housekeeping procedures, safe work practices, personal and medical monitoring, shortened shifts or changed work schedules, etc.
- Personal Protective Equipment: safety glasses, goggles, face shields, earplugs, respirators, gloves, hoods, boots, and full body suits.

Review Your Current Procedures for Handling Chemicals and Compare With Recommended Practices Identified on MSDS's and Labels

Consider Keeping a Record of Employee/Supervisor Training

- Follow-up and evaluate your training program to make sure employees know how to handle the chemicals they are using and are applying the training you have given them.

Establish a Written Emergency Action Plan

- Training in procedures such as emergency controls and phone numbers, evacuation plans, alarm systems, reporting and shut-down procedures, first-aid, personal protection, etc.
- How and when to report leaks and spills.

TRAINING CHECKLIST

	Complete	Incomplete
1. Established a thorough training program.		
2. Identified employees who need training.		
3. Training program ensures that new employees are trained before their first assignment.		
4. Informed employees of the specific information and training requirements of the Hazard Communication Standard.		
5. Informed employees of the requirements of the standard, and their rights under the law.		
6. Informed employees of our written program and training requirements.		
7. Informed employees of the different types of chemicals and the hazards associated with them.		
8. Informed employees of specific hazards of the chemicals and processes they work with and their proper use and handling.		
9. Informed employees of the hazards associated with performing non-routine tasks.		
10. Employees know how to detect the presence or release of hazardous chemicals in the workplace.		
11. Trained employees in the use of proper work practices, personal protective equipment and clothing, and other controls to reduce or eliminate their exposure to the chemicals in their work areas.		
12. Trained employees in emergency and first-aid procedures and signs of overexposure.		
13. Listed all the hazardous chemicals in our workplace.		
14. Employees know when and how to update our hazardous chemical list.		
15. Obtained or developed a material safety data sheet for each hazardous chemical in the workplace.		
16. Explained how to use an MSDS.		

	Complete	Incomplete
17. Informed employees of the list of hazardous chemicals and MSDS's and where they are located.		
18. Explained labels and their warnings to employees.		
19. Developed a system to ensure that all incoming hazardous chemicals are checked for proper labels and data sheets.		
20. Established procedures to ensure proper labeling or warning signs for containers that hold hazardous chemicals.		
21. Developed a way to identify and inform employees of new hazardous chemicals before they are introduced into a work area.		
22. Established a way to inform employees of new hazards associated with the chemicals they already use.		
23. Developed a way to evaluate the effectiveness of the training program and to keep track of who has received training.		

VOLUNTARY TRAINING GUIDELINES

I. Introduction

The Occupational Safety and Health Act of 1970 does not address specifically the responsibility of employers to provide health and safety information and instruction to employees, although Section 5(a)(2) does not require that each employer "...shall comply with occupational safety and health standards promulgated under this Act." However, more than 100 of the Act's current standards do contain training requirements.

Therefore, the Occupational Safety and Health Administration has developed voluntary training guidelines to assist employers in providing the safety and health information needed for their employees to work at minimal risk to themselves, to fellow employees, and to the public.

The guidelines are designed to help employers to:

- (1) Determine whether a worksite problem can be solved by training;
- (2) Determine what training, if any, is needed;
- (3) Identify goals and objectives for the training;
- (4) Design learning activities;
- (5) Conduct training;
- (6) Determine the effectiveness of the training; and
- (7) Revise the training program based on feedback from employees, supervisors, and others.

The development of the guidelines is part of an agency-wide objective to encourage cooperative, voluntary safety and health activities among OSHA, the business community, and workers. These voluntary programs include training and education, consultation, voluntary protection programs, and abatement assistance.

A. Training Model

The guidelines provide employers with a model for designing, conducting, evaluating, and revising training programs. The training model can be used to develop training programs for a variety of occupational safety and health hazards identified at the workplace. Additionally, it can assist employers in their efforts to meet the training requirements in current or future occupational safety and health standards.

A training program designed in accordance with these guidelines can be used to supplement and enhance the employer's other education and training activities. The guidelines afford employers significant flexibility in the selection of content and training program design. OSHA encourages a personalized approach to the informational and instructional programs at individual worksites, thereby enabling employers to provide the training that is most needed and applicable to local working conditions.

Assistance with training programs of the identification of resources for training is available through such organizations as OSHA full-service area offices, State agencies which have their own OSHA-approved occupational safety and health programs, OSHA-funded State on-site consultation programs for employers, local safety councils, the OSHA Office of Training and Education, and OSHA-funded New Directions grantees.

B. Review Commission Implications

OSHA does not intend to make the guidelines mandatory. And they should not be used by employers as a total or complete guide in training and education matters which can result in enforcement proceeding before the Occupational Safety and Health Review Commission. However, employee training programs are always an issue in Review Commission cases which involve alleged violations of training requirements contained in OSHA standards.

The adequacy of employee training may also become an issue in contested cases where the affirmative defense of unpreventable employee misconduct is raised. Under case law well-established in the Commission and the courts, an employer may successfully defend against an otherwise valid citation by demonstrating that all feasible steps were taken to avoid the occurrence of the hazard, and that the actions of the employee involved in the violation were a departure from a uniformly and effectively enforced work rule of which the employee had either actual or constructive knowledge.

In either type of case, the adequacy of training given to employees in connection with a specific hazard is a factual matter which can be decided only by considering all the facts and circumstances surrounding the alleged violation. The general guidelines presented here are not intended, and cannot be used, as evidence of the appropriate level of training in litigation involving either the training requirements of OSHA standards or affirmative defenses based upon employer training programs.

II. Training Guidelines

OSHA's training guidelines follow a model that consists of:

- A. Determining if Training is Needed**
- B. Identifying Training Needs**
- C. Identifying Goals and Objectives**
- D. Developing Learning Activities**
- E. Conducting the Training**
- F. Evaluating Program Effectiveness**
- G. Improving the Program**

The model is designed to be one that even the owner of a business with very few employees can use without having to hire a professional trainer or purchase expensive training materials. Using this model, employers or supervisor can develop and administer safety and health training programs that address problems specific to their own business, fulfill the learning needs of their own employees, and strengthen the overall safety and health program of the workplace.

A. Determining if Training is Needed

The first step in the training process is a basic one: to determine whether a problem can be solved by training. Whenever employees are not performing their jobs properly, it is often assumed that training will bring them up to standard. However, it possible that other actions (such as hazard abatement or the implementation of engineering controls) would enable employees to perform their jobs properly.

Ideally, safety and health training should be provided before problems or accidents occur. This training would cover both general safety and health rules and work procedures, and would be repeated if an accident or near-miss incident occurred.

