The Ohio State University
Hazard Communication Program
For

The Department of Materials Science and Engineering

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Date: Dec 14, 1999

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1.0 Scope

In order to comply with the Public Employment Risk Reduction Program (PERRP) (Ohio House Bill 308 - An Act) and the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard [29 CFR 1910.1200 (Appendix A)], the following written Hazard Communication Program has been developed by the Office of Environmental Health and Safety and modified for the Department of Materials Science and Engineering. These laws are designed to protect University and contractor employees from the dangers associated with hazardous chemicals to which they maybe exposed at The Ohio State University. This written program includes information on labeling, availability of Material Safety Data Sheets (MSDS's), employer and employee responsibilities and employee training.

2.0 University Policy

It is The Ohio State University policy (Appendix B) that all faculty, staff, student employees and contractor employees, who may come in contact with hazardous chemicals in the workplace, receive information concerning the particular hazards which the chemicals pose and methods by which they may deal with such chemicals in a safe manner. In accordance with PERRP, The Ohio State University establishes a hazard communication program for all employees.

3.0 Responsibilities

This section discusses the responsibilities of the Office of Environmental Health and Safety, the administrative units, and employees. The relevant sections of this program shall be reviewed by supervisors, employees and other individuals having responsibility for the non-laboratory use of hazardous chemicals. Specific Hazard Communication Program responsibilities for the various groups include the following:

3.1 Office of Environmental Health and Safety

•Provide a model written Hazard Communication Program for modification and adoption by administrative units.

•Provide technical assistance to supervisors, workers and contractors concerning the appropriate storage, handling and disposal of hazardous substances.

•Conduct internal audits for compliance with the Hazard Communication Standard.

•Establish and maintain an MSDS system for use by University personnel.

•Develop a generic Hazard Communication training program and work with administrative units concerning the program delivery.

3.2 The Administrative Unit

•Maintain an administrative unit specific written Hazard Communication Program.

•Maintain an inventory of the hazardous chemicals known to be present in the workplace.

•Provide job specific training for employees and maintain training records.

•Request assistance from the Office of Environmental Health and Safety as needed.

•Ensure that all materials deemed hazardous under this Standard are labeled in accordance with this Standard.

•Provide and maintain MSDS's for all hazardous chemicals within the operation.

3.3 Employees

•Follow all health and safety standards, rules and policies.

•Report all hazardous conditions to their supervisor.

•Wear or use prescribed personal protective equipment.

•Report any job-related injuries or illnesses to their supervisor and seek treatment immediately.

•Refrain from the operation of any equipment or instrumentation without proper instruction or authorization.

•Understand the dangers associated with hazardous substances in the workplace, as well as their safe and proper use.

•Request information when unsure about handling procedures for a hazardous substance.

4.0 Hazard Determination

The University will primarily rely upon the safety and health related information found on labels and within the Material Safety Data Sheets (MSDS's) which are provided by manufacturers or suppliers of chemicals and chemical containing products. The University will also use other information sources or references for determining the hazard potential of chemicals such as those references listed in the Hazard Communication Standard (Appendix A).

5.0 Hazardous Chemical Inventory

A list of all hazardous chemicals or products containing hazardous chemicals known to be present in the work area will be maintained by the Department of Materials Science and Engineering. The instructions for completing the inventory list of hazardous chemicals or products are described in Appendix C. The list of hazardous chemicals should be routinely reviewed to determine if the information is current. Additions or deletions to the list shall be communicated by the administrative unit to all affected employees and contractors.

The list of hazardous chemicals or products will be located in the Department's main office, room 177 Watts Hall. This will assure employee access to the hazardous chemical inventory. The Department OSHA Coordinator will be responsible for maintaining, reviewing, and updating the hazardous chemical inventory.

6.0 Labels and Other Forms of Warning

The Hazard Communication Standard requires that product containers inform employees about the physical and health hazards of the product. The labels must also inform employees of appropriate protective equipment and body organs affected by over exposure. The description of acceptable hazardous chemical labeling systems is provided in Appendix D. The Materials Science and

Engineering Department will ensure the following:

•Labels for incoming chemical containers are not to be removed or defaced.

•Hazardous chemicals transferred to another container for storage must be appropriately labeled (Appendix D).

•Chemicals transferred to new containers must have the new container labeled as discussed previously. Labeling is not required for portable containers into which hazardous chemicals have been transferred as long as the chemical transfer is intended for immediate use by the employee who performs the transfer.

Note: Some chemicals may be exempted from the Hazard Communication Standard. See Appendix A Section f.

The Materials Science and Engineering Department will follow the labeling system provided by the manufacturer for chemicals transferred to new containers. The Department OSHA Coordinator is responsible for ensuring proper and correct labeling methods are utilized.

7.0 Material Safety Data Sheets (MSDS's)

Material Safety Data Sheets (MSDS's) are written documents which are provided by manufacturers for each hazardous chemical or product that they produce, sell or distribute. Chemical manufacturers and suppliers are mandated by law to provide the MSDS's along with their product to the customer or user. The MSDS contains valuable information about the characteristics, safety and health hazards, protective measures and emergency response procedures for the hazardous chemical or product. The Department of Materials Science and Engineering must maintain a current file of MSDS's for all products containing hazardous chemicals as listed in the inventory. The MSDS's shall be readily accessible to University employees and University contractors. The Office of Environmental Health and Safety will provide assistance to the departments in obtaining MSDS's. MSDS's must be completed by the individual(s), who synthesize chemicals that are transferred outside the group or unit.

The Department file of MSDS's will be located in room 177 Watts Hall. This will assure employee access to the file. The Department OSHA Coordinator is responsible for ensuring that MSDS's are obtained, maintained and updated for all chemicals on the inventory.

8.0 Training Requirements

The Department of Materials Science and Engineering will be responsible for

informing and training their employees about hazardous chemicals used in the workplace. This information and training must be provided to employees at the time of the initial assignment to the work area. Additional instruction will be provided whenever a new chemical hazard is introduced to the work area. Appendix E outlines the information that must be included in the generic and specific Hazard Communication training.

Generic Hazard Communication instruction and training includes the following:

•A discussion of the Hazard Communication Standard and its key elements. This includes an explanation of: definitions (Appendix F), and abbreviations of key terms (Appendix G), and permissible exposure limit (PEL) information (Appendix H).

• An explanation of the information within MSDSÕs.

•A description of the health and physical hazards posed by chemicals.

•Safe operating procedures and personal protective equipment to be used for various chemical hazard classes.

•The methods for detecting and identifying the presence of a hazardous chemical in the work area.

•The emergency procedures to be followed in case of chemical spills, fires and other incidents.

•The measures (i.e., safe work practices, emergency procedures, and spill control) that employees can take to protect themselves from work place hazards.

The Department OSHA Coordinator is responsible for training employees on the generic Hazard Communication information.

Specific Hazard Communication instruction and training includes:

•The location and availability of the department administrative unit's written Hazard Communication Program.

•The location and accessibility of MSDS's for the hazardous chemicals known to be present in the work area.

•The specific physical and health hazards of the chemicals known to be present in the work area. This would include a discussion of the physical and chemical characteristics of these substances, as well as target organ systems.

•Any operations where hazardous chemicals are present.

•The location and availability of the inventory of hazardous chemicals known to be present in the work area.

The Department OSHA Coordinator is responsible for training employees on specific Hazard Communication information. The Coordinator is responsible for ensuring that new, transferred or employees returning from long leaves receive training on both generic and specific Hazard Communication information. The Coordinator also is responsible for training affected employees when a change of hazard(s) or information occurs in their work area.

Employees are to be informed of any new information concerning potential hazards as it becomes available. The Department of Materials Science and Engineering is responsible for documenting all generic, specific and follow-up training. The documentation will include the date, time, location, subject material, attendance lists of all participants and names of instructors.

The Department OSHA Coordinator is responsible for maintaining, reviewing, and updating the records of generic and specific Hazard Communication training.

9.0 Employee Hazard Awareness - Non-Routine Tasks

It is the responsibility of the Department of Materials Science and Engineering and the immediate supervisor to ensure that their employees are informed about the hazards of non-routine tasks, as well as the protective measures that should be followed to reduce exposure. Special written operating procedures are to be developed for internal use when necessary.

10.0 Contractors

It is the responsibility of the University through the Department of Materials Science and Engineering to inform contractors about potentially hazardous chemicals or operations that may threaten the health and safety of contract employees. Furthermore, it is the responsibility of project captains, administrators, supervisors or research investigators that have authority for controlling the work area or operation to inform the contractors of these hazards. A list of known chemicals, precautions and procedures to be followed must be communicated to the contractor. Administrative Unit MSDS's must be available to contractors.

The Department OSHA Coordinator is responsible for ensuring that information about hazardous materials utilized in the MSE Department will be communicated

to contractors.

The contractor must maintain MSDS's for hazardous chemicals utilized during the course of their work. They must have them readily available upon request to the contractor employees, University Employees, or government officials. The project captains or persons responsible for the construction or renovation work are responsible for forwarding the name and phone number of the contact employee responsible for maintaining contractor MSDS's to the Office of Environmental Health and Safety.

11.0 Hazard Communication Program Availability and Review

The written Hazard Communication Program, which includes the hazardous chemical inventory and MSDS's is to be made available to employees, employee designated representative(s), contractors, and regulatory officials upon request. The written Hazard Communication Program should be reviewed and updated at least annually using the review document included in Appendix I.

The Hazard Communication Plan is located in room 177 Watts Hall, this will assure employee access during normal working hours.
The Department OSHA Coordinator is responsible for maintaining, reviewing, and updating the Hazard Communication Plan.

Part Number: 1910 Appendix A

Standard Number: 1910.1200

Title: Hazard communication

(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 subject to regulations issued under that Act by the Environmental Protection Agency;

(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 deg. F (37.8 deg. C), but below 200 deg. F (93.3 deg. C), except any mixture having components with flashpoints of 200 deg. F (93.3 deg. 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 deg. F (21.1 deg. C); or

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

(iii) A liquid having a vapor pressure exceeding 40 psi at 100 deg. F (37.8 deg. 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 deg. F (37.8 deg. C), except any mixture having components with flashpoints of 100 deg. F (37.8 deg. 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 deg. F (37.8 deg. 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 deg. F (37.8 deg. 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 autoaccelerating 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 deg. F (54.4 deg. 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.

(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 1910.20 (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, as an alternative to keeping a file of material safety data sheets for all hazardous chemicals they sell, 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 1910.20(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.

Standard Number: 1910.1200

Title: Health hazard definitions (Mandatory) (Appendix - Part A)

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

Standard Number: 1910.1200

Title: Hazard determination (Mandatory) (Appendix - Part B)

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.

Standard Number: 1910.1200

Title: Information sources (Advisory) (Appendix - Part C)

The following is a list of available data sources which the chemical manufacturer, importer, distributor, or employer may wish to consult to evaluate the hazards of chemicals they produce or import:

- Any information in their own company files, such as toxicity testing results or illness experience of company employees.

- Any information obtained from the supplier of the chemical, such as material safety data sheets or product safety bulletins.

- Any pertinent information obtained from the following source list (latest editions should be used):

Condensed Chemical Dictionary
Van Nostrand Reinhold Co., 135 West 50th Street, New York, NY 10020.

The Merck Index: An Encyclopedia of Chemicals and Drugs Merck and Company, Inc., 126 E. Lincoln Ave., Rahway, NJ 07065.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man
Geneva: World Health Organization, International Agency for Research on Cancer, 1972 - Present. (Multivolume work). Summaries are available in supplement volumes. 49 Sheridan Street, Albany, NY 12210.

