

# HAZARD COMMUNICATION GUIDELINES

## GUÍA PARA LA COMUNICACIÓN DE RIESGOS



A bilingual guide for workplaces with  
Hispanic workers

Guía bilingüe para empresas con  
trabajadores hispanos

Rev. 1999  
Translated 01/2007

# HAZARD COMMUNICATION

## GUIDELINES

### MODULE #1 (of 2)

## INFORMATION



## PRESENTED BY

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These guidelines are intended to provide information to assist in the development of a chemical Hazard Communication Program. This information is not considered a substitute for any provisions of 1910.1200, nor will it serve as a Hazard Communication Program. These guidelines were derived from OSHA standards and interpretations.

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MÓDULO #1 (de 2)  
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PRESENTADO POR



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Esta guía tiene la intención de asistir en el desarrollo de un Programa de Comunicación de Riesgos. Esta información no se considera un sustituto para ninguna de las estipulaciones de 1910.1200, ni tampoco servirá como un Programa de Comunicación de Riesgos. Esta guía se ha derivado de las normas e interpretaciones de OSHA.

**Por favor considere lo siguiente:** Mientras que se ha intentado proporcionar una traducción correcta, en situaciones en las que la versión original u oficial fue un texto en inglés, cualquier diferencia en la traducción no es obligatoria y no tiene efecto legal.

## HAZARD COMMUNICATION GUIDELINES - MODULE #1

### Introduction

With an estimated 575,000 existing chemical products in the workplace and hundreds of new ones being added every year, workers throughout this country are confronted with the health and safety hazards associated with the use of these substances. As a result of these risks the Occupational Safety and Health Administration (OSHA) issued a workplace standard called the Hazard Communication Standard. Otherwise known as the "Right to Know Law" or 29 CFR 1910.1200, it covers nearly 3.5 million workers and is designed to require manufacturers, distributors and end users of chemicals to communicate their hazards to affected employers and employees.

Now a decade old, the Hazard Communication Standard is still as widely discussed and debated as ever before. Last year, OSHA issued nearly 20,000 citations to general industry under this standard alone. Many of those citations include the lack of even a written program.

A performance-based standard, Hazard Communication was drafted in a manner which would give employers the flexibility to make their own decisions about how best to comply with its provisions. When all is said and done, however, the only true test of compliance is whether your employees will have the knowledge and skills to understand the chemical hazards that exist in their working lives and how to protect themselves and others through the use of safe work practices, control systems and personal protection.

The intent of these guidelines is to provide employers with assistance in complying with OSHA requirements of the Hazard Communication Standard. For starters, we recommend you first read the standard. (In Appendix A of this module). By working through Module #1, you should acquire a good understanding of this very important workplace standard, learn more about some of the side issues involved in compliance, and find valuable reference material for use in training yourself and others.

In order to make optimal use of these guidelines, it is recommended that they be utilized in conjunction with an onsite consultation State State representatives.

### Hazard Communication Overview

The quality of hazard communication is largely dependent on the adequacy and accuracy of the **HAZARD ASSESSMENT**. Chemical manufacturers and the employers who use them are required to review the available scientific evidence concerning the hazards of the chemicals they produce or bring into the workplace. This information is to be reported to the employees and to any downstream users of products they may make or sell. When you acquire chemicals from another source, it is acceptable for you to rely on the evaluations performed by the manufacturers of those chemicals (as found on the Material Safety Data Sheets). From this information, you may establish your own hazard communication program. You may also consult other sources of information to determine the hazards of some chemicals in your workplace. Those sources are discussed in more detail in Appendix B, in the section called "Hazardous Chemicals List."

Employers must also prepare a **WRITTEN HAZARD COMMUNICATION PROGRAM** which explains how you will comply with OSHA's various requirements for container labeling, obtaining and maintaining material safety data sheets and providing employees training. It must also contain a list of the hazardous chemicals in each work area. Non-routine tasks involving special precautions or presenting unique hazards must be addressed individually. Hazards associated with chemicals in unlabeled pipes and the manner in which contractors will be informed of hazards at your work site must also be covered in the written program. Preparation of a written program is addressed in Appendix B of this module. Module #2 is dedicated to the development of the written program.

**HAZARD LABELS** are required on all containers of hazardous chemical. Chemical manufacturers, importers and distributors must be sure that containers of hazardous chemicals leaving the workplace are labeled, tagged or marked with the identify, appropriate hazard warnings and the name and address of the manufacturer or other responsible party. In the workplace, each container must be labeled, tagged or marked with the identify of hazardous chemicals contained therein, and must show hazard warnings appropriate for employee protection. Appendices B and C of these guidelines address the labeling requirements and variations permissible by OSHA.