Problems that can be addressed effectively by training include those that arise from lack of knowledge in a work process, unfamiliarity with equipment, or incorrect execution of a task.

Training is less effective (but still can be used) for problems arising from an employee's lack of motivation or lack of attention to the job. Whatever its purpose, training is most effective when designed in relation to the goals of the employer's total safety and health program.

B. Identifying Training Needs

If the problem is one that can be solved, in whole or in part, by training, then the next step is to determine what training is needed. For this, it is necessary to identify what the employee is expected to do and in what ways, if any, the employee's performance is deficient. This information can be obtained by conducting a job analysis which pinpoints what an employee needs to know in order to perform a job.

When designing a new training program, or preparing to instruct an employee in an unfamiliar procedure or system, a job analysis can be developed by examining engineering data on new equipment or the safety data sheets on unfamiliar substances. The content of the specific Federal or State OSHA standards applicable to a business can also provide direction in developing training content. Another option is to conduct a Job Hazard Analysis (see OSHA 3071, same title, 1987). This is a procedure for studying and recording each step of a job, identifying existing or potential hazards, and determining the best way to perform the job in order to reduce or eliminate the risks. Information obtained from a Job Hazard Analysis can be used as the content for the training activity.

If an employee's learning needs can be met by revising an existing training program rather than developing a new one, or if the employee already has some knowledge of the process or system to be used, appropriate training content can be developed through such means as:

1. Using company accident and injury records to identify how accidents occur and what can be done to prevent them from recurring.
2. Requesting employees to provide, in writing and in their own words, descriptions of their jobs. These should include the tasks performed and the tools, materials and equipment used.
3. Observing employees at the worksite as they perform tasks, asking about the work, and recording their answers.
4. Examining similar training programs offered by other companies in the same industry, or obtaining suggestions from such organizations as the National Safety Council (which can provide information on Job Hazard Analysis), the Bureau of Labor Statistics, OSHA-approved state programs, OSHA full-service Area Offices, OSHA-funded State consultation programs, or the OSHA Office of Training and Education.

The employees themselves can provide valuable information on the training they need. Safety and health hazards can be identified through the employees' responses to such questions as whether anything about their jobs frightens them, if they have had any near-miss incidents, if they feel they are taking risks, or if they believe that their jobs involve hazardous operations or substances.

Once the kind of training that is needed has been determined, it is equally important to determine what kind of training is not needed. Employees should be made aware of all the steps involved in a task or procedure, but training should focus on those steps on which improved performance is needed. This avoids unnecessary training and tailors the training to meet the needs of the employees.

C. Identify Goals and Objectives

Once the employees' training needs have been identified, employers can then prepare objectives for the training. Instructional objectives, if clearly stated, will tell employers what they want their employees to do, to do better, or to stop doing.

Learning objectives do not necessarily have to be written, but in order for the training to be as successful as possible, clear and measurable objectives should be thought out before the training begins. For an objective to be effective it should identify as precisely as possible what the individuals will do to demonstrate that they have learned, or that the objective has been reached. They should also describe the important conditions under which the individual will demonstrate competence and define what constitutes acceptable performance.

Using specific, action-oriented language, the instructional objectives should describe the preferred practice or skill and its observable behavior. For example, rather than using the statement: "The employee will understand how to use a respirator" as an instructional objective, it would be better to say: "The employee will be able to describe how a respirator works and when it should be used." Objectives are most effective when worded in sufficient detail that other qualified persons can recognize when the desired behavior is exhibited.

D. Developing Learning Activities

Once employers have stated precisely what the objectives for the training program are, then learning activities can be identified and described. Learning activities enable employees to demonstrate that they have acquired the desired skills and knowledge. To ensure the employees transfer the skills or knowledge from the learning activity to the job, the learning situation should simulate the actual job as closely as possible. Thus, employers may want to arrange the objectives and activities in a sequence which corresponds to the order in which the tasks are to be performed on the job, if a specific process is to be learned. For instance, if an employee must learn the beginning processes of using a machine, the sequence might be (1) to check that the power source is connected, (2) to ensure that the safety devices are in place and are operative, (3) to know when and how to throw the switch, and so on.

A few factors will help to determine the type of learning activity to be incorporated into the training. One aspect is the training resources available to the employer. Can a group training program that uses an outside trainer and film be organized, or should the employer personally train the employees on a one-to-one basis? Another factor is the kind of skills or knowledge to be learned. Is the learning oriented toward physical skills (such as the use of special tools) or toward mental processes and attitudes? Such factors will influence the type of learning activity designed by employers. The training activity can be group-oriented, with lectures, role play, and demonstrations; or designed for the individual as with self-paced instruction.

The determination of methods and materials for the learning activity can be as varied as the employer's imagination and available resources will allow. The employer may want to use charts, diagrams, manuals, slides, films, viewgraphs (overhead transparencies), videotapes, audiotapes, or simply blackboard and chalk, or any combination of these and other instructional aids. Whatever the method of instruction, the learning activities should be developed in such a way that they have acquired the desired skills or knowledge.

E. Conducting the Training

With the completion of the steps outlined above, the employer is ready to begin conducting the training. To the extent possible, the training should be presented so that its organization and meaning are clear to the employees. To do so, employers or supervisors should:

- (1) Provide overviews of the material to be learned;
- (2) Relate, wherever possible, the new information to the employees's goals, interests, or experience; and
- (3) Reinforce what the employees learned by summarizing the program's objectives and the key points of information covered. These steps will assist employers in presenting the training in a clear, unambiguous manner.

In addition to organizing the content, employers must also develop the structure and format of the training. The content developed for the program, the nature of the workplace or other training site, and the resources available for training will help employers determine for themselves the frequency of training activities, the length of the sessions, the instructional techniques, and the individual(s) best qualified to present the information.

In order to be motivated and pay attention and learn the material that the employer or supervisor is presenting, employees must be convinced of the importance and relevance of the material. Among the ways of developing motivation are:

- (1) Explaining the goals and objectives of instruction;
- (2) Relating the training to the interests, skills, and experiences of the employees;
- (3) Outlining the main points to be presented during the training session(s); and
- (4) Pointing out the benefits of training (e.g., the employee will be better informed, more skilled, and thus more valuable both on the job and on the labor market; or the employee will, if he or she applies the skills and knowledge learned, be able to work at reduced risk).

An effective training program allows employees to participate in the training process and to practice their skill or knowledge. This will help to ensure that they are learning the required knowledge or skills and permit correction if necessary. Employees can become involved in the training process by participating in discussions, asking questions, contributing their knowledge and expertise, learning through hands-on experiences, and through role-playing exercises.