Industrial Hygiene and Toxicology, by F.A. Patty
John Wiley & Sons, Inc., New York, NY (Multivolume work).

Clinical Toxicology of Commercial Products
Gleason, Gosselin, and Hodge.

Casarett and Doull's Toxicology; The Basic Science of Poisons
Doull, Klaassen, and Amdur, Macmillan Publishing Co., Inc., New York, NY.

Industrial Toxicology, by Alice Hamilton and Harriet L. Hardy
Publishing Sciences Group, Inc., Acton, MA.

Toxicology of the Eye, by W. Morton Grant
Charles C. Thomas, 301-327 East Lawrence Avenue, Springfield, IL.

Recognition of Health Hazards in Industry
William A. Burgess, John Wiley and Sons, 605 Third Avenue, New York, NY 10158.

Chemical Hazards of the Workplace
Nick H. Proctor and James P. Hughes, J.P. Lipincott Company, 6 Winchester Terrace, New York, NY 10022.

Handbook of Chemistry and Physics
Chemical Rubber Company, 18901 Cranwood Parkway, Cleveland, OH 44128.

Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment and Biological Exposure Indices with Intended Changes
American Conference of Governmental Industrial Hygienists (ACGIH), 6500 Glenway Avenue, Bldg. D-5, Cincinnati, OH 45211.

Information on the physical hazards of chemicals may be found in publications of the National Fire Protection Association, Boston, MA.

Note: The following documents may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

Occupational Health Guidelines

NIOSH/OSHA (NIOSH Pub. No. 81-123).

NIOSH Pocket Guide to Chemical Hazards

NIOSH Pub. No. 90-117.

Registry of Toxic Effects of Chemical Substances

(Latest edition)

Miscellaneous Documents published by the National Institute for Occupational Safety and Health:

- Criteria documents
- Special Hazard Reviews
- Occupational Hazard Assessments
- Current Intelligence Bulletins

OSHA's General Industry Standards (29 CFR Part 1910)

NTP Annual Report on Carcinogens and Summary of the Annual Report on Carcinogens.

National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161; (703) 487-4650.

Bibliographic data bases service provider	File name
Bibliographic Retrieval Services (BRS), 1200 Route 7, Latham, NY 12110	Biosis Previews
	CA Search Medlars
	NTIS
	Hazardline
	American Chemical Society
	Journal
	Excerpta Medica
	IRCS Medical Science Journal
	Pre-Med
	Intl Pharmaceutical Abstracts
	IPaper Chem
Lockheed-DIALOG Information Service, Inc., 3460 Hillview Avenue, Palo Alto, CA 94304	Biosis Prev. Files CA Search Files
	CAB Abstracts
	Chemical Exposure
	Chemname
	Chemsis Files
	Chemzero
	Embase Files
	Environmental Bibliographies
	Enviroline
	Federal Research in Progress
	IRL Life Science Collection
	NTIS
	Occupational Safety and Health (NIOSH)
	Paper Chem
SDC-ORBIT, SDC Information Service, 2500 Colorado Avenue, Santa Monica, CA 90406	CAS Files
	Chemdex, 2, 3
	NTIS
National Library of Medicine	Hazardous Substances
	Data Bank (NSDB)
Department of Health and Human Services, Public Health Service, National Institutes of Health, Bethesda, MD 20209	Medline Files
	Toxline Files
	Cancerlit
	RTECS
	Chemline

Bibliographic data bases service provider	File name
Pergamon International Information Corp., 1340 Old Chain Bridge R., McLean, VA 22101	Laboratory Hazard Bulletin
Questel, Inc., 1625 Eye Street, NW, Suite 818, Washington, DC 20006.	CIS/ILO Cancernet
Chemical Information System ICI (ICIS), Bureau of National Affairs, 1133 15th Street, NW, Suite 300, Washington, DC 20005	Structure and Nomenclature Search System (SANSS) Acute Toxicity (RTECS)
	Clinical Toxicology of Commercial Products
	Oil and Hazardous
	Materials Technical
	Assistance Data System
	CCRIS
	CESARS
Occupational Health Services, 400 Plaza Drive, Secaucus, NJ 07094	MSDS Hazardline

Standard Number: 1910.1200

Title: Definition of "Trade Secret" (Mandatory) (Appendix - Part D)

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 s759 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.

Standard Number: 1910.1200

Title: Guidelines for Employer Compliance - (Advisory) (Appendix - Part E)

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 the 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 chemical	_____
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.

* [52 FR 31877, Aug. 24, 1987; 52 FR 46080, Dec. 4, 1987; 53 FR 15035, Apr. 27, 1988; 54 FR 6888, Feb. 15, 1989; 54 FR 24334, June 7, 1989; 59 FR 6170, Feb. 9, 1994]

University Hazard Communication Policy
(29CFR 1910.1200)

Subject: Hazard Communication

Applies To: All University Employees

Policy

To ensure that all The Ohio State University Employees are protected by a Hazard Communication Program.

Summary

The Purpose of the standard is to ensure that the hazards of all chemicals are evaluated and that information concerning their hazards is transmitted to employers and employees. Information is to be transmitted to employees through a written hazard communication program, labels and other forms of warning, Material Safety Data Sheets (MSDS), and information and training.

Definitions

University Employee: any individual receiving compensation from The Ohio State University.

Policy Guidelines

I. Responsibilities

The State University, represented by the Office of Environmental Health and Safety will:

A. Develop a written Hazard Communication Plan for the University which may be modified and adopted by Colleges, Departments and like units.

B. Establish and maintain a MSDS system for adoption by the Colleges, Departments and like units.

C. Provide notice to University contractors on The Ohio State University Hazard Communication Plan, policies and availability of MSDS's.

D. Develop a Hazard Communication Training Program, system of delivery and work with Colleges and like units to train all employees at The Ohio State University in Hazard Communication.

The Deans and Directors of Colleges, Regional Campuses and like units will:

A. Modify, if necessary, and adopt the University written Hazard Communication Plan.

B. Maintain a physical inventory for all hazardous materials as defined by the Hazard Communication Standard.

C. Adopt and maintain a MSDS system.

D. Provide notice to contractors conducting work specifically for the college, regional campus or like unit.

E. Make available all facility, staff, graduate assistants and other employees for Hazard Communication Training.

Departments will:

A. Modify, if necessary, and adopt the College written Hazard Communication Plan.

B. Identify all hazards as defined by the written Hazard Communication Plan.

C. Maintain a physical inventory of all hazardous materials as defined by the Hazard Communication Standard.

D. Adopt and maintain a MSDS system.

E. Provide notice to contractors conducting work specifically for the Department or like unit.

F. Make available all faculty, staff, graduate assistants and other employees for Hazard Communication Training.

All Principal Investigators and Supervisors within Departments or like units will:

A. Identify all hazards as defined by the written Hazard Communication Plan.

B. Provide notice to contractors conducting work specifically for the Department or like unit.

C. Assure warning labels are on containers as defined by the written Hazard Communication Plan.

D. Make available all faculty, staff, graduate assistants and other employees for Hazard Communication Training.

E. Identify new hazards in the workplace and conduct, or assist in conducting, such additional Hazard Communication Training.

All Employees will:

A. Identify hazards as defined by the written Hazard Communication Plan.

B. Assure warning labels on containers as defined by the written Hazard Communication Plan.

C. Make themselves available for Hazard Communication Training.

Hazard Communication Inventory of Hazardous Chemicals and Products

INSTRUCTIONS

Compliance with the Federal Occupational Safety and Health Administration's Hazard Communication Standard (29 CFR 1910.1200) requires the University to inventory all non-laboratory hazardous chemicals that may be present in your work area or where workers may come in contact with these substances. According to the standard, a hazardous chemical is defined as any substance which may be a physical and/or health hazard. Physical hazards include: combustible liquids, compressed gases, explosives, flammables, organic peroxides, oxidizers, pyrophorics, and unstable or water reactive chemicals. Chemicals that have the capacity to cause an acute or chronic effect to an exposed worker are considered health hazards. Products must be included if the label has key words such as "Warning", "Caution", "Danger", "Irritant", "Toxic", "Corrosive", "Flammable", "Combustible", etc. Please list on the attached form all those hazardous chemicals that meet the previously described criteria. If you are unsure about a specific product or chemical, list it and put a question mark or notation in the left margin next to its name. Questions about what to list can be addressed to the Office Environmental Health and Safety (OEHS) at 292-1284.

The inventory can be used to search for the Material Safety Data Sheet (MSDS's). These documents are required by the standard to be maintained in the work area and readily accessible for all employees. Also, the list can be used to compile and index your administrative unit's MSDS files. Any MSDS's which can not be found should be marked as such, and you will need to contact the manufacturer or supplier of each product to obtain the MSDS. Requests for assistance in obtaining MSDS's can be made by submitting the inventory or chemical list to OEHS. All requests will be filled in the order that they are received. Please make product information as specific as possible. Requests can be sent to:

Mail:	Hand Deliver:	Fax:
OEHS Room 106 1314 Kinnear Road Columbus, OH 43212-1168	Room 106 1314 Kinnear	Chemical Inventory MSDS Request 292-6404

USER IDENTIFICATION

Administrative Unit:_____

Name of Contact/Person(s) Who Made Inventory:_____

Phone:_____ Campus Mail Address:_____

_____

_____

NOTE: Arrangements for the disposal of unused or unneeded chemicals can be made through OEHS.

Please copy the cover sheet and inventory listing to insure against loss in transit.

Chemical or Product Name	Manufacturer	Address	Phone (if available)

Hazard Communications Labeling Systems

The identification of hazardous chemicals is one of the key elements of the Hazard Communication Standard. The contents of chemical containers must be known at all times.

In general, labels as supplied by the manufacturer are acceptable so long as the label lists the identity of the hazardous chemical, appropriate hazard warnings, and the name and address of the manufacturer.

When hazardous chemicals are transferred into portable containers, the portable containers must be labeled unless the portable container is intended for immediate use by the employee who made the transfer.

If the contents of the portable containers remain beyond the immediate work shift, the labels on portable containers must contain:

- Identity of the chemical or common name used on the hazardous chemical list or inventory which matches the name of the MSDS
- Appropriate hazard warnings and, in some cases, specific chemical substance labeling requirements (e.g., benzene)
- Physical and health hazards
- State or identify the target organs
- Appropriate personal protective equipment

Commercially available systems which are useful in meeting the requirements for portable containers include:

HMIG Target Organ Labels from Lab Safety Supply

HMIS® Personalized Container Target Organ Labels from Labelmaster, An American Labelmark Co.

Hazard Communication Training Requirements

Generic Requirements for Hazard Communication Training

Below is an outline of the information that is covered in the generic training for Hazard Communication [29CFR1910.1200] in the class given by the Office of Environmental Health and Safety.

Generic Training Topics:

- History of the Hazard Communication Standard (Federal and State)

- Elements of the Hazard Communication Standard
  - Written Hazard Communication Program
  - Container Labeling
  - Material Safety Data Sheets
  - Training Requirements

- Written Hazard Communication Program
  - Chemical Inventory
  - Non-Routine Tasks
  - Multi-employer Worksites
  - "Right to Know Center"

- Background
  - What are Chemicals?
  - What are Hazardous Chemicals?