## GUÍA PARA LA COMUNICACIÓN DE RIESGOS- MÓDULO #1

### Introducción

Con un número estimado de 575,000 productos químicos existentes en el lugar de trabajo, y cientos de nuevos productos siendo introducidos cada año, los trabajadores de este país se encuentran expuestos a riesgos de salud y seguridad asociados con el uso de estas sustancias. Como resultado de estos riesgos, la Administración de la Salud y Seguridad Ocupacional (OSHA) estableció una norma para el lugar de trabajo llamada Norma para la Comunicación de Riesgos. También conocida como la "Ley del Derecho a Saber" o 29 CFR 1910.1200, cubre cerca de 3.5 millones de trabajadores y está diseñada para obligar a los fabricantes, distribuidores y usuarios de químicos a comunicar sus riesgos a patrones (empleadores) y trabajadores afectados.

Aún ahora, la Norma para la Comunicación de Riesgos todavía está siendo discutida y debatida. OSHA otorga miles de multas a la industria general por infracciones a esta norma. Muchas de estas multas incluyen la falta de un programa establecido por escrito.

La Norma para la Comunicación de Riesgos, basada en el desempeño, fue creada en una forma que pudiera dar a los patrones flexibilidad para tomar sus propias decisiones respecto a cómo cumplir mejor con sus estipulaciones. No obstante, cuando todo haya sido dicho y hecho, la única prueba de cumplimiento será si sus trabajadores poseen el conocimiento y las habilidades para entender los riesgos químicos que existen en sus trabajos, y cómo protegerse ellos mismos y a otros, a través de prácticas de trabajo seguras, sistemas de control y protección personal.

La intención de esta guía es proporcionar a los patrones asistencia en el cumplimiento de los requerimientos de la Norma para la Comunicación de Riesgos de OSHA. Para los principiantes, recomendamos que primero lean la norma (En Apéndice A de este módulo, en inglés). A través de su trabajo con el Módulo #1, usted deberá de adquirir un mejor entendimiento de esta norma tan importante para el lugar de trabajo, aprenderá más sobre algunos de los asuntos laterales involucrados con el cumplimiento, y encontrará material de referencia de gran valor para entrenarse usted mismo y a otros.

Para lograr el óptimo uso de esta guía, se recomienda que se utilice en combinación con el servicio de consultoría de Safe State.

### Visión General de la Comunicación de Riesgos

La calidad de la comunicación de riesgos depende en gran parte de la suficiencia y exactitud de la **EVALUACIÓN DE RIESGOS**. Los fabricantes de químicos y los patrones (o empleadores) que los usan tienen la obligación de revisar la evidencia científica disponible referente a los riesgos de los químicos que ellos producen o traen a sus lugares de trabajo. Esta información debe de ser reportada a los trabajadores y a cualquier otro usuario posterior del producto que ellos fabrican o venden. Cuando usted adquiere químicos de otra fuente, es aceptable que usted dependa de las evaluaciones realizadas por los fabricantes de esos químicos (como las que se encuentran en las Hojas de Datos de Seguridad de los Materiales -MSDS, por sus siglas en inglés). A partir de esa información usted podrá establecer su propio programa de comunicación de riesgos. También puede consultar otras fuentes de información para determinar los riesgos de algunos de los químicos en su lugar de trabajo. Estas fuentes de información se discuten con más detalle en el Apéndice B (en español), en la sección llamada "Lista de Químicos Riesgosos".

Los patrones deben de preparar un **PROGRAMA ESCRITO PARA LA COMUNICACIÓN DE RIESGOS** que explique cómo cumplirán con los diferentes requerimientos de OSHA para etiquetado de recipientes (envases), obtención y mantenimiento de las hojas de datos de seguridad de los materiales, y entrenamiento de los trabajadores. También deberá de incluir una lista de químicos riesgosos en cada área de trabajo. Tareas no rutinarias que involucren precauciones especiales, o presenten riesgos únicos, deberán de tratarse individualmente. El programa por escrito también deberá de incluir los riesgos asociados con químicos en tuberías no etiquetadas, y de la manera como los contratistas serán informados de los riesgos existentes en su lugar de trabajo. El Apéndice B de este módulo cubre la preparación de un programa por escrito. El Módulo #2 está dedicado al desarrollo del programa escrito.