F. Evaluating Program Effectiveness

To make sure that the training program is accomplishing its goals, an evaluation of the training can be valuable. Training should have, as one of its critical components, a method of measuring the effectiveness of the training. A plan for evaluating the training session(s) should be developed when the course objectives and content are developed. It should not be delayed until the training has been completed. Evaluation will help employers or supervisors determine the amount of learning achieved and whether an employee's performance has improved on the job. Among the methods of evaluating training are

- (1) Student opinion. Questionnaires or informal discussions with employees can help employers determine the relevance and appropriateness of the training program;
- (2) Supervisor's observations. Supervisors are in good positions to observe an employee's performance both before and after the training and note improvements or changes; and
- (3) Workplace improvements. The ultimate success of a training program may be changes throughout the workplace that result in reduced injury or accident rates.

However it is conducted, an evaluation of training can give employers the information necessary to decide whether or not the employees achieved the desired results, and whether the training session should be offered again at some future date.

G. Improving the Program

If, after evaluation, it is clear that the training did not give the employees the level of knowledge and skill that was expected, then it may be necessary to revise the training program or provide periodic retraining. At this point, asking questions of employees and of those who conducted the training may be of some help. Among the questions that could be asked are:

- (1) Were parts of the content already known and, therefore, unnecessary?

- (2) What material was confusing or distracting?
- (3) Was anything missing from the program?
- (4) What did the employees learn, and what did they fail to learn?

It may be necessary to repeat steps in the training process, that is, to return to the first steps and retrace one's way through the training process. As the program is evaluated, the employer should ask:

- (1) If a job analysis was conducted, was it accurate?
- (2) Was any critical feature of the job overlooked?
- (3) Were the important gaps in knowledge and skill included?
- (4) Was material already known by the employees intentionally omitted?
- (5) Were the instructional objectives presented clearly and concretely?
- (6) Did the objectives state the level of acceptable performance that was expected of employees?
- (7) Did the learning activity simulate the actual job?
- (8) Was the learning activity appropriate for the kinds of knowledge and skills required on the job?
- (9) When the training was presented, was the organization of the material and its meaning made clear?
- (10) Were the employees motivated to learn?
- (11) Were the employees allowed to participate actively in the training process?
- (12) Was the employer's evaluation of the program thorough?

A critical examination of the steps in the training process will help employers to determine where course revision is necessary.

III. Matching Training to Employees

While all employees are entitled to know as much as possible about the safety and health hazards to which they are exposed, and employers should attempt to provide all relevant information and instruction to all employees, the resources for such an effort frequently are not, or are not believed to be, available. Thus, employers are often faced with the problem of deciding who is in the greatest need of information and instruction.

One way to differentiate between employees who have priority needs for training and those who do not is to identify employee populations which are at higher levels of risk. The nature of work will provide an indication that such groups should receive priority for information on occupational safety and health risks.

A. Identifying Employees at Risk

One method of identifying employee populations at high levels of occupational risk (and thus in greater need of safety and health training) is to pinpoint hazardous occupations. Even with industries which are hazardous in general, there are some employees who operate at greater risk than others. In other cases the hazardousness of an occupation is influenced by the conditions under which it is performed, such as noise, heat or cold, or safety or health hazards in the surrounding area. In these situations, employees should be trained not only on how to perform their job safely but also on how to operate within a hazardous environment.

A second method of identifying employee populations at high levels of risk is to examine the incidence of accidents and injuries, both within the company and within the industry. If employees in certain occupational categories are experiencing higher accident and injury rates than other employees, training may be one way to reduce that rate. In addition, thorough accident investigation can identify not only specific employees who could benefit

from training but also identify company-wide training needs.

Research has identified the following variables as being related to a disproportionate share of injuries and illnesses at the worksite on the part of employees:

1. The average age of the employee (younger employees have higher incidence rates).
2. The length of time on the job (new employees have higher incidence rates).
3. The size of the firm (in general terms, medium-size firms have higher incidence rates than smaller or larger firms).
4. The type of work performed (incidence and severity rates vary significantly by Standard Industrial Classification, or SIC, Code).
5. The use of hazardous substances (by SIC Code).

These variables should be considered when identifying employee groups for training in occupational safety and health.

In summary, information is readily available to help employers identify which employees should receive safety and health information, education, and training, and who should receive it before others. Employers can request assistance in obtaining information by contacting such organizations as OSHA Area Offices, the Bureau of Labor Statistics, OSHA-approved State programs, State on-site consultation programs, the OSHA Office of Training and Education, or local safety councils.

B. Training Employees at Risk

Determining the content of training for employee populations at higher levels of risk is similar to determining what any employee needs to know, but more emphasis is placed on the requirements of the job and the possibility of injury. One useful tool for determining training content from job requirements is the Job Hazard Analysis described earlier. This procedure examines each step of a job, identifies existing or potential hazards, and determines the best way to perform the job in order to reduce or eliminate the hazards. Its key elements are:

- (1) Job description;
- (2) Job location;
- (3) Key steps (preferably in the order in which they are performed);
- (4) Tools, machines and materials used;
- (5) Actual and potential safety and health hazards associated with these key job steps;
and
- (6) Safe and healthful practices, apparel, and equipment required for each job step.

Material Safety Data Sheets (MSDS) can also provide information for training employees in the safe use of materials. These data sheets, developed by chemical manufacturers and importers, are supplied with manufacturing or construction materials and describe the ingredients of a product, its hazards, protective equipment to be used, safe handling procedures, and emergency first-aid responses. The information contained in these sheets can help employers identify employees in need of training (i.e., workers handling substances described in the sheets) and train employees in safe use of the substances. Material Safety Data Sheets are generally available from suppliers, manufacturers of the substance, large employers who use the substance on a regular basis, or they can be developed by employers or trade associations. MSDS's are particularly useful for those employers who are developing training on chemical use as required by OSHA's Hazard Communication Standard.

IV. Conclusion

In an attempt to assist employers with their occupational health and safety training activities, OSHA has developed a set of training guidelines in the form of a model. This model is designed to help employers develop instructional programs as part of their total education and training effort. The model addresses the questions of who should be trained, on what topics, and for what purposes. It also helps employers determine how effective the program has been and enables them to identify employees who are in greatest need of education and training. The model is general enough to be used in any area of occupational safety and health training, and allows employers to determine for themselves the content and format of training. Use of this model in training activities is just one of the many ways that employers can comply with the OSHA standards that relate to training and enhance the safety and health of their employees.