- Hazardous Chemicals - Terminology
  - Physical Hazard Classes
  - Health Hazard Classes

- When Can a Hazardous Chemical Cause Harm?
  - Exposure

- Routes of Entry
  - Inhalation
  - Ingestion
  - Absorption

- Detection of Chemicals
  - Senses
  - Symptoms
  - Monitoring

- Personal Protective Equipment

- Labels
  - What They Contain
  - Common Types

- Material Safety Data Sheets (MSDS)

What They Contain

- Emergency Procedures (generic)
  - Medical
  - Fire
  - Chemical Spills
- Safe Work Practices (generic)
- Review: Responsibilities
  - Manufacturer
  - Employer (the administrative unit)
  - Employees

Hazard Communication Training Requirements

Specific Requirements for Hazard Communication Training

The Office of Environmental Health and Safety (OEHS) provides generic training for the Hazard Communication Standard (HCS: designation 29CFR1910.1200) covering the basic tenets of the Standard. However, there are additional requirements which are the responsibility of each administrative unit and which are referred to as "Specific Requirements" (see below).

> Note: It may be possible to combine both the generic and specific training in one session, with OEHS providing generic training and the OSHA Coordinator or designee providing the specific training. In addition, provisions should be made for employees with special needs, e.g. language or reading deficiencies.

Specific Training Topics:

- Location and content of the "Right to Know" Center
  - Written Hazard Communication Program
    - Non-Routine Tasks (if applicable)
    - Contractor issues (if applicable)
  - Chemical Inventory
  - Materials Safety Data Sheets (MSDS)
  - Hazard Communication Standard

- Labeling Practices Specific to the administrative unit (if applicable)
  - How "In-House" containers are to be labeled
  - Specific Labeling Systems
  - What to do it a label is missing or defaced

- Shipping Practices: How Hazardous Chemicals are to be shipped (if applicable)
  - Material Safety Data Sheets (MSDS)
  - Labeling

- Specific Emergency Procedures:
  - Calling for Help
  - Chemical Spills
  - Fire Procedures
  - Medical Emergencies
  - Required personnel protective equipment (PPE) (if applicable)
  - Evacuation Routes
  - Specific Work Practices or Procedures (e.g. waste disposal, standard operating procedures (SOP's)

- Chemical Inventory
  - Hazard classes

- Specific operations where hazardous chemicals are present (if applicable)

- Chemical Monitoring (if applicable)

It is recommended that hazard communication training be implemented as a continuous activity to reinforce the information included in this training.

Hazard Communication Glossary

Acute Effect	An adverse effect on a human or animal body with severe symptoms which develop rapidly wan will subside after the exposure stops.
Anesthetic	A Chemical that causes a total or partial loss of sensation. Overexposure can cause impaired judgment, dizziness, headache, drowsiness and even death.
Asphyxiant	A chemical (vapor or gas) that can cause death or unconsciousness by suffocation.
Boiling Point	The temperature at which a liquid changes to a vapor state.
"C" or Ceiling	The maximum allowable exposure limit for an airborne substance. This limit is not to be exceeded even momentarily.
Carcinogen	A substance or agent that can cause a growth of abnormal tissue or tumors in humans or animals.
Chronic Effect	An adverse effect on a human or animal body that can take months or years to develop after exposure.
Combustible Liquid	Those liquids having a false point at or above 100°F.
Compressed Gas	Any gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70°F (21.1°C); or 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 a liquid having a vapor pressure exceeding 40 psi at 100°F (37.8°C) as determined by ASTM D-323-82.
Corrosive	According to DOT, causes visible destruction or permanent changes in human skin tissue at the site of contact or is highly corrosive to steel.
Decomposition	Breakdown of a material or substance (by heat, chemical reaction, decay or other processes) into parts or simpler compounds.
Density	The mass (weight) per unit volume of a substance.
DOT Hazard Class	A Department of Transportation labeling system used for hazardous material that are being transported. These classes include corrosive, flammable liquid, organic peroxide poison, etc.
Evaporation Rate	The rate at which a material is converted to vapor (evaporates) at a given temperature and pressure when compared to the evaporation rate of a given substance.
Explosive	A chemical that causes a sudden almost instantaneous release of pressure gas and heat when subjected to sudden shock, pressure or high temperature.

Flammable Liquid	Those liquids having a flash point below 100°F.
Flammable Gas	A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of thirteen percent (13%) by volume or less; or a gas that at ambient temperature and pressure, forms a range of flammable mixtures with air, wider than twelve percent (12%) by volume, regardless of the lower limit.
Flammable Solid	A solid other than a blasting agent or explosive as defined in 29CFR 1910.109 (a), that is liable to cause fire through friction, absorption or moisture, spontaneous chemical change, or retained heat from manufacturing processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard.
Flash Point	The temperature at which a liquid will give off enough flammable vapor to ignite if an ignition source is present. There are several flash point test method, and flash points may vary for the same material depending on the method used, so the test method is indicated when the flash point is given.
General Exhaust	A system for exhausting air containing contaminants from a work area, usually accomplished by dilution.
Hazardous Chemical	Any chemical which is a physical hazard or a health hazard.
Hazard Warning	Any words, pictures symbols, or combination thereof appearing on label of other appropriate form or warning which convey the hazard of the chemical(s) in the container(s).
Hazardous Decomposition Products	Any hazardous material that may-be produced in dangerous amounts of the material reacts with other agents, burns, or is exposed to other processes such as welding.
Hazardous Polymerization	Polymerization is a chemical reaction in which one or more small molecules combine to form larger molecules. The reaction occurs at a rate which realize large amounts of energy.
Health Hazard	A chemical for which there is statistically significant evidence based on at least one scientific study that acute or chronic health effects may occur in exposed employees.
Ignition Source	A material or energy source that will cause, create, or initiate the minimum temperature at which a substance will continue to burn without the application of external heat.
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 only within the work shift in which it is transferred.
Incompatible	The term applied to two substances to indicate that one material cannot be mixed with the other without the possibility of a dangerous reaction.
Ingestion	The taking in of a substance through the mouth.
Inhalation	The breathing in of a substance in the form of a gas, vapor, or particulate.
Insoluble	Incapable of being dissolved in a liquid.
Irritant	A substance that produces an irritating effect when it contacts skin, eyes, nose or respiratory system.

Lethal Concentration$_{50}$ (LC_{50})	The concentration of an air contaminant that will kill 50 percent of the test animals in a group during a single exposure.
Lethal Dose$_{50}$ (LC_{50})	The dose of a substance or chemical that will kill 50 percent of the test animals in a group within the first 30 days following exposure.
Local Exhaust Ventilation	A ventilation system that removes contaminants from the air at the point where contaminants are generated.
Lower Explosive Limit	(Also known as Lower Flammable Limit.) The lowest concentration of a substance that will produce a fire or flash when an ignition source is present.
Melting Point	The temperature at which a solid changes to a liquid.
Mechanical Exhaust	A mechanical device, like a motor-driven fan, that removes contaminants from a work area.
Mutagen	Anything that can alter the genetics make-up of a sperm or egg cell.
Oxidizer	A substance that gives up oxygen easily to stimulate combustion of organic material.
Permissible Exposure Limit (PEL)	An exposure limit that is published and enforced by OSHA as a legal standard.
Personal Protective Equipment	Any devices or clothing worn by the worker to protect against hazards in the environment.
Physical Hazard	A chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.
Pyrophoric	A chemical that is capable of self-ignition when it is exposed to air.
Reactivity	A substance's susceptibility to undergo a chemical reaction or change that may result in dangerous side effects.
Respiratory Protection	Consists of air cleaning or air supplying devices that protect your breathing system from contaminants or supply fresh air in toxic/oxygen deficient atmospheres.
Routes of Entry	The means by which material may gain access to the body, for example, inhalation, ingestion and skin contact.
Sensitizer	A substance that may cause no reaction in a person during initial exposures, but afterwards, further exposures will cause an allergic response to the substance.
Skin Absorption	The ability of some hazardous chemicals to pass directly thorough the skin and enter the bloodstream.
Solubility in Water	Indicates how much of a substance will dissolve in water.
Specific Gravity	The weight of a material compared to the weight of an equal volume of water, and expression of the density of the material.
Target Organ Toxin	A toxic substance that attacks a specific organ of the body.
Teratogen	A substance that can cause birth defects in the fetus of a pregnant female.
Threshold Limit Value (TLV)	Threshold Limit Value; a term used by ACGIH to express the airborne concentration of a material to which nearly all persons can be exposed day after day, without adverse effects.

Time Weighted Average (TWA)	The average time, over a given work period (e.g., 8 hour workday) of a person's exposure to a chemical or an agent.
Toxicity	The sum of adverse effects resulting from exposure to a material.
Upper Explosive Limit (UEL)	(Also know as Upper Flammable Limit.) It is the highest concentration of a substance that will burn or explode when an ignition source is present.
UN Number	A number required in shipping documentation and on packaging as a part of the DOT regulations for shipping hazardous materials.
Vapor Density	The weight of a vapor or gas compared to the weight of an equal volume of air; an expression of the density of the vapor or gas.

Abbreviation Index

ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
“C”	Ceiling Limit
CAS	Chemical Abstract Service
CFR	Code of Federal Regulations
CHEMTREC	Chemical Transportation Emergency Center
COC	Cleveland Open Cup
CPSC	Consumer Product Safety Commission
DOT	Department of Transportation
EPA	Environmental Protection Agency
IARC	International Agency for Research on Cancer
LEL	Lower Explosive Limit
LFL	Lower Flammable Limit
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NTP	National Toxicology Program
OSHA	Occupational Safety & Health Act (Administration)
PEL	Permissible Exposure Limit
PMCC	Pensky-Martens Closed Cup
ppm	part per million
ppb	parts per billion
RCRA	Resource Conservation and Recovery Act
SARA	SuperFund Amendments and Reauthorization Act
SETA	Setaflash Closed Tester
STEL	Short Term Exposure Limit
TCC	Tag Closed Cup
TOC	Tagliabue Open Cup
TSCA	Toxic Substances Control Act
TLV	Threshold Limit Value
TWA	Time Weighted Average
UEL	Upper Explosive Limit
UFL	Upper Flammable Limit

STANDARD NUMBER: 1910 Subpart Z

STANDARD TITLE: Authority for 1910 Subpart Z

SUBPART NUMBER: Z

SUBPART TITLE: Toxic and Hazardous Substances

TEXT:
*Authority: Secs. 6, 8 Occupational Safety and Health Act, 29 U.S.C. 655, 657: Secretary of Labor's Orders 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), or 1-90 (55 FR 9033), as applicable; and 29 CFR Part 1911.

All of subpart Z issued under section 6(b) of the Occupational Safety and Health Act, except those substances which have exposure limits listed in Tables Z-1, Z-2, and Z-3 of 29 CFR 1910.1000. The latter were issued under section 6(a) [29 U.S.C. 655(a)]. Section 1910.1000, Tables Z-1, Z-2, Z-3 also issued under 5 U.S.C. 553. Section 1910.1000, Table Z-1, Z-2, and Z-3 not issued under 29 CFR part 1911 except for the arsenic (organic compounds), benzene, and cotton dust listings.

Section 1910.1001 also issued under Sec. 107 of Contract Work Hours and Safety and Standards Act, 40 U.S.C. 333 and 5 U.S.C. 553. Section 1910.1002 not issued under 29 U.S.C. 655 or 29 CFR Part 1911; also issued under 5 U.S.C. 553.