Todos los envases que contengan químicos riesgosos deben de tener **ETIQUETAS DE RIESGO**. Los fabricantes de químicos, importadores y distribuidores deben de asegurarse de que todos los envases que contengan químicos de alto riesgo que salen del lugar de trabajo estén etiquetados, rotulados o marcados con la identidad, las debidas advertencias sobre los riesgos así como el nombre y dirección del fabricante u otra persona responsable. En el lugar de trabajo, cada envase deberá de estar etiquetado, rotulado o marcado con la identidad del químico de alto riesgo contenido en él, y deberá de incluir también advertencias adecuadas sobre los riesgos para protección de los trabajadores. Los Apéndices B y C de esta guía incluyen los requerimientos de etiquetado y las variaciones permitidas por OSHA.

**MATERIAL SAFETY DATA SHEETS (MSDS)** must be developed by the chemical manufacturers and importers for each hazardous chemical they produce or import. Employers are responsible for either obtaining or developing a MSDS for each hazardous chemical used in their workplaces. These documents must be in English (at a minimum) and include information regarding the specific chemical identity of the hazardous chemicals involved and their common names. Information must also be provided on the physical and chemical characteristics of the hazardous chemical, known acute and chronic health effects and related health information, exposure limits, carcinogen information, precautionary measures, emergency first aid procedures and the identification of the MSDS preparer. Copies of the MSDS's are to be readily accessible to employees in their work areas. Appendix E of this module is an MSDS Glossary, which explains many of the technical terms frequently found in these documents.

Employers must establish a **TRAINING AND INFORMATION PROGRAM** for employees exposed to hazardous chemicals in their work area at the time of their initial assignment and whenever a new hazard is introduced into their work area.

Information to be provided to employees must consist of:

- The existence of the Hazard Communication Standard and its requirements;
- The components of the employer's hazard communication program;
- Operations in the employees' work area where hazardous chemicals are present;
- The location of the written hazard evaluation procedures, communication program, hazardous chemicals list and the required material safety data sheets.

Training to be provided to employees must consist of:

- How the hazard communication program is implemented in the workplace, how to read and interpret information on labels and MSDS, and how employees can obtain and use that hazard information;
- The hazards of chemicals in the work area;
- Measures the employees can take to protect themselves from the hazards;
- Specific measures put into effect by the employer to provide protection, such as work practices, control systems and the use of personal protective equipment (PPE);
- Methods and observations, such as visual appearance and smell, that workers may use to detect the presence of a hazardous chemical they may be exposed to.

More about training requirements and techniques are found in Appendices B and D of Module #1.

These various elements, the hazardous chemicals list, the MSDS, the hazard labels and the training all work together to provide a package of information to your employees. The written program simply describes how its all going to get done. When this program works as intended, your employees should be able to (1) read the label on a chemical container; (2) use that information to go to a hazardous chemicals list and see if an MSDS exists for that product; and, (3) be able to locate the correct MSDS for that particular chemical. What's more, your employees should be able to learn from those documents important hazard information relating to the chemical in question.

In the appendices of this Module, you will find information, instructions, checklists, and reference material invaluable to the development of a program in your facility. In Module #2, the framework for your own written program is provided.

**LAS HOJAS DE DATOS DE SEGURIDAD DE LOS MATERIALES (MSDS)** deberán de ser desarrolladas por los fabricantes de químicos y por los importadores de cada uno de los químicos de alto riesgo que ellos producen o importan. Los patrones son responsables ya sea de obtener o desarrollar una MSDS para cada uno de los químicos riesgosos que se usan en sus lugares de trabajo. Estos documentos deben de estar en inglés (como mínimo) e incluir información referente a la identidad química específica del producto químico riesgoso del que se trate y sus nombres comunes. También se debe de proporcionar información sobre las características químicas y físicas del producto químico riesgoso; los efectos conocidos sobre la salud agudos y crónicos y demás información relacionada sobre la salud; límites de exposición; información sobre si el producto es carcinógeno o no; medidas de precaución; procedimientos de emergencia para primeros auxilios y la identificación del organismo responsable de la preparación de las hojas de datos de seguridad de los materiales. Copias de las MSDS deben de estar siempre disponibles (accesibles) para los trabajadores en sus áreas de trabajo. El Apéndice E de este módulo es un glosario de las MSDS que explica muchos de los términos técnicos que se encuentran con frecuencia en estos documentos.

Los patrones deben de establecer un **PROGRAMA DE INFORMACIÓN Y ENTRENAMIENTO** para los trabajadores expuestos a productos químicos riesgosos en sus áreas de trabajo, al momento de su asignación inicial y siempre que se introduzca un nuevo riesgo en sus áreas de trabajo.