SAMPLE HAZARD COMMUNICATION PROGRAM

INTRODUCTION

The Hazard Communication Standard requires you to develop a written hazard communication program.

The following is a sample hazard communication program that you may use as a guide in developing your in-house program.

OUR HAZARD COMMUNICATION PROGRAM

GENERAL COMPANY POLICY

The purpose of this notice is to inform you that our company is complying with the OSHA Hazard Communication Standard, 29 CFR 1910.1200, as adopted by 803 KAR 2:320, by compiling a hazardous chemicals list, by using material safety data sheets (MSDS), by ensuring that containers are labeled, and by providing you with training.

This program applies to all work operations in our company where you may be exposed to hazardous substances under normal working conditions or during an emergency situation.

The safety and health (S & H) manager, Robert Jones, is the program coordinator, acting as the representative of the plant manager, who has overall responsibility for the program. Mr. Robert Jones will review and update the program, as necessary. Copies of the written program may be obtained from Mr. Jones in Room SD-10.

Under this program, you will be informed of the contents of the Hazard Communication Standard, the hazardous properties of chemicals with which you work, safe handling procedures, and measures to take to protect yourselves from these chemicals. You will also be informed of the hazards associated with non-routine tasks, such as the cleaning of reactor vessels, and the hazards associated with chemicals in unlabeled pipes.

LIST OF HAZARDOUS CHEMICALS

The safety and health manager will make a list of all hazardous chemicals and related work practices used in the facility, and will update the list as necessary. Our list of chemicals identifies all of the chemicals used in our ten work process areas. A separate list is available for each work area and is posted there. Each list also identifies the corresponding MSDS for each chemical. A master list of these chemicals will be maintained by, and is available from Mr. Jones' in Room SD-10.

MATERIAL SAFETY DATA SHEETS (MSDS)

MSDS's provide you with specific information on the chemicals you use. The safety and health manager, Mr. Jones, will maintain a binder in his office with an MSDS on every substance on the list of hazardous chemicals. The MSDS will be a fully completed OSHA Form 174 or equivalent. The plant manager, Jeff O'Brien, will ensure that each work site maintains an MSDS for hazardous materials in that area. MSDS's will be made readily available to you at

your work stations during your shifts.

The safety and health manager, Mr. Jones, is responsible for acquiring and updating MSDS's. He will contact the chemical manufacturer or vendor if additional research is necessary or if an MSDS has not been supplied with an initial shipment. All new procurements for the company must be cleared by the safety and health manager. A master list of MSDS's is available from Mr. Jones in Room SD-10.

LABELS AND OTHER FORMS OF WARNING

The safety and health manager will ensure that all hazardous chemicals in the plant are properly labeled and updated, as necessary. Labels should list at least the chemical identity, appropriate hazard warnings, and the name and address of the manufacturer, importer or other responsible party. Mr. Jones will refer to the corresponding MSDS to assist you in verifying label information. Containers that are shipped from the plant will be checked by the supervisor of shipping and receiving to make sure all containers are properly labeled.

If there are a number of stationary containers within a work area that have similar contents and hazards, signs will be posted on them to convey the hazard information. On our stationary process equipment, regular process sheets, batch tickets, blend tickets, and similar written materials will be substituted for container labels when they contain the same information as labels. These written materials will be made readily available to you during your work shift.

If you transfer chemicals from a labeled container to a portable container that is intended only for your immediate use, no labels are required on the portable container. Pipes or piping systems will not be labeled but their contents will be described in the training sessions.

NON-ROUTINE TASKS

When you are required to perform hazardous non-routine tasks (e.g., cleaning tanks, entering confined spaces, etc), a special training session will be conducted to inform you regarding the hazardous chemicals to which you might be exposed and the proper precautions to take to reduce or avoid exposure.

TRAINING

Everyone who works with or is potentially exposed to hazardous chemicals will receive initial training on the Hazard Communication Standard and the safe use of those hazardous chemicals by the safety and health manager. A program that uses both audiovisual materials and classroom type training has been prepared for this purpose. Whenever a new hazard is introduced, additional training also be used to review information presented in the initial training. Foremen and other supervisors will be extensively trained regarding hazards and appropriate protective measures so they will be available to answer questions from employees and provide daily monitoring of safe work practices.

The training plan will emphasize these items:

- * Summary of the standard and this written program;
- * Chemical and physical properties of hazardous materials (e.g., flash point, reactivity) and methods that can be used to detect the presence or release of chemicals (including chemicals in unlabeled pipes);
- * Physical hazards of chemicals (e.g., potential for fire, explosion, etc);
- * Health hazards, including signs and symptoms of exposure, associated with exposure to chemicals and any medical condition known to be aggravated by exposure to the chemical;

- * Procedures to protect against hazards (e.g., personal protective equipment required, proper use, and maintenance; work practices or methods to assure proper use and handling of chemicals; and procedures for emergency response);
- * Work procedures to follow to assure protection when cleaning hazardous chemical spills and leaks; and
- * Where MSDS's are located, how to read and interpret the information on both labels and MSDS's, and how employees may obtain additional hazard information.

The safety and health manager or designee will review our employee training program and advise the plant manager on training or retraining needs. Retraining is required when the hazard changes or when a new hazard is introduced into the workplace, but it will be company policy to provide training regularly in safety meetings to ensure the effectiveness of the program. As part of the assessment of the training program, the safety and health manager will obtain input from employees regarding the training they have received and their suggestions for improving it.

CONTRACTOR EMPLOYERS

The safety and health manager, Robert Jones, upon notification by the responsible supervisor, will advise outside contractors in person of any chemical hazards that may be encountered in the normal course of their work on the premises, the labeling system in use, the protective measures to be taken, and the safe handling procedures to be used. In addition, Mr. Jones will notify these individuals of the location and availability of MSDS's. Each contractor bringing chemicals on-site must provide us with the appropriate hazard information on these substances including the labels used and the precautionary measures to be taken in working with these chemicals.

ADDITIONAL INFORMATION

All employees, or their designated representatives, can obtain further information on this written program, the hazard communication standard, applicable MSDS's, and chemical information lists at the safety and health office, Room SD-10.

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NOTES:

ACCESS TO EMPLOYEE EXPOSURE AND MEDICAL RECORDS

1910.1020

(a) PURPOSE.