Section 1910.1003 through 1910.1018 also issued under 29 CFR 653.
Section 1910.1025 also issued under 29 U.S.C. 653 and 5 U.S.C. 553.
Section 1910.1028 also issued under 29 U.S.C. 653.
Section 1910.1030 also issued under 29 U.S.C. 653.
Section 1910.1043 also issued under 5 U.S.C. 551 et seq.
Section 1910.1045 and 1910.1047 also issued under 29 U.S.C. 653.
Section 1910.1048 also issued under 29 U.S.C. 653.
Sections 1910.1200, 1910.1499 and 1910.1500 also issued under 5 U.S.C. 553.
Section 1910.1450 is also issued under secs. 6(b), 8(c) and 8(g)(2), Pub. L. 91-596, 84 Stat. 1593, 1955, 1600; 29 U.S.C. 655, 657.

SOURCE: 39 FR 23502, June 27, 1974, unless otherwise noted. Redesignated at 40 FR 23072, May 28, 1975.

*[55 FR 3327, Jan. 31, 1990; 55 FR 4999, Feb. 13, 1990; 55 FR 12819, Apr. 6, 1990; 55 FR 50686, Dec. 10, 1990; 56 FR, Dec. 6, 1991; 58 FR 21780 April 23, 1993; 58 FR 35310 & 35338, June 30, 1993; 59 FR 6169, Feb. 9, 1994; 59 FR 17479, April 13, 1994; 59 FR 36695, July 19, 1994; 59 FR 40964, Aug. 10, 1994; 59 FR 65947, Dec. 22, 1994; 60 FR 9624, Feb. 21, 1995; 60 FR 33343, June 28, 1995; 60 FR 52856, Oct. 11, 1995]

STANDARD NUMBER: 1910.1000

STANDARD TITLE: Air contaminants.

SUBPART NUMBER: Z

SUBPART TITLE: Toxic and Hazardous Substances

TEXT:
An employee's exposure to any substance listed in Tables Z-1, Z-2, or Z-3 of this section shall be limited in accordance with the requirements of the following paragraphs of this section.

(a) Table Z-1

(1) "Substances with limits preceded by "C" - Ceiling Values." An employee's exposure to any substance in Table Z-1, the exposure limit of which is preceded by a "C", shall at no time exceed the exposure limit given for that substance. If instantaneous monitoring is not feasible, then the ceiling shall be assessed as a 15-minute time weighted average exposure which shall not be exceeded at any time during the working day.

(2) "Other substances" - "8-hour Time Weighted Averages." An employee's exposure to any substance in Table Z-1, the exposure limit of which is not preceded by a "C", shall not exceed the 8-hour Time Weighted Average given for that substance any 8-hour work shift of a 40-hour work week.

(b) Table Z-2 - An employee's exposure to any substance listed in Table Z-2 shall not exceed the exposure limits specified as follows:

(1) "8-hour time weighted averages." An employee's exposure to any substance listed in Table Z-2, in any 8-hour work shift of a 40-hour work week, shall not exceed the 8-hour time weighted average limit given for that substance in Table Z-2.

(2) "Acceptable ceiling concentrations." An employee's exposure to a substance listed in Table Z-2 shall not exceed at any time during an 8-hour shift the acceptable ceiling concentration limit given for the substance in the table, except for a time period, and up to a concentration not exceeding the maximum duration and concentration allowed in the column under "acceptable maximum peak above the acceptable ceiling concentration for an 8-hour shift".

(3) "Example." During an 8-hour work shift, an employee may be exposed to a concentration of Substance A (with a 10 ppm TWA, 25 ppm ceiling and 50 ppm peak) above 25 ppm (but never above 50 ppm) only for a maximum period of 10 minutes. Such exposure must be compensated by exposures to concentrations less than 10 ppm so that the cumulative exposure for the entire 8-hour work shift does not exceed a weighted average of 10 ppm.

(c) Table Z-3 - An employee's exposure to any substance listed in Table Z-3, in any 8-hour work shift of a 40-hour work week, shall not exceed the 8-hour time weighted average limit given for that substance in the table.

(d) Computation formulae - The computation formula which shall apply to employee exposure to more than one substance for which 8-hour time weighted averages are listed in subpart Z of 29 CFR Part 1910 in order to determine whether an employee is exposed over the regulatory limit is as follows:

(1)(i) The cumulative exposure for an 8-hour work shift shall be computed as follows:

(E = C(a)T(a) + C(b)T(b) + . . . C(n)T(n)) divided by 8

Where:
E is the equivalent exposure for the working shift.

C is the concentration during any period of time T where the concentration remains constant.

T is the duration in hours of the exposure at the concentration C.

The value of E shall not exceed the 8-hour time weighted average specified in Subpart Z or 29 CFR Part 1910 for the substance involved.

(ii) To illustrate the formula prescribed in paragraph (d)(1)(i) of this section, assume that Substance A has an 8-hour time weighted average limit of 100 ppm noted in Table Z-1. Assume that an employee is subject to the following exposure:

Two hours exposure at 150 ppm
Two hours exposure at 75 ppm
Four hours exposure at 50 ppm

Substituting this information in the formula, we have

(2 X 150 + 2 X 75 + 4 X 50) divided by 8 = 81.25 ppm

Since 81.25 ppm is less than 100 ppm, the 8-hour time weighted average limit, the exposure is acceptable.

(2)(i) in case of a mixture of air contaminants an employer shall compute the equivalent exposure as follows:

E_m = (C_1 divided by L_1 + C_2 divided by L_2) + . . . (C_n divided by L_n)

Where:
E_m is the equivalent exposure for the mixture.

C is the concentration of a particular contaminant.

L is the exposure limit for that substance specified in Subpart Z of 29 CFR Part 1910.

The value of E(m) shall not exceed unity (1).

(ii) To illustrate the formula prescribed in paragraph (d)(2)(i) of this section, consider the following exposures:

Substance	Actual concentration of 8-hour exposure (ppm)	8-hour TWA Pel (ppm)
B	500	1,000
C	45	200

D	40	200

Substituting in the formula, we have:

E_m = 500 divided by 1,000 + 45 divided by 200 + 40 divided by 200

E_m = 0.500 + 0.225 + 0.200

E_m = 0.925

Since E_m is less than unity (1), the exposure combination is within acceptable limits.

(e) To achieve compliance with paragraphs (a) through (d) of this section, administrative or engineering controls must first be determined and implemented whenever feasible. When such controls are not feasible to achieve full compliance, protective equipment or any other protective measures shall be used to keep the exposure of employees to air contaminants within the limits prescribed in this section. Any equipment and/or technical measures used for this purpose must be approved for each particular use by a competent industrial hygienist or other technically qualified person. Whenever respirators are used, their use shall comply with 1910.134.

(f) Effective dates. The exposure limits specified have been in effect with the method of compliance specified in paragraph (e) of this section since May 29, 1971.

STANDARD NUMBER: 1910.1000

STANDARD TITLE: Air contaminants

SUBPART NUMBER: Z

SUBPART TITLE: Toxic and Hazardous Substances

TEXT:
An employee's exposure to any substance listed in Tables Z-1, Z-2, or Z-3 of this section shall be limited in accordance with the requirements of the following paragraphs of this section.

(a) Table Z-1

(1) "Substances with limits preceded by "C" - Ceiling Values." An employee's exposure to any substance in Table Z-1, the exposure limit of which is preceded by a "C", shall at no time exceed the exposure limit given for that substance. If instantaneous monitoring is not feasible, then the ceiling shall be assessed as a 15-minute time weighted average exposure which shall not be exceeded at any time during the working day.

(2) "Other substances" - "8-hour Time Weighted Averages." An employee's exposure to any substance in Table Z-1, the exposure limit of which is not preceded by a "C", shall not exceed the 8-hour Time Weighted Average given for that substance any 8-hour work shift of a 40-hour work week.

(b) Table Z-2 - An employee's exposure to any substance listed in Table Z-2 shall not exceed the exposure limits specified as follows:

(1) "8-hour time weighted averages." An employee's exposure to any substance listed in Table Z-2, in any 8-hour work shift of a 40-hour work week, shall not exceed the 8-hour time weighted average limit given for that substance in Table Z-2.

(2) "Acceptable ceiling concentrations." An employee's exposure to a substance listed in Table Z-2 shall not exceed at any time during an 8-hour shift the acceptable ceiling concentration limit given for the substance in the table, except for a time period, and up to a concentration not exceeding the maximum duration and concentration allowed in the column under "acceptable maximum peak above the acceptable ceiling concentration for an 8-hour shift".

(3) "Example." During an 8-hour work shift, an employee may be exposed to a concentration of Substance A (with a 10 ppm TWA, 25 ppm ceiling and 50 ppm peak) above 25 ppm (but never above 50 ppm) only for a maximum period of 10 minutes. Such exposure must be compensated by exposures to concentrations less than 10 ppm so that the cumulative exposure for the entire 8-hour work shift does not exceed a weighted average of 10 ppm.

(c) Table Z-3 - An employee's exposure to any substance listed in Table Z-3, in any 8-hour work shift of a 40-hour work week, shall not exceed the 8-hour time weighted average limit given for that substance in the table.

(d) Computation formulae - The computation formula which shall apply to employee exposure to more than one substance for which 8-hour time weighted averages are listed in subpart Z of 29 CFR Part 1910 in order to determine whether an employee is exposed over the regulatory limit is as follows:

(1)(i) The cumulative exposure for an 8-hour work shift shall be computed as follows:

(E = C(a)T(a) + C(b)T(b) + . . . C(n)T(n)) divided by 8

Where:
E is the equivalent exposure for the working shift.

C is the concentration during any period of time T where the concentration remains constant.

T is the duration in hours of the exposure at the concentration C.

The value of E shall not exceed the 8-hour time weighted average specified in Subpart Z or 29 CFR Part 1910 for the substance involved.

(ii) To illustrate the formula prescribed in paragraph (d)(1)(i) of this section, assume that Substance A has an 8-hour time weighted average limit of 100 ppm noted in Table Z-1. Assume that an employee is subject to the following exposure:

Two hours exposure at 150 ppm
Two hours exposure at 75 ppm
Four hours exposure at 50 ppm

Substituting this information in the formula, we have

(2 X 150 + 2 X 75 + 4 X 50) divided by 8 = 81.25 ppm

Since 81.25 ppm is less than 100 ppm, the 8-hour time weighted average limit, the exposure is acceptable.

(2)(i) in case of a mixture of air contaminants an employer shall compute the equivalent exposure as follows:

E_m = (C_1 divided by L_1 + C_2 divided by L_2) + . . . (C_n divided by L_n)

Where:
E_m is the equivalent exposure for the mixture.

C is the concentration of a particular contaminant.

L is the exposure limit for that substance specified in Subpart Z of 29 CFR Part 1910.

The value of E(m) shall not exceed unity (1).

(ii) To illustrate the formula prescribed in paragraph (d)(2)(i) of this section, consider the following exposures:

Substance	Actual concentration of 8-hour exposure (ppm)	8-hour TWA Pel (ppm)
B	500	1,000
C	45	200

D	40	200

Substituting in the formula, we have:

E_m = 500 divided by 1,000 + 45 divided by 200 + 40 divided by 200

E_m = 0.500 + 0.225 + 0.200

E_m = 0.925

Since E_m is less than unity (1), the exposure combination is within acceptable limits.