The purpose of this section is to provide employees and their designated representatives a right of access to relevant exposure and medical records; and to provide representatives of the Assistant Secretary a right of access to these records in order to fulfill responsibilities under the Occupational Safety and Health Act. Access by employees, their representatives, and the Assistant Secretary is necessary to yield both direct and indirect improvements in the detection, treatment, and prevention of occupational disease. Each employer is responsible for assuring compliance with this section, but the activities involved in complying with the access to medical records provisions can be carried out, on behalf of the employer, by the physician or other health care personnel in charge of employee medical records. Except as expressly provided, nothing in this section is intended to affect existing legal and ethical obligations concerning the maintenance and confidentiality of employee medical information, the duty to disclose information to a patient/employee or any other aspect of the medical-care relationship, or affect existing legal obligations concerning the protection of trade secret information.

(b) SCOPE AND APPLICATION.

- (1) This section applies to each general industry, maritime, and construction employer who makes, maintains, contracts for, or has access to employee exposure or medical records, or analyses thereof, pertaining to employees exposed to toxic substances or harmful physical agents.
- (2) This section applies to all employee exposure and medical records, and analyses thereof, of employees exposed to toxic substances or harmful physical agents, whether or not the records are related to specific occupational safety and health standards.
- (3) This section applies to all employee exposure and medical records, and analyses thereof, made or maintained in any manner, including on an in-house or contractual (e.g., fee-for-service) basis. Each employer shall assure that the preservation and access requirements of this section are complied with regardless of the manner in which records are made or maintained.

(c) DEFINITIONS.

- (1) "Access" means the right and opportunity to examine and copy.
- (2) "Analysis using exposure or medical records" means any compilation of data, or any research, statistical or other study based at least in part on information collected from individual employee exposure or medical records or information collected from health insurance claims records, provided that either the analysis has been reported to the employer or no further work is currently being done by the person responsible for preparing the analysis.
- (3) "Designated representative" means any individual or organization to whom an employee gives written authorization to exercise a right of access. For the purposes of

access to employee exposure records and analyses using exposure or medical records, a recognized or certified collective bargaining agent shall be treated automatically as a designated representative without regard to written employee authorization.

(4) "Employee" means a current employee, a former employee, or an employee being assigned or transferred to work where there will be exposure to toxic substances or harmful physical agents. In the case of a deceased or legally incapacitated employee, the employee's legal representative may directly exercise all the employee's rights under this section.

(5) "Employee exposure record" means a record containing any of the following kinds of information:

(i) Environmental (workplace) monitoring or measuring, including personal, area, grab, wipe, or other form of sampling, as well as related collection and analytical methodologies, calculations, and other background data relevant to interpretation of the results obtained;

(ii) Biological monitoring results which directly assess the absorption of a substance or agent by body systems (e.g., the level of a chemical in the blood, urine, breath, hair, fingernails, etc.) but not including results which assess the biological effect of a substance or agent or which assess an employee's use of alcohol or drugs;

(iii) Material safety data sheets indicating that the material may pose a hazard to human health; or

(iv) In the absence of the above, a chemical inventory or any other record which reveals the identity (e.g., chemical, common, or trade name) of a toxic substance or harmful physical agent.

(6)

(i) "Employee medical record" means a record concerning the health status of an employee which is made or maintained by a physician, nurse, or other health care personnel, or technician, including:

(A) Medical and employment questionnaires or histories (including job description and occupational exposures),

(B) The results of medical examinations (pre-employment, pre-assignment, periodic, or episodic) and laboratory tests (including chest and other X-ray examinations taken for the purpose of establishing a baseline or detecting occupational illnesses and all biological monitoring not defined as an "employee exposure record"),

(C) Medical opinions, diagnoses, progress notes, and recommendations,

(D) First Aid Records

(E) Descriptions of treatments and prescriptions, and

(F) Employee medical complaints.

(ii) "Employee medical record" does not include medical information in the form of:

- (A) Physical specimens (e.g., blood or urine samples) which are routinely discarded as a part of normal medical practice, or
 - (B) Records concerning health insurance claims if maintained separately from the employer's medical program and its records, and not accessible to the employer by employee name or other direct personal identifier (e.g., social security number, payroll number, etc.), or
 - (C) Records created solely in preparation for litigation which are privileged from discovery under the applicable rules of procedure or evidence; or
 - (D) Records concerning voluntary employee assistance programs (alcohol, drug abuse, or personal counseling programs) if maintained separately from the employer's medical program and its records.
- (7) "Employer" means a current employer, a former employer, or a successor employer.
- (8) "Exposure" or "exposed" means that an employee is subjected to a toxic substance or harmful physical agent in the course of employment through any route of entry (inhalation, ingestion, skin contact or absorption, etc.), and includes past exposure and potential (e.g., accidental or possible) exposure, but does not include situations where the employer can demonstrate that the toxic substance or harmful physical agent is not used, handled, stored, generated, or present in the workplace in any manner different from typical non-occupational situations.
- (9) " Health Professional" means a physician, occupational health nurse, industrial hygienist, toxicologist, or epidemiologist, providing medical or other occupational health services to exposed employees.
- (10) "Record" means any item, collection, or grouping of information regardless of the form or process by which it is maintained (e.g., paper document, microfiche, microfilm, X-ray film, or automated data processing).
- (11) "Specific chemical identity" means a chemical name, Chemical Abstracts Service (CAS) Registry Number, or any other information that reveals the precise chemical designation of the substance.
- (12)
- (i) "Specific written consent" means a written authorization containing the following:
 - (A) The name and signature of the employee authorizing the release of medical information,
 - (B) The date of the written authorization,
 - (C) The name of the individual or organization that is authorized to release the medical information,
 - (D) The name of the designated representative (individual or organization) that is authorized to receive the released information,
 - (E) A general description of the medical information that is authorized to be released,

- (F) A general description of the purpose for the release of the medical information, and
 - (G) A date or condition upon which the written authorization will expire (if less than one year).
- (ii) A written authorization does not operate to authorize the release of medical information not in existence on the date of written authorization, unless the release of future information is expressly authorized, and does not operate for more than one year from the date of written authorization.
 - (iii) A written authorization may be revoked in writing prospectively at any time.
- (13) "Toxic substance or harmful physical agent" means any chemical substance, biological agent (bacteria, virus, fungus, etc.), or physical stress (noise, heat, cold, vibration, repetitive motion, ionizing and non-ionizing radiation, hypo - or hyperbaric pressure, etc.) which:
- (i) Is listed in the latest printed edition of the National Institute for Occupational Safety and Health (NIOSH) Registry of Toxic Effects of Chemical Substances (RTECS):
 - (ii) Has yielded positive evidence of an acute or chronic health hazard in human, animal, or other biological testing conducted by, or known to, the employer, or
 - (iii) Is the subject of a material safety data sheet kept by or known to the employer indicating that the material may pose a hazard to human health.
- (14) "Trade secret" means any confidential formula, pattern, process, device, or information or compilation of information that is used in an employer's business and that gives the employer an opportunity to obtain an advantage over competitors who do not know or use it.

(d) PRESERVATION OF RECORDS.

- (1) Unless a specific occupational safety and health standard provides a different period of time, each employer shall assure the preservation and retention of records as follows:
- (i) Employee medical records. The medical record for each employee shall be preserved and maintained for at least the duration of employment plus thirty (30) years, except that the following records need not be retained for any specified period;
 - (A) Health insurance claims records maintained separately from the employer's medical program and its records.
 - (B) First aid records (not including medical histories) of one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and the like which do not involve medical treatment, loss of consciousness, restriction of work or motion, or transfer to another job, if made on-site by a non-physician and if maintained separately from the employer's medical program and its records, and
 - (C) The medical records of employees who have worked for less than (1) year for the employer need not be retained beyond the term of

employment if they are provided to the employee upon the termination of employment.

(ii) Employee exposure records. Each employee exposure record shall be preserved and maintained for at least thirty (30) years, except that:

(A) Background data to environmental (workplace) monitoring or measuring, such as laboratory reports and worksheets, need only be retained for one (1) year so long as the sampling results, the collection methodology (sampling plan), a description of the analytical and mathematical methods used, and a summary of other background data relevant to interpretation of the results obtained, are retained for at least thirty (30) years; and

(B) Material safety data sheets and paragraph (c)(5)(iv) records concerning the identity of a substance or agent need not be retained for any specified period as long as some record of the identity (chemical name if known) of the substance or agent, where it was used, and when it was used is retained for at least thirty (30) years⁽¹⁾; and

Footnote(1) Material safety data sheets must be kept for those chemicals currently in use that are effected by the Hazard Communication Standard in accordance with 29 CFR 1910.1200(g).

(C) Biological monitoring results designated as exposure records by specific occupational safety and health standards shall be preserved and maintained as required by the specific standard.

(iii) Analyses using exposure or medical records. Each analysis using exposure or medical records shall be preserved and maintained for at least thirty (30) years.

(2) Nothing in this section is intended to mandate the form, manner, or process by which an employer preserves a record so long as the information contained in the record is preserved and retrievable, except that chest X-ray films shall be preserved in their original state.

(e) ACCESS TO RECORDS

(1) General.

(i) Whenever an employee or designated representative requests access to an exposure or medical record, the employer shall assure that access is provided in a reasonable time, place, and manner, but not longer than fifteen (15) days after the request for access is made unless sufficient reason is given why such a time is unreasonable or impractical.”

(ii) The employer may require of the requester only such information as should be readily known to the requester and which may be necessary to locate or identify the records being requested (e.g. dates and locations where the employee worked during the time period in question).

(iii) Whenever an employee or designated representative requests a copy of a record, the employer shall, except as specified in (v) of this section, within the period of time previously specified assure that either:

(A) A copy of the record is provided without cost to the employee or

representative,

- (B) The necessary mechanical copying facilities (e.g., photocopying) are made available without cost to the employee or representative for copying the record, or
 - (C) The record is loaned to the employee or representative for a reasonable time to enable a copy to be made.
- (iv) In the case of an original X-ray, the employer may restrict access to on-site examination or make other suitable arrangements for the temporary loan of the X-ray.
 - (v) Original x-ray film will be made available to the employee and/or designated representative for inspection, review, and duplication under the supervision of the employer or his representative. The employer is not required to bear the cost of duplication of x-ray film. Whenever a record has been previously provided without cost to an employee or designated representative, the employer may charge reasonable, non-discriminatory administrative costs (i.e., search and copying expenses but not including overhead expenses) for a request by the employee or designated representative for additional copies of the record, except that:
 - (A) An employer shall not charge for an initial request for a copy of new information that has been added to a record which was previously provided; and
 - (B) An employer shall not charge for an initial request by a recognized or certified collective bargaining agent for a copy of an employee exposure record or an analysis using exposure or medical records.
 - (vi) Nothing in this section is intended to preclude employees and collective bargaining agents from collectively bargaining to obtain access to information in addition to that available under this section.
- (2) Employee and designated representative access
- (i) Employee exposure records.
 - (A) Except as limited by paragraph (f) of this section, each employer shall, upon request, assure the access to each employee and designated representative to employee exposure records relevant to the employee. For the purpose of this section, an exposure record relevant to the employee consists of:
 - (1) A record which measures or monitors the amount of a toxic substance or harmful physical agent to which the employee is or has been exposed;
 - (2) In the absence of such directly relevant records, such records of other employees with past or present job duties or working conditions related to or similar to those of the employee to the extent necessary to reasonably indicate the amount and nature of the toxic substances or harmful physical agents to which the employee is or has been subjected, and
 - (3) Exposure records to the extent necessary to reasonably

indicate the amount and nature of the toxic substances or harmful physical agents at workplaces or under working conditions to which the employee is being assigned or transferred.

- (B) Requests by designated representatives for unconsented access to employee exposure records shall be in writing and shall specify with reasonable particularity:
 - (1) The record requested to be disclosed; and
 - (2) The occupational health need for gaining access to these records.
- (ii) Employee medical records.
 - (A) Each employer shall, upon request, assure the access of each employee to employee medical records of which the employee is the subject, except as provided in paragraph (e)(2)(ii)(D) of this section.
 - (B) Each employer shall, upon request, assure the access of each designated representative to the employee medical records of any employee who has given the designated representative specific written consent. Appendix A to this section contains a sample form which may be used to establish specific written consent for access to employee medical records.
 - (C) Whenever access to employee medical records is requested, a physician representing the employer may recommend that the employee or designated representative:
 - (1) Consult with the physician for the purposes of reviewing and discussing the records requested,
 - (2) Accept a summary of material facts and opinions in lieu of the records requested, or
 - (3) Accept release of the requested records only to a physician or other designated representative.
 - (D) Whenever an employee requests access to his or her employee medical records, and a physician representing the employer believes that direct employee access to information contained in the records regarding a specific diagnosis of a terminal illness or a psychiatric condition could be detrimental to the employee's health, the employer may inform the employee that access will only be provided to a designated representative of the employee having specific written consent, and deny the employee's request for direct access to this information only. Where a designated representative with specific written consent requests access to information so withheld, the employer shall assure the access of the designated representative to this information, even when it is known that the designated representative will give the information to the employee.
 - (E) A physician, nurse, or other responsible health care personnel maintaining employee medical records may delete from requested

medical records the identity of a family member, personal friend, or fellow employee who has provided confidential information concerning an employee's health status.