(e) To achieve compliance with paragraphs (a) through (d) of this section, administrative or engineering controls must first be determined and implemented whenever feasible. When such controls are not feasible to achieve full compliance, protective equipment or any other protective measures shall be used to keep the exposure of employees to air contaminants within the limits prescribed in this section. Any equipment and/or technical measures used for this purpose must be approved for each particular use by a competent industrial hygienist or other technically qualified person. Whenever respirators are used, their use shall comply with 1910.134.

(f) Effective dates. The exposure limits specified have been in effect with the method of compliance specified in paragraph (e) of this section since May 29, 1971.

Standard Number: 1910.1000 TABLE Z-1

Title: TABLE Z-1 Limits for Air Contaminants

TABLE Z-1 LIMITS FOR AIR CONTAMINANTS

NOTE: Because of the length of the table, explanatory Footnotes applicable to all substances are given below as well as at the end of the table. Footnotes specific only to a limited number of substances are also shown within the table.

Footnote(1) The PELs are 8-hour TWAs unless otherwise noted; a (C) designation denotes a ceiling limit. They are to be determined from breathing-zone air samples.

Footnote(a) Parts of vapor or gas per million parts of contaminated air by volume at 25 degrees C and 760 torr.

Footnote(b) Milligrams of substance per cubic meter of air. When entry is in this column only, the value is exact; when listed with a ppm entry, it is approximate.

Footnote(c) The CAS number is for information only. Enforcement is based on the substance name. For an entry covering more than one metal compound measured as the metal, the CAS number for the metal is given - not CAS numbers for the individual compounds.

Footnote(d) The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except in some circumstances the distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures; for the excepted subsegments, the benzene limits in Table Z-2 apply. See 1910.1028 for specific circumstances.

Footnote(e) This 8-hour TWA applies to respirable dust as measured by a vertical elutriator cotton dust sampler or equivalent instrument. The time-weighted average applies to the cotton waste processing operations of waste recycling (sorting, blending, cleaning and willowing) and garnetting. See also 1910.1043 for cotton dust limits applicable to other sectors.

Footnote(f) All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by the Particulates Not Otherwise Regulated (PNOR) limit which is the same as the inert or nuisance dust limit of Table Z-3.

Footnote(2) See Table Z-2

Footnote(3) See Table Z-3

Footnote(4) Varies with compound.

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3)(b)(1)	Skin designation
Acetaldehyde	75-07-0	200	360	
Acetic acid	64-19-7	10	25	
Acetic anhydride	108-24-7	5	20	
Acetone	67-64-1	1000	2400	
Acetonitrile	75-05-8	40	70	
2-Acetylaminofluorene; see 1910.1014	53-96-3			
Acetylene dichloride; see 1,2-Dichloroethylene.				
Acetylene tetrabromide.	79-27-6	1	14	
Acrolein	107-02-8	0.1	0.25	
Acrylamide	79-06-1	.....	0.3	X
Acrylonitrile; see 1910.1045	107-13-1			
Aldrin	309-00-2	.....	0.25	X
Allyl alcohol	107-18-6	2	5	X
Allyl chloride	107-05-1	1	3	
Allyl glycidyl ether (AGE)	106-92-3	(C)10	(C)45	
Allyl propyl disulfide.	2179-59-1	2	12	
alpha-Alumina	1344-28-1			
Total dust		.....	15	
Respirable fraction		.....	5	
Aluminum Metal (as Al).	7429-90-5			
Total dust		.....	15	
Respirable fraction		.....	5	
4-Aminodiphenyl; see 1910.1011	92-67-1			
2-Aminoethanol; see Ethanolamine				
2-Aminopyridine	504-29-0	0.5	2	
Ammonia	7664-41-7	50	35	
Ammonium sulfamate	7773-06-0			
Total dust		.....	15	
Respirable fraction		.....	5	
n-Amyl acetate	628-63-7	100	525	
sec-Amyl acetate	626-38-0	125	650	
Aniline and homologs	62-53-3	5	19	X
Anisidine (o-,p-isomers)	29191-52-4	.....	0.5	X
Antimony and compounds (as Sb)	7440-36-0	.....	0.5	
ANTU (alpha Naphthylthiourea)	86-88-4	.....	0.3	
Arsenic, inorganic compounds (as As); see 1910.1018	7440-38-2			

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS (cont.)

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Arsenic, organic compounds (as As)....	7440-38-2	.....	0.5	
Arsine.....	7784-42-1	0.05	0.2	
Asbestos; see 1910.1001.....	(4)			
Azinphos-methyl.....	86-50-0	.....	0.2	X
Barium, soluble compounds (as Ba)....	7440-39-3	.....	0.5	
Barium sulfate.....	7727-43-7			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Benomyl.....	17804-35-2			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Benzene; See 1910.1028. See Table Z-2 for the limits applicable in the operations or sectors excluded in 1910.1028(d)	71-43-2			
Benzidine; See 1910.1010.....	92-87-5			
p-Benzoquinone; see Quinone.				
Benzo(a)pyrene; see Coal tar pitch volatiles.....				
Benzoyl peroxide.....	94-36-0	.....	5	
Benzyl chloride.....	100-44-7	1	5	
Beryllium and beryllium compounds (as Be).....	7440-41-7		(2)	
Biphenyl; see Diphenyl.				
Bismuth telluride, Undoped.....	1304-82-1			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Boron oxide.....	1303-86-2			
Total dust.....		.....	15	
Boron trifluoride.....	7637-07-2	(C)1	(C)3	
Bromine.....	7726-95-6	0.1	0.7	
Bromoform.....	75-25-2	0.5	5	X
Butadiene (1,3-Butadiene).....	106-99-0	1000	2200	
Butanethiol; see Butyl mercaptan..				

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS (cont.)

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	designation
2-Butanone (Methyl ethyl ketone)	78-93-3	200	590	
2-Butoxyethanol	111-76-2	50	240	X
n-Butyl-acetate	123-86-4	150	710	
sec-Butyl acetate	105-46-4	200	950	
tert-Butyl-acetate	540-88-5	200	950	
n-Butyl alcohol	71-36-3	100	300	
sec-Butyl alcohol	78-92-2	150	450	
tert-Butyl alcohol	75-65-0	100	300	
Butylamine	109-73-9	(C)5	(C)15	X
tert-Butyl chromate (as CrO(3))	1189-85-1	.....	(C)0.1	X
n-Butyl glycidyl ether (BGE)	2426-08-6	50	270	
Butyl mercaptan	109-79-5	10	35	
p-tert-Butyltoluene	98-51-1	10	60	
Cadmium (as Cd); see 1910.1027	7440-43-9			
Calcium Carbonate	1317-65-3			
Total dust		.....	15	
Respirable fraction		.....	5	
Calcium hydroxide	1305-62-0			
Total dust		.....	15	
Respirable fraction		.....	5	
Calcium oxide	1305-78-8	.....	5	
Calcium silicate	1344-95-2			
Total dust		.....	15	
Respirable fraction		.....	5	
Calcium sulfate	7778-18-9			
Total dust		.....	15	
Respirable fraction		.....	5	
Camphor, synthetic	76-22-2	.....	2	
Carbaryl (Sevin)	63-25-2	.....	5	
Carbon black	1333-86-4	.....	3.5	
Carbon dioxide	124-38-9	5000	9000	
Carbon disulfide	75-15-0		(2)	
Carbon monoxide	630-08-0	50	55	
Carbon tetrachloride	56-23-5		(2)	
Cellulose	9004-34-6			
Total dust		.....	15	
Respirable fraction		.....	5	
Chlordane	57-74-9	.....	0.5	X
Chlorinated camphene	8001-35-2	.....	0.5	X
Chlorinated diphenyl oxide	55720-99-5	.....	0.5	
Chlorine	7782-50-5	(C)1	(C)3	
Chlorine dioxide	10049-04-4	0.1	0.3	

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS (cont.)

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation

Chlorine trifluoride...	7790-91-2	(C)0.1	(C)0.4	
Chloroacetaldehyde.....	107-20-0	(C)1	(C)3	
a-Chloroacetophenone (Phenacyl chloride)..	532-27-4	0.05	0.3	
Chlorobenzene.....	108-90-7	75	350	
o-Chlorobenzylidene malononitrile.....	2698-41-1	0.05	0.4	
Chlorobromomethane.....	74-97-5	200	1050	
2-Chloro-1,3-butadiene; See beta-Chloroprene.				
Chlorodiphenyl (42% Chlorine)(PCB)..	53469-21-9	.....	1	X
Chlorodiphenyl (54% Chlorine)(PCB)..	11097-69-1	.....	0.5	X
1-Chloro-2, 3-epoxypropane; See Epichlorohydrin.				
2-Chloroethanol; See Ethylene chlorohydrin				
Chloroethylene; See Vinyl chloride.				
Chloroform (Trichloromethane)...	67-66-3	(C)50	(C)240	
bis(Chloromethyl) ether; see 1910.1008.	542-88-1			
Chloromethyl methyl ether; see 1910.1006.	107-30-2			
1-Chloro-1-nitropropane	600-25-9	20	100	
Chloropicrin.....	76-06-2	0.1	0.7	
beta-Chloroprene.....	126-99-8	25	90	X
2-Chloro-6 (trichloromethyl) pyridine.....	1929-82-4			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Chromic acid and chromates (as CrO(3))	(4)		(2)	
Chromium (II) compounds (as Cr).....	440-47-3	.....	0.5	
Chromium (III) compounds (as Cr)....	7440-47-3	.....	0.5	
Chromium metal and insol. salts (as Cr)	7440-47-3	.....	1	
Chrysene; see Coal tar pitch volatiles.....				

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS (cont.)

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Clopidol	2971-90-6			
Total dust		.....	15	
Respirable fraction		.....	5	
Coal dust (less than 5% SiO(2)), respirable fraction			(3)	
Coal dust (greater than or equal to 5% SiO(2)), respirable fraction			(3)	
Coal tar pitch volatiles (benzene soluble fraction), anthracene, BaP, phenanthrene, acridine, chrysene, pyrene	65966-93-2	.....	0.2	
Cobalt metal, dust, and fume (as Co)	7440-48-4	.....	0.1	
Coke oven emissions; see 1910.1029				
Copper	7440-50-8			
Fume (as Cu)		.....	0.1	
Dusts and mists (as Cu)		.....	1	
Cotton dust (e), see 1910.1043		.....	1	
Crag herbicide (Sesone)	136-78-7			
Total dust		.....	15	
Respirable fraction		.....	5	
Cresol, all isomers	1319-77-3	5	22	X
Crotonaldehyde	123-73-9	2	6	
	4170-30-3			
Cumene	98-82-8	50	245	X
Cyanides (as CN)	(4)	.....	5	
Cyclohexane	110-82-7	300	1050	
Cyclohexanol	108-93-0	50	200	
Cyclohexanone	108-94-1	50	200	
Cyclohexene	110-83-8	300	1015	
Cyclopentadiene	542-92-7	75	200	
2,4-D (Dichlorophenoxyacetic acid)	94-75-7	.....	10	
Decaborane	17702-41-9	0.05	0.3	X
Demeton (Systox)	8065-48-3	.....	0.1	X
Diacetone alcohol (4-Hydroxy-4-methyl-2-pentanone)	123-42-2	50	240	

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS (cont.)