- (iii) Analyses using exposure or medical records.
 - (A) Each employer shall, upon request, assure the access of each employee and designated representative to each analysis using exposure or medical records concerning the employee's working conditions or workplace.
 - (B) Whenever access is requested to an analysis which reports the contents of employee medical records by either direct identifier (name, address, social security number, payroll number, etc.) or by information which could reasonably be used under the circumstances indirectly to identify specific employees (exact age, height, weight, race, sex, date of initial employment, job title, etc.), the employer shall assure that personal identifiers are removed before access is provided. If the employer can demonstrate that removal of personal identifiers from an analysis is not feasible, access to the personally identifiable portions of the analysis need not be provided.

(3) OSHA access.

- (i) Each employer shall, upon request, and without any derogation of any rights under the Constitution or the Occupational Safety and Health Act of 1970, 29 U.S.C. 651 et seq., that the employer chooses to exercise, assure the prompt access of representatives of the Assistant Secretary of Labor for Occupational Safety and Health to employee exposure and medical records and to analyses using exposure or medical records. Rules of agency practice and procedure governing OSHA access to employee medical records are contained in 29 CFR 1913.10.
- (ii) Whenever OSHA seeks access to personally identifiable employee medical information by presenting to the employer a written access order pursuant to 29 CFR 1913.10(d), the employer shall prominently post a copy of the written access order and its accompanying cover letter for at least fifteen (15) working days.

(f) TRADE SECRETS.

- (1) Except as provided in paragraph (f)(2) of this section, nothing in this section precludes an employer from deleting from records requested by an employee or designated representative any trade secret data which discloses manufacturing processes, or discloses the percentage of a chemical substance in a mixture, as long as the health professional, employee, or designated representative is notified that information has been deleted. Whenever deletion of trade secret information substantially impairs evaluation of the place where or the time when exposure to a toxic substance or harmful physical agent occurred, the employer shall provide alternative information which is sufficient to permit the requesting party to identify where and when exposure occurred.
- (2) The employer may withhold the specific chemical identity, including the chemical name and other specific identification of a toxic substance from a disclosable record provided that:
 - (i) The claim that the information withheld is a trade secret can be supported;

- (ii) All other available information on the properties and effects of the toxic substance is disclosed;
 - (iii) The employer informs the requesting party that the specific chemical identity is being withheld as a trade secret; and
 - (iv) The specific chemical identity is made available to health professionals, employees and designated representatives in accordance with the specific applicable provisions of this paragraph.
- (3) Where a treating physician or nurse determines that a medical emergency exists and the specific chemical identity of a trade secret chemical to the treating physician or nurse, regardless of the existence of a written statement of need or a confidentiality agreement, in accordance with the provisions of paragraphs (f)(4) and (f)(5), as soon as circumstances permit.
- (4) In non-emergency situations, an employer shall, upon request, disclose a specific chemical identity, otherwise permitted to be withheld under paragraph (f)(2) of this section, to a health professional, employee, or designated representative if:
- (i) The request is in writing;
 - (ii) The request describes with reasonable detail one or more of the following occupational health needs for the information;
 - (A) To assess the hazards of the chemicals to which employees will be exposed;
 - (B) To conduct or assess sampling of the workplace atmosphere to determine employee exposure levels;
 - (C) To conduct pre-assignment or periodic medical surveillance of exposed employees;
 - (D) To provide medical treatment to exposed employees;
 - (E) To select or assess appropriate personal protective equipment for exposed employees;
 - (F) To design or assess engineering controls or other protective measures for exposed employees; and
 - (G) To conduct studies to determine the health effects of exposure.
 - (iii) The request explains in detail why the disclosure of the specific chemical identity is essential and that in lieu thereof, the disclosure of the following information would not enable the health professional, employee or designated representative to provide the occupational health services described in paragraph (f)(4)(ii) of this section;
 - (A) The properties and effects of the chemical;
 - (B) Measures for controlling workers' exposure to the chemical.
 - (C) Methods of monitoring and analyzing worker exposure to the chemi-

cal; and

- (D) Methods of diagnosing and treating harmful exposures to the chemical;
 - (iv) The request includes a description of the procedures to be used to maintain the confidentiality of the disclosed information; and
 - (v) The health professional, employee, or designated representative and the employer or contractor of the services of the health professional or designated representative agree in a written confidentiality agreement that the health professional, employee or designated representative will not use the trade secret information for any purpose other than the health need(s) asserted and agree not to release the information under any circumstances other than to OSHA, as provided in paragraph (f)(9) of this section, except as authorized by the terms of the agreement or by the employer.
- (5) The confidentiality agreement authorized by paragraph (f)(4)(iv) of this section;
- (i) May restrict the use of the information to the health purposes indicated in the written statement of need;
 - (ii) May provide for appropriate legal remedies in the event of a breach of the agreement, including stipulation of a reasonable pre-estimate of likely damages; and
 - (iii) May not include requirements for the posting of a penalty bond.
- (6) Nothing in this section is meant to preclude the parties from pursuing non-contractual remedies to the extent permitted by law.
- (7) If the health professional, employee or designated representative receiving the trade secret information decides that there is a need to disclose it to OSHA, the employer who provided the information shall be informed by the health professional prior to, or at the same time as, such disclosure.
- (8) If the employer denies a written request for disclosure of a specific chemical identity, the denial must;
- (i) Be provided to the health professional, employee or designated representative within thirty days of the request;
 - (ii) Be in writing;
 - (iii) Include evidence to support chemical identity is a trade secret;
 - (iv) State the specific reasons why the request is being denied; and
 - (v) Explain in detail how alternative information may satisfy the specific medical or occupational health need without revealing the specific chemical identity.
- (9) The health professional, employee, or designated representative whose request for information is denied under paragraph (f)(4) of this section may refer the request and the written denial of the request to OSHA for consideration.
- (10) When a health professional, employee, or designated representative refers a denial to

OSHA under paragraph (f)(9) of this section, OSHA shall consider the evidence to determine if;

- (i) The employer has supported the claim that the specific chemical identity is a trade secret;
- (ii) The health professional employee or designated representative has supported the claim that there is a medical or occupational health need for the information; and
- (iii) The health professional, employee or designated representative demonstrated adequate means to protect the confidentiality.