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
1,2-Diaminoethane; see Ethylenediamine...				
Diazomethane.....	334-88-3	0.2	0.4	
Diborane.....	19287-45-7	0.1	0.1	
1,2-Dibromo-3-chloropropane (CBCP); see 1910.1044.....	96-12-8			
1,2-Dibromoethane; see Ethylene dibromide...				
Dibutyl phosphate.....	107-66-4	1	5	
Dibutyl phthalate.....	84-74-2	.....	5	
o-Dichlorobenzene.....	95-50-1	(C)50	(C)300	
p-Dichlorobenzene.....	106-46-7	75	450	
3,3'-Dichlorobenzidine; see 1910.1007.....	91-94-1			
Dichlorodifluoromethane	75-71-8	1000	4950	
1,3-Dichloro-5,5-dimethyl hydantoin.	118-52-5	.....	0.2	
Dichlorodiphenyltrichloroethane (DDT)...	50-29-3	.....	1	X
1,1-Dichloroethane.....	75-34-3	100	400	
1,2-Dichloroethane; see Ethylene dichloride..				
1,2-Dichloroethylene...	540-59-0	200	790	
Dichloroethyl ether....	111-44-4	(C)15	(C)90	X
Dichloromethane; see Methylene chloride...				
Dichloromonofluoromethane.....	75-43-4	1000	4200	
1,1-Dichloro-1-nitroethane.....	594-72-9	(C)10	(C)60	
1,2-Dichloropropane; see Propylene dichloride.				
Dichlorotetrafluoroethane.....	76-14-2	1000	7000	
Dichlorvos (DDVP).....	62-73-7	.....	1	X
Dicyclopentadienyl iron	102-54-5			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Dieldrin.....	60-57-1	.....	0.25	X
Diethylamine.....	109-89-7	25	75	
2-Diethylaminoethanol...	100-37-8	10	50	X
Diethyl ether; see Ethyl ether.....				
Difluorodibromomethane.	75-61-6	100	860	
Diglycidyl ether (DGE).	2238-07-5	(C)0.5	(C)2.8	

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS (cont.)

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Dihydroxybenzene; see Hydroquinone.....				
Diisobutyl ketone.....	108-83-8	50	290	
Diisopropylamine.....	108-18-9	5	20	X
4-Dimethylaminoazo-benzene; see 1910.1015.....	60-11-7			
Dimethoxymethane; see Methylal.....				
Dimethyl acetamide.....	127-19-5	10	35	X
Dimethylamine.....	124-40-3	10	18	
Dimethylaminobenzene; see Xylidine.....				
Dimethylaniline (N,N-Dimethylaniline)	121-69-7	5	25	X
Dimethylbenzene; see Xylene.....				
Dimethyl-1,2-dibromo-2, 2-dichloroethyl phosphate.....	300-76-5	.....	3	
Dimethylformamide.....	68-12-2	10	30	X
2,6-Dimethyl-4-heptanone; see Diisobutyl ketone....				
1,1-Dimethylhydrazine...	57-14-7	0.5	1	X
Dimethylphthalate.....	131-11-3	.....	5	
Dimethyl sulfate.....	77-78-1	1	5	X
Dinitrobenzene (all isomers).....			1	X
(ortho).....	528-29-0			
(meta).....	99-65-0			
(para).....	100-25-4			
Dinitro-o-cresol.....	534-52-1	.....	0.2	X
Dinitrotoluene.....	5321-14-6	.....	1.5	X
Dioxane (Diethylene dioxide).	123-91-1	100	360	X
Diphenyl (Biphenyl)....	92-52-4	0.2	1	
Diphenylmethane diisocyanate; see Methylene bisphenyl isocyanate.....				
Dipropylene glycol methyl ether.....	34590-94-8	100	600	X
Di-sec octyl phthalate (Di-(2-ethylhexyl) phthalate).....	117-81-7	.....	5	

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS (cont.)

				Skin

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Emery	2415-34-8			
Total dust		.....	15	
Respirable fraction		.....	5	
Endosulfan	115-29-7	.....	0.1	
Endrin	72-20-8	.....	0.1	X
Epichlorohydrin	106-89-8	5	19	X
EPN	2104-64-5	.....	0.5	X
1,2-Epoxypropane; see Propylene oxide				
2,3-Epoxy-1-propanol; see Glycidol				
Ethanethiol; see Ethyl mercaptan				
Ethanolamine	141-43-5	3	6	
2-Ethoxyethanol (Cellosolve)	110-80-5	200	740	X
2-Ethoxyethyl acetate (Cellosolve acetate)	111-15-9	100	540	X
Ethyl acetate	141-78-6	400	1400	
Ethyl acrylate	140-88-5	25	100	X
Ethyl alcohol (Ethanol)	64-17-5	1000	1900	
Ethylamine	75-04-7	10	18	
Ethyl amyl ketone (5-Methyl-3-heptanone)	541-85-5	25	130	
Ethyl benzene	100-41-4	100	435	
Ethyl bromide	74-96-4	200	890	
Ethyl butyl ketone (3-Heptanone)	106-35-4	50	230	
Ethyl chloride	75-00-3	1000	2600	
Ethyl ether	60-29-7	400	1200	
Ethyl formate	109-94-4	100	300	
Ethyl mercaptan	75-08-1	(C)10	(C)25	
Ethyl silicate	78-10-4	100	850	
Ethylene chlorohydrin	107-07-3	5	16	X
Ethylenediamine	107-15-3	10	25	
Ethylene dibromide	106-93-4		(2)	
Ethylene dichloride (1,2-Dichloroethane)	107-06-2		(2)	
Ethylene glycol dinitrate	628-96-6	(C)0.2	(C)1	X
Ethylene glycol methyl acetate; see Methyl cellosolve acetate				
Ethyleneimine; see 1910.1012	151-56-4			

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS (cont.)

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Ethylene oxide; see 1910.1047	75-21-8			
Ethylidene chloride; see 1,1-Dichlorethane				
N-Ethylmorpholine	100-74-3	20	94	X
Ferbam	14484-64-1			
Total dust		.....	15	
Ferrovanadium dust	12604-58-9	.....	1	
Fluorides (as F)	(4)	.....	2.5	
Fluorine	7782-41-4	0.1	0.2	
Fluorotrichloromethane (Trichloro-fluoromethane)	75-69-4	1000	5600	
Formaldehyde; see 1910.1048	50-00-0			
Formic acid	64-18-6	5	9	
Furfural	98-01-1	5	20	X
Furfuryl alcohol	98-00-0	50	200	
Grain dust (oat, wheat barley)	.....	.....	10	
Glycerin (mist)	56-81-5			
Total dust		.....	15	
Respirable fraction		.....	5	
Glycidol	556-52-5	50	150	
Glycol monoethyl ether; see 2-Ethoxyethanol				
Graphite, natural respirable dust	7782-42-5		(3)	
Graphite, synthetic				
Total dust		.....	15	
Respirable Fraction		.....	5	
Guthion; see Azinphos methyl				
Gypsum	13397-24-5			
Total dust		.....	15	
Respirable fraction		.....	5	
Hafnium	7440-58-6	.....	0.5	
Heptachlor	76-44-8	.....	0.5	X
Heptane (n-Heptane)	142-82-5	500	2000	
Hexachloroethane	67-72-1	1	10	X
Hexachloronaphthalene	1335-87-1	.....	0.2	X
n-Hexane	110-54-3	500	1800	
2-Hexanone (Methyl n-butyl ketone)	591-78-6	100	410	
Hexone (Methyl isobutyl ketone)	108-10-1	100	410	
sec-Hexyl acetate	108-84-9	50	300	

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS (cont.)

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Hydrazine	302-01-2	1	1.3	X
Hydrogen bromide	10035-10-6	3	10	
Hydrogen chloride	7647-01-0	(C)5	(C)7	
Hydrogen cyanide	74-90-8	10	11	X
Hydrogen fluoride (as F)	7664-39-3		(2)	
Hydrogen peroxide	7722-84-1	1	1.4	
Hydrogen selenide (as Se)	7783-07-5	0.05	0.2	
Hydrogen sulfide	7783-06-4		(2)	
Hydroquinone	123-31-9	.....	2	
Iodine	7553-56-2	(C)0.1	(C)1	
Iron oxide fume	1309-37-1	.....	10	
Isomyl acetate	123-92-2	100	525	
Isomyl alcohol (primary and secondary)	123-51-3	100	360	
Isobutyl acetate	110-19-0	150	700	
Isobutyl alcohol	78-83-1	100	300	
Isophorone	78-59-1	25	140	
Isopropyl acetate	108-21-4	250	950	
Isopropyl alcohol	67-63-0	400	980	
Isopropylamine	75-31-0	5	12	
Isopropyl ether	108-20-3	500	2100	
Isopropyl glycidyl ether (IGE)	4016-14-2	50	240	
Kaolin	1332-58-7			
Total dust		.....	15	
Respirable fraction		.....	5	
Ketene	463-51-4	0.5	0.9	
Lead inorganic (as Pb); see 1910.1025	7439-92-1			
Limestone	1317-65-3			
Total dust		.....	15	
Respirable fraction		.....	5	
Lindane	58-89-9	.....	0.5	X
Lithium hydride	7580-67-8	.....	0.025	
L.P.G. (Liquified petroleum gas)	68476-85-7	1000	1800	
Magnesite	546-93-0			
Total dust		.....	15	
Respirable fraction		.....	5	
Magnesium oxide fume	1309-48-4			
Total Particulate		.....	15	
Malathion	121-75-5			
Total dust		.....	15	X
Maleic anhydride	108-31-6	0.25	1	

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS (cont.)

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Manganese compounds (as Mn)	7439-96-5	.....	(C)5	

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Manganese fume (as Mn).	7439-96-5	.....	(C)5	
Marble.....	1317-65-3			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Mercury (aryl and inorganic)(as Hg)....	7439-97-6		(2)	
Mercury (organo) alkyl compounds (as Hg)....	7439-97-6		(2)	
Mercury (vapor) (as Hg)	7439-97-6		(2)	
Mesityl oxide.....	141-79-7	25	100	
Methanethiol; see Methyl mercaptan.				
Methoxychlor.....	72-43-5			
Total dust.....		.....	15	
2-Methoxyethanol; (Methyl cellosolve)..	109-86-4	25	80	X
2- Methoxyethyl acetate (Methyl cellosolve acetate).....	110-49-6	25	120	X
Methyl acetate.....	79-20-9	200	610	
Methyl acetylene (Propyne).....	74-99-7	1000	1650	
Methyl acetylene propadiene mixture (MAPP).....		1000	1800	
Methyl acrylate.....	96-33-3	10	35	X
Methylal (Dimethoxy-methane)..	109-87-5	1000	3100	
Methyl alcohol.....	67-56-1	200	260	
Methylamine.....	74-89-5	10	12	
Methyl amyl alcohol; see Methyl Isobutyl carbinol.....				
Methyl n-amyl ketone...	110-43-0	100	465	
Methyl bromide.....	74-83-9	(C)20	(C)80	X
Methyl butyl ketone; see 2-Hexanone.....				
Methyl cellosolve; see 2-Methoxyethanol.				
Methyl cellosolve acetate; see 2-Methoxyethyl acetate.....				
Methyl chloride.....	74-87-3		(2)	

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS (cont.)

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Methyl chloroform (1,1,1-Trichloro-ethane).....	71-55-6	350	1900	
Methylcyclohexane.....	108-87-2	500	2000	

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Methylcyclohexanol	25639-42-3	100	470	
o-Methylcyclohexanone	583-60-8	100	460	X
Methylene chloride	75-09-2		(2)	
Methyl ethyl ketone (MEK); see 2-Butanone				
Methyl formate	107-31-3	100	250	
Methyl hydrazine (Monomethyl hydrazine)	60-34-4	(C)0.2	(C)0.35	X
Methyl iodide	74-88-4	5	28	X
Methyl isoamyl ketone	110-12-3	100	475	
Methyl isobutyl carbinol	108-11-2	25	100	X
Methyl isobutyl ketone; see Hexone				
Methyl isocyanate	624-83-9	0.02	0.05	X
Methyl mercaptan	74-93-1	(C)10	(C)20	
Methyl methacrylate	80-62-6	100	410	
Methyl propyl ketone; see 2-Pentanone				
alpha-Methyl styrene	98-83-9	(C)100	(C)480	
Methylene bisphenyl isocyanate (MDI)	101-68-8	(C)0.02	(C)0.2	
Mica; see Silicates				
Molybdenum (as Mo)	7439-98-7			
Soluble compounds		.....	5	
Insoluble Compounds				
Total dust		.....	15	
Monomethyl aniline	100-61-8	2	9	X
Monomethyl hydrazine; see Methyl hydrazine.				
Morpholine	110-91-8	20	70	X
Naphtha (Coal tar)	8030-30-6	100	400	
Naphthalene	91-20-3	10	50	
alpha-Naphthylamine; see 1910.1004	134-32-7			
beta-Naphthylamine; see 1910.1009	91-59-8			
Nickel carbonyl (as Ni)	13463-39-3	0.001	0.007	
Nickel, metal and insoluble compounds (as Ni)	7440-02-0	.....	1	

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS (cont.)

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Nickel, soluble compounds (as Ni)	7440-02-0	.....	1	
Nicotine	54-11-5	.....	0.5	X
Nitric acid	7697-37-2	2	5	
Nitric oxide	10102-43-9	25	30	
p-Nitroaniline	100-01-6	1	6	X

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Nitrobenzene	98-95-3	1	5	X
p-Nitrochlorobenzene	100-00-5	.....	1	X
4-Nitrodiphenyl; see 1910.1003	92-93-3			
Nitroethane	79-24-3	100	310	
Nitrogen dioxide	10102-44-0	(C)5	(C)9	
Nitrogen trifluoride	7783-54-2	10	29	
Nitroglycerin	55-63-0	(C)0.2	(C)2	X
Nitromethane	75-52-5	100	250	
1-Nitropropane	108-03-2	25	90	
2-Nitropropane	79-46-9	25	90	
N-Nitrosodimethylamine; see 1910.1016				
Nitrotoluene (all isomers)		5	30	X
o-isomer	88-72-2			
m-isomer	99-08-1			
p-isomer	99-99-0			
Nitrotrichloromethane; see Chloropicrin				
Octachloronaphthalene	2234-13-1	.....	0.1	X
Octane	111-65-9	500	2350	
Oil mist, mineral	8012-95-1	.....	5	
Osmium tetroxide (as Os)	20816-12-0	.....	0.002	
Oxalic acid	144-62-7	.....	1	
Oxygen difluoride	7783-41-7	0.05	0.1	
Ozone	0028-15-6	0.1	0.2	
Paraquat, respirable dust	4685-14-7 1910-42-5 2074-50-2	.....	0.5	X
Parathion	56-38-2	.....	0.1	X
Particulates not otherwise regulated (PNOR)(f)				
Total dust		.....	15	
Respirable fraction		.....	5	
PCB; see Chlorodiphenyl (42% and 54% chlorine)				

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS (cont.)

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Pentaborane	19624-22-7	0.005	0.01	
Pentachloronaphthalene	1321-64-8	.....	0.5	X
Pentachlorophenol	87-86-5	.....	0.5	X
Pentaerythritol	115-77-5			
Total dust		.....	15	
Respirable fraction		.....	5	
Pentane	109-66-0	1000	2950	
2-Pentanone (Methyl				

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
propyl ketone).....	107-87-9	200	700	
Perchloroethylene (Tetrachloroethylene)	127-18-4		(2)	
Perchloromethyl mercaptan.....	594-42-3	0.1	0.8	
Perchloryl fluoride....	7616-94-6	3	13.5	
Perlite.....	93763-70-3			
Total dust.....		.....	15	
Respirable fraction..		.....	5	
Petroleum distillates (Naphtha)(Rubber Solvent).....		500	2000	
Phenol.....	108-95-2	5	19	X
p-Phenylene diamine....	106-50-3	.....	0.1	X
Phenyl ether, vapor....	101-84-8	1	7	
Phenyl ether-biphenyl mixture, vapor.....		1	7	
Phenylethylene; see Styrene.....				
Phenyl glycidyl ether (PGE).....	122-60-1	10	60	
Phenylhydrazine.....	100-63-0	5	22	X
Phosdrin (Mevinphos)....	7786-34-7	.....	0.1	X
Phosgene (Carbonyl chloride).....	75-44-5	0.1	0.4	
Phosphine.....	7803-51-2	0.3	0.4	
Phosphoric acid.....	7664-38-2	.....	1	
Phosphorus (yellow).....	7723-14-0	.....	0.1	
Phosphorus pentachloride.....	10026-13-8	..,.....	1	
Phosphorus pentasulfide.	1314-80-3	.....	1	
Phosphorus trichloride..	7719-12-2	0.5	3	
Phthalic anhydride.....	85-44-9	2	12	
Picloram.....	1918-02-1			
Total dust.....		.....	15	
Respirable fraction...		.....	5	
Picric acid.....	88-89-1	.....	0.1	X
Pindone (2-Pivalyl-1, 3-indandione).....	83-26-1	.....	0.1	

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS (cont.)

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Plaster of paris.....	26499-65-0			
Total dust.....		.....	15	
Respirable fraction....		.....	5	
Platinum (as Pt).....	7440-06-4			
Metal.....		.....	.....	
Soluble Salts.....		.....	0.002	
Portland cement.....	65997-15-1			
Total dust.....		.....	15	
Respirable fraction....		.....	5	
Propane.....	74-98-6	1000	1800	

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
beta-Propriolactone; see 1910.1013	57-57-8			
n-Propyl acetate	109-60-4	200	840	
n-Propyl alcohol	71-23-8	200	500	
n-Propyl nitrate	627-13-4	25	110	
Propylene dichloride	78-87-5	75	350	
Propylene imine	75-55-8	2	5	X
Propylene oxide	75-56-9	100	240	
Propyne; see Methyl acetylene				
Pyrethrum	8003-34-7	.....	5	
Pyridine	110-86-1	5	15	
Quinone	106-51-4	0.1	0.4	
RDX: see Cyclonite				
Rhodium (as Rh), metal fume and insoluble compounds	7440-16-6	.....	0.1	
Rhodium (as Rh), soluble compounds	7440-16-6	.....	0.001	
Ronnel	299-84-3	.....	15	
Rotenone	83-79-4	.....	5	
Rouge				
Total dust		.....	15	
Respirable fraction		.....	5	
Selenium compounds (as Se)	7782-49-2	.....	0.2	
Selenium hexafluoride (as Se)	7783-79-1	0.05	0.4	
Silica, amorphous, precipitated and gel	112926-00-8		(3)	
Silica, amorpous, diatomaceous earth, containing less than 1% crystalline silica	61790-53-2		(3)	
Silica, crystalline cristobalite, respirable dust	14464-46-1		(3)	

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS (cont.)

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Silica, crystalline quartz, respirable dust	14808-60-7		(3)	
Silica, crystalline tripoli (as quartz), respirable dust	1317-95-9		(3)	
Silica, crystalline tridymite, respirable dust	15468-32-3		(3)	
Silica, fused, respirable dust	60676-86-0		(3)	
Silicates (less than 1%				

crystalline silica)				
Mica (respirable dust).....	12001-26-2		(3)	
Soapstone, total dust	.....		(3)	
Soapstone, respirable dust.....	.....		(3)	
Talc (containing asbestos): use asbestos limit: see 29 CFR 1910.1001.....			(3)	
Talc (containing no asbestos), respirable dust.....	14807-96-6		(3)	
Tremolite, asbestiform; see 1910.1001.....				
Silicon.....	7440-21-3			
Total dust.....		.....	15	
Respirable fraction...		.....	5	
Silicon carbide.....	409-21-2			
Total dust.....		.....	15	
Respirable fraction...		.....	5	
Silver, metal and soluble compounds (as Ag).....	7440-22-4	.....	0.01	
Soapstone; see Silicates.....				
Sodium fluoroacetate....	62-74-8	.....	0.05	X
Sodium hydroxide.....	1310-73-2	.....	2	
Starch.....	9005-25-8			
Total dust.....		.....	15	
Respirable fraction...		.....	5	
Stibine.....	7803-52-3	0.1	0.5	
Stoddard solvent.....	8052-41-3	500	2900	
Strychnine.....	57-24-9	.....	0.15	

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS (cont.)

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Styrene.....	100-42-5		(2)	
Sucrose.....	57-50-1			
Total dust.....		.....	15	
Respirable fraction....		.....	5	
Sulfur dioxide.....	7446-09-5	5	13	
Sulfur hexafluoride.....	2551-62-4	1000	6000	
Sulfuric acid.....	7664-93-9	.....	1	
Sulfur monochloride.....	10025-67-9	1	6	
Sulfur pentafluoride.....	5714-22-7	0.025	0.25	
Sulfuryl fluoride.....	2699-79-8	5	20	
Systox; see Demeton.....				
2,4,5-T (2,4,5-tri-chlorophenoxyacetic acid).....	93-76-5	.....	10	

Talc; see Silicates.....				
Tantalum, metal and oxide dust.....	7440-25-7	.....	5	
TEDP (Sulfotep).....	3689-24-5	.....	0.2	X
Tellurium and compounds (as Te).....	13494-80-9	.....	0.1	
Tellurium hexafluoride (as Te).....	7783-80-4	0.02	0.2	
Temephos.....	3383-96-8			
Total dust.....		.....	15	
Respirable fraction...		.....	5	
TEPP (Tetraethyl pyrophosphaate).....	107-49-3	.....	0.05	X
Terphenylis.....	26140-60-3	(C)1	(C)9	
1,1,1,2-Tetrachloro-2, 2-difluoroethane.....	76-11-9	500	4170	
1,1,2,2-Tetrachloro-1, 2-difluoroethane.....	76-12-0	500	4170	
1,1,2,2-Tetrachloro-ethane.....	79-34-5	5	35	X
Tetrachoroethylene; see Perchloroethylene				
Tetrachloromethane; see Carbon tetrachloride..				
Tetrachloronaphthalene..	1335-88-2	.....	2	X
Tetraethyl lead (as Pb)	78-00-2	.....	0.075	X
Tetrahydrofuran.....	109-99-9	200	590	
Tetramethyl lead, (as Pb).....	75-74-1	.....	0.075	X
Tetramethyl succinonitrile.....	3333-52-6	0.5	3	X
Tetranitromethane.....	509-14-8	1	8	

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS (cont.)