(11)

- (i) If OSHA determines that the specific chemical identity requested under paragraph (f)(4) of this section is not a bona fide trade secret, or that it is a trade secret but the requesting health professional, employee or designated representatives has a legitimate medical or occupational health need for the information, has executed a written confidentiality agreement, and has shown adequate means for complying with the terms of such agreement, the employer will be subject to citation by OSHA.
- (ii) If an employer demonstrates to OSHA that the execution of a confidentiality agreement would not provide sufficient protection against the potential harm from the unauthorized disclosure of a trade secret specific chemical identity, the Assistant Secretary may issue such orders or impose such additional limitations or conditions upon the disclosure of the requested chemical information as may be appropriate to assure that the occupational health needs are met without an undue risk of harm to the employer.

(12) Notwithstanding the existence of a trade secret claim, an employer shall, upon request, disclose to the Assistant Secretary any information which this section requires the employer to make available. Where there is a trade secret claim, such claim shall be made no later than at the time the information is provided to the Assistant Secretary so that suitable determinations of trade secret status can be made and the necessary protections can be implemented.

(13) Nothing in this paragraph shall be construed as requiring the disclosure under any circumstances of process or percentage of mixture information which is a trade secret.

(g) EMPLOYEE INFORMATION.

(1) Upon an employee's first entering into employment, and at least annually thereafter, each employer shall inform current employees covered by this section of the following:

- (i) The existence, location, and availability of any records covered by this section;
- (ii) The person responsible for maintaining and providing access to records; and
- (iii) Each employee's rights of access to these records.

(2) Each employer shall keep a copy of this section and its appendices, and make copies readily available, upon request to employees. The employer shall also distribute to current employees any informational materials concerning this section which are made available to the employer by the Assistant Secretary of Labor for Occupational Safety and Health.

(h) TRANSFER OF RECORDS.

- (1) Whenever an employer is ceasing to do business, the employer shall transfer all records subject to this section to the successor employer. The successor employer shall receive and maintain these records.
- (2) Whenever an employer is ceasing to do business and there is no successor employer to receive and maintain the records subject to this standard, the employer shall notify affected current employees of their rights of access to records at least three (3) months prior to the cessation of the employer's business.
- (3) Whenever an employer either is ceasing to do business and there is no successor employer to receive and maintain the records, or intends to dispose of any records required to be preserved for at least thirty (30) years, the employer shall:
 - (i) Transfer the records to the Director of the National Institute for Occupational Safety and Health (NIOSH) if so required by a specific occupational safety and health standard: or
 - (ii) Notify the Director of NIOSH in writing of the impending disposal of records at least three (3) months prior to the disposal of the records.
- (4) Where an employer regularly disposes of records required to be preserved for at least thirty (30) years, the employer may, with at least (3) months notice, notify the Director of NIOSH on an annual basis of the records intended to be disposed of in the coming year.
 - (i) Appendices. The information contained in the appendices to this section is not intended, by itself, to create any additional obligations not otherwise imposed by this section nor detract from any existing obligation.

The RTECS is issued in an annual printed edition as mandated by section 20(a)(6) of the Occupational Safety and Health Act (29 U.S.C. 669(a)(6)).

The introduction to the 1980 printed edition describes the RTECS as follows:

The 1980 edition of the Registry of Toxic Effects of Chemical Substances, formerly known as the Toxic Substances list, is the ninth revision prepared in compliance with the requirements of Section 20(a)(6) of the Occupational Safety and Health Act of 1970 (Public Law 91-596). The original list was completed on June 28, 1971, and has been updated annually in book format. Beginning in October 1977, quarterly revisions have been provided in microfiche. This edition of the Registry contains 168,096 listings of chemical substances; 45,156 are names of different chemicals with their associated toxicity data and 122,940 are synonyms. This edition includes approximately 5,000 new chemical compounds that did not appear in the 1979 Registry.(p. xi)

The Registry's purposes are many, and it serves a variety of users. It is a single source document for basic toxicity information and for other data, such as chemical identifiers and information necessary for the preparation of safety directives and hazard evaluations for chemical substances. The various types of toxic effects linked to literature citations provide researchers and occupational health scientists with an introduction to the toxicological literature, making their own review of the toxic hazards of a given substance easier. By presenting data on the lowest reported doses that produce effects by several routes of entry in various species, the Registry furnishes valuable information to those responsible for preparing safety data sheets for chemical substances in the workplace. Chemical and production engineers can use the Registry to identify the hazards which may be associated with chemical intermediates in the development of final products, and thus can more readily select substitutes or alternate processes which may be less hazardous. Some organizations, including health agencies and chemical companies, have included the NIOSH Registry accession numbers with the listing of chemicals in their files to reference toxicity information associated with those chemicals. By including foreign language chemical names, a start has been made toward providing rapid identification of substances produced in other countries.(p xi)

In this edition of the Registry, the editors intend to identify "all known toxic substances" which may exist in the environment and to provide pertinent data on the toxic effects from known doses entering an organism by any route described.(p xi)

It must be reemphasized that the entry of a substance in the Registry does not automatically mean that it must be avoided. A listing does mean, however, that the substance has the documented potential of being harmful if misused, and care must be exercised to prevent tragic consequences. Thus the Registry lists many substances that are common in everyday life and are in nearly every household in the United States. One can name a variety of such dangerous substances: prescription and non-prescription drugs; food additives; pesticide concentrates, sprays, and dusts; fungicides; herbicides, paints; glazes, dyes; bleaches and other household cleaning agents; alkalis; and various solvents and diluents. The list is extensive because chemicals have become an integral part of our existence.

The RTECS 1978 printed edition may be purchased from the Superintendent of Documents, U.S. Government Printing Office (GPO), Washington, DC 20402 (202-783-3238).

Some employers may desire to subscribe to the quarterly update to the RTECS which is published in a microfiche edition. An annual subscription to the quarterly microfiche may be purchased from the GPO (Order the "Microfiche Edition, Registry of Toxic Effects of Chemical Substances"). Both the printed edition and the microfiche edition of RTECS are available for review at many university and public libraries throughout the country. The latest RTECS editions may also be examined at the OSHA Technical Data Center, Room N2439 - Rear,

United States Department of Labor, 200 Constitution Avenue, N.W.,
Washington, DC 20210 (202-523-9700), or at any OSHA Regional or Area Office (See, major
city telephone directories under United States Government - Labor Department).

For information concerning the Occupational safety and health standards, regulations interpretations and actions of the Kentucky Occupational Safety and Health Standards Board, contact:

**Department of Workplace Standards
Office of Occupational Safety and Health
Frankfort, Kentucky 40601
(502) 564-3070**

For information concerning Occupational Safety and Health training, consultation, technical assistance, publications and OSH recordkeeping forms, contact:

**Department of Workplace Standards
Division of Education and Training
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**Kentucky Labor Cabinet
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