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Tetryl (2,4,6-Trinitro-phenylmethyl-nitramine).....	479-45-8	.....	1.5	X
Thallium, soluble compounds (as Tl).....	7440-28-0	.....	0.1	X
4,4'-Thiobis(6-tert, Butyl-m-cresol).....	96-69-5			
Total dust.....		.....	15	
Respirable fraction...		.....	5	
Thiram.....	137-26-8	.....	5	
Tin, inorganic compounds (except oxides) (as Sn).....	7440-31-5	.....	2	
Tin, organic compounds (as Sn).....	7440-31-5	.....	0.1	
Titanium dioxide.....	3463-67-7			

Total dust.....		.....	15	
Toluene.....	108-88-3		(2)	
Toluene-2, 4-diisocyanate (TDI)..	584-84-9	(C)0.02	(C)0.14	
o-Toluidine.....	95-53-4	5	22	X
Toxaphene; see Chlorinated camphene..				
Tremolite; see Silicates.....				
Tributyl phosphate.....	126-73-8	.....	5	
1,1,1-Trichloroethane; see Methyl chloroform.				
1,1,2-Trichloroethane...	79-00-5	10	45	X
Trichloroethylene.....	79-01-6		(2)	
Trichloromethane; see Chloroform				
Trichloronaphthalene....	321-65-9	.....	5	X
1,2,3-Trichloropropane..	96-18-4	50	300	
1,1,2-Trichloro-1,2, 2-trifluoroethane.....	76-13-1	1000	7600	
Triethylamine.....	121-44-8	25	100	
Trifluorobromomethane...	75-63-8	1000	6100	
2,4,6-Trinitrophenyl; see Picric acid.....				
2,4,6-Trinitrophenyl-methyl nitramine; see Tetryl.....				
2,4,6-Trinitrotoluene (TNT).....	118-96-7	.....	1.5	X
Triorthocresyl phosphate.....	78-30-8	.....	0.1	

TABLE Z-1. - LIMITS FOR AIR CONTAMINANTS (cont.)

Substance	CAS No. (c)	ppm (a)(1)	mg/m(3) (b)(1)	Skin designation
Triphenyl phosphate.....	115-86-6	.....	3	
Turpentine.....	8006-64-2	100	560	
Uranium (as U).....	7440-61-1			
Soluble compounds.....		.....	0.05	
Insoluble compounds...		.....	0.05	
Vanadium.....	1314-62-1			
Respirable dust (as V(2)O(5)).....		.....	(C)0.5	
Fume (as V(2)O(5)).....		.....	(C)0.1	
Vegetable oil mist.....				
Total dust.....		.....	15	
Respirable fraction...		.....	5	
Vinyl benzene; see Styrene.....				
Vinyl chloride; see 1910.1017.....	75-01-4			
Vinyl cyanide; see Acrylonitrile				

Vinyl toluene.....	5013-15-4	100	480	
Warfarin.....	81-81-2	.....	0.1	
Xylenes (o-, m-, p-isomers)...	1330-20-7	100	435	
Xylidine.....	1300-73-8	5	25	X
Yttrium.....	7440-65-5	.....	1	
Zinc chloride fume.....	7646-85-7	.....	1	
Zinc oxide fume.....	1314-13-2	.....	5	
Zinc oxide.....	1314-13-2			
Total dust.....		.....	15	
Respirable fraction...		.....	5	
Zinc stearate.....	557-05-1			
Total dust.....		.....	15	
Respirable fraction...		.....	5	
Zirconium compounds (as Zr).....	7440-67-7	.....	5	

Footnote(1) The PELs are 8-hour TWAs unless otherwise noted; a (C) designation denotes a ceiling limit. They are to be determined from breathing-zone air samples.

Footnote(a) Parts of vapor or gas per million parts of contaminated air by volume at 25 degrees C and 760 torr.

Footnote(b) Milligrams of substance per cubic meter of air. When entry is in this column only, the value is exact; when listed with a ppm entry, it is approximate.

Footnote(c) The CAS number is for information only. Enforcement is based on the substance name. For an entry covering more than one metal compound measured as the metal, the CAS number for the metal is given - not CAS numbers for the individual compounds.

Footnote(d) The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except in some circumstances the distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures; for the excepted subsegments, the benzene limits in Table Z-2 apply. See 1910.1028 for specific circumstances.

Footnote(e) This 8-hour TWA applies to respirable dust as measured by a vertical elutriator cotton dust sampler or equivalent instrument. The time-weighted average applies to the cotton waste processing operations of waste recycling (sorting, blending, cleaning and willowing) and garnetting. See also 1910.1043 for cotton dust limits applicable to other sectors.

Footnote(f) All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by the Particulates Not Otherwise Regulated (PNOR) limit which is the same as the inert or nuisance dust limit of Table Z-3.

Footnote(2) See Table Z-2.

Footnote(3) See Table Z-3

Footnote(4) Varies with compound.

[54 FR 36767, Sept. 5, 1989; 54 FR 41244, Oct. 6, 1989; 55 FR 3724, Feb. 5, 1990; 55 FR 12819, Apr 6, 1990; 55 FR 19259, May 9, 1990; 55 FR 46950, Nov. 8, 1990; 57 FR 29204, July 1, 1992; 57 FR 42388, Sept. 14, 1992; 58 FR 35340, June 30, 1993]

TABLE Z-2

Substance	8-hour time weighted average	Acceptable ceiling concentration	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift	
			Concentration	Maximum duration
Benzene(a) (Z37.40-1969).....	10 ppm.....	25 ppm.....	50 ppm.....	10 minutes.
Beryllium and beryllium compounds (Z37.29-1970).....	2 ug/m(3)..	5 ug/m(3)...	25 ug/m(3).	30 minutes.
Cadmium fume(b) (Z37.5-1970).....	0.1 mg/m(3).	0.3 mg/m(3).	.....	
Cadmium dust(b) (Z37.5-1970).....	0.2 mg/m(3).	0.6 mg/m(3).		
Carbon disulfide (Z37.3-1968).....	20 ppm.....	30 ppm.....	100 ppm....	30 minutes.
Carbon tetrachloride (Z37.17-1967).....	10 ppm.....	25 ppm.....	200 ppm....	5 min. in any 4 hrs.
Chromic acid and chromates (Z37-7-1971).....	.....	1 mg/10 m(3)		
Ethylene dibromide (Z37.31-1970).....	20 ppm.....	30 ppm.....	50 ppm.....	5 minutes.
Ethylene dichloride (Z37.21-1969).....	50 ppm.....	100 ppm.....	200 ppm....	5 min. in any 3 hrs.
Fluoride as dust (Z37.28-1969).....	2.5 mg/m(3).	.....	.....	
Formaldehyde: see 1910.1048.....	.....	.....	.....	
Hydrogen fluoride (Z37.28-1969).....	3 ppm.....	.....	.....	
Hydrogen sulfide (Z37.2-1966).....	.....	20 ppm.....	50 ppm.....	10 mins. once only if no other meas. exp. occurs.

TABLE Z-2 (Cont.)

Substance	8-hour time weighted average	Acceptable ceiling concentration	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift	
			Concentration	Maximum duration
Mercury (Z37.8-1971).....	.....	1 mg/10m(3).	.....	
Methyl chloride (Z37.18-1969).....	100 ppm.....	200 ppm.....	300 ppm....	5 mins. in any 3 hrs.
Methylene chloride (Z37.23-1969).....	500 ppm.....	1,000 ppm...	2,000 ppm..	5 mins. in any 2 hrs.
Organo (alkyl) mercury (Z37.30-1969).....	0.01 mg/m(3)	0.04 mg/m(3)	.....	
Styrene (Z37.15-1969).....	100 ppm.....	200 ppm.....	600 ppm....	5 mins. in any 3 hrs.
Tetrachloroethylene (Z37.22-1967).....	100 ppm.....	200 ppm.....	300 ppm....	5 mins. in any 3 hrs.
Toluene (Z37.12-1967).....	200 ppm.....	300 ppm.....	500 ppm....	10 minutes
Trichloroethylene (Z37.19-1967).....	100 ppm.....	200 ppm.....	300 ppm....	5 mins. in any 2 hrs.

Footnote(a) This standard applies to the industry segments exempt from the 1 ppm 8-hour TWA and 5 ppm STEL of the benzene standard at 1910.1028.

Footnote(b) This standard applies to any operations or sectors for which the Cadmium standard, 1910.1027, is stayed or otherwise not in effect.

[57 FR 42388, Sept. 14, 1992; 58 FR 21781, April 23, 1993; 58 FR 35340, June 30, 1993]

Part Number: 1910 **Appendix H (Z-3 cont.)**

Standard Number: 1910.1000 TABLE Z-3

Title: TABLE Z-3 Mineral Dusts

Note: The Federal Register revised Table Z-3 July 27, 1993.

TABLE Z-3 Mineral Dusts

Substance	mppcf(a)	mg/m(3)
Silica:		
Crystalline		
Quartz (Respirable)	**250(b) / %SiO(2)+5**	**10 mg/m(3)(e) / %SiO(2)+2**
Quartz (Total Dust)	.....	**30 mg/m(3) / %SiO(2)+2**
Cristobalite: Use 1/2 the value calculated from the count or mass formulae for quartz		
Tridymite: Use 1/2 the value calculated from the formulae for quartz.		
Amorphous, including natural diatomaceous earth	**20**	**80 mg/m(3) / %SiO(2)**
Silicates (less than 1% crystalline silica):		
Mica	**20**	
Soapstone	**20**	
Talc (not containing asbestos)	**20(c)**	
Talc (containing asbestos) Use asbestos limit		
Tremolite, asbestiform (see 29 CFR 1910.1001)		
Portland cement	**50**	
Graphite (Natural)	**15**	
Coal Dust:		
Respirable fraction less than 5% SiO(2)	.....	**2.4 mg/m(3)(e) / %SiO(2)+2**
Respirable fraction greater than 5% SiO(2)	.....	**10 mg/m(3)(e) / %SiO(2)+2**
Inert or Nuisance Dust:(d)		
Respirable fraction	**15**	**5 mg/m(3)**
Total dust	**50**	**15 mg/m(3)**

Note. - Conversion factors - mppcf X 35.3 = million particles per cubic meter = particles per c.c.

Footnote(a) Millions of particles per cubic foot of air, based on impinger samples counted by light-field techniques.

Footnote(b) The percentage of crystalline silica in the formula is the amount determined from airborne samples, except in those instances in which other methods have been shown to be applicable.

Footnote(c) Containing less than 1% quartz; if 1% quartz or more, use quartz limit.

Footnote(d) All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by this limit, which is the same as the Particulates Not Otherwise Regulated (PNOR) limit in Table Z-1.

Footnote(e) Both concentration and percent quartz for the application of this limit are to be determined from the fraction passing asize-selector with the following characteristics:

Aerodynamic diameter (unit density sphere)	Percent passing selector
2	90
2.5	75
3.5	50
5.0	25
10	0

The measurements under this note refer to the use of an AEC (now NRC) instrument. The respirable fraction of coal dust is determined with an MRE; the figure corresponding to that of 2.4 mg/m(3) in the table for coal dust is 4.5 mg/m(3).

[54 FR 2920, Jan. 19. 1989, 54 FR 28059, July 5, 1989, as amended at 54 FR 36767, Sept. 5, 1989; 54 FR 47513, Nov. 15, 1989; 54 FR 50372, Dec. 6, 1989; 55 FR 19259, May 9, 1990; 55 FR 46950, Nov. 8, 1990; 57 FR 29205, July 1, 1992; 58 FR 35340, June 30, 1993; 58 FR 40191, July 27, 1993]

Hazard Communication Program Review Statement

The Hazard Communication Program has been reviewed to ensure that the information contained therein is current and appropriate to safely protect those individuals who use or may come in contact with hazardous chemicals in the workplace. The review has indicated that the following action occurred.

X___ No revisions to Hazard Communication Program.

____ Revisions incorporated into Hazard Communication Program.

The Materials Science and Engineering Department

University Official (Name)	Title	Signature	Date
Steven Bright	Research Associate		12/14/99