La información que se debe de proporcionar a los trabajadores debe de incluir lo siguiente:

- La existencia de la Norma de Comunicación de Riesgos y sus requerimientos;
- Los componentes del programa de comunicación de riesgos del patrón;
- Las operaciones de los trabajadores en el área de trabajo donde están presentes los químicos riesgosos;
- La ubicación de los procedimientos por escrito para la evaluación de riesgos, programa de comunicación, lista de químicos riesgosos y las hojas de datos de seguridad de los materiales que sean requeridas.

El entrenamiento de los trabajadores debe de consistir en:

- Cómo se implementará el programa de comunicación de riesgos en el lugar de trabajo, cómo leer e interpretar la información incluida en las etiquetas y las MSDS, y cómo pueden los trabajadores obtener y usar esa información sobre los riesgos;
- Los riesgos de los químicos en el lugar de trabajo;
- Medidas que los trabajadores pueden tomar para protegerse ellos mismos de los riesgos;
- Medidas específicas impuestas por el patrón para proporcionar protección, como las prácticas de trabajo, el control de los sistemas y el uso de equipo de protección personal (PPE, por sus siglas en inglés);
- Métodos y observaciones, como la apariencia visual y el olor, que los trabajadores deben de usar para detectar la presencia de químicos riesgosos a los que ellos podrían estar expuestos.

En el Apéndice B y D (ambos en español) del Módulo #1 se encuentran más requerimientos y técnicas de entrenamiento.

Todos estos elementos, la lista de químicos riesgosos, las MSDS, las etiquetas de riesgos y el entrenamiento, trabajan juntos para proporcionar un paquete de información para sus trabajadores. El programa por escrito simplemente describe cómo todo se llevará a cabo. Si este programa trabaja como se pretende, sus trabajadores deberán de ser capaces de (1) leer las etiquetas de los envases que contienen los químicos; (2) usar esa información para consultar la lista de químicos riesgosos y ver si existe una MSDS para ese producto; y, (3) ser capaces de localizar la MSDS correcta para ese químico en particular. Lo que es todavía mejor, sus trabajadores deberán de ser capaces de aprender con esos documentos importante información sobre los riesgos relacionados con el químico en cuestión.

En los apéndices de este Módulo, usted encontrará información, instrucciones, listas de verificación, y material de referencia invaluable para el desarrollo de un programa para su compañía. En el Módulo #2 se proporciona un programa modelo en el que podrá basar su propio programa.

## APPENDIX A

### HAZARD COMMUNICATION STANDARD

February 9, 1994, the Federal Register published an amended version of the Hazard Communication Standard, 29 CFR 1910.1200. This amended standard, including appendices, is provided for your reference. Particularly noteworthy are changes in Paragraph (c), "Definitions." It is suggested that all employers carefully review this revised standard in order to ascertain their compliance status.

#### 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 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 (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, (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;

(viii) Cosmetics which are packaged for sale to consumers in a retail establishment, and cosmetics intended for personal consumption by employees while in the workplace;

(ix) Any consumer product or hazardous substance, as those terms are defined in the Consumer Product Safety Act

(15 U.S.C. 2051 et seq.) and Federal Hazardous Substances Act (15 U.S.C. 1261 et seq.) respectively, where the employer can show that it is used in the workplace for the purpose intended by the chemical manufacturer or importer of the product, and the use results in a duration and frequency of exposure which is not greater than the range of exposures that could reasonably be experienced by consumers when used for the purpose intended;

(x) Nuisance particulates where the chemical manufacturer or importer can establish that they do not pose any physical or health hazard covered under this section;

(xi) Ionizing and nonionizing radiation; and,

(xii) Biological hazards.

(c) **Definitions.**

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

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

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

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

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

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

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

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

**Compressed gas** means:

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

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

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

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

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

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

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

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

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

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

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

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

(i) **Aerosol, flammable** means an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;

(ii) **Gas, flammable** means: (a) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of thirteen (13) percent by volume or less; or

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

(iii) **Liquid, flammable** means any liquid having a flashpoint below 100°F (37.8°C), except any mixture having components with flashpoints of 100°F (37.8°C) or higher, the total of which make up 99% or more of the total volume of the mixture.

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

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

(i) **Tagliabue Closed Tester** (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24-1979 (ASTM D 56-79) for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at

100°F (37.8°C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or

(ii) **Pensky-Martens Closed Tester** (see American National Standard Method of Test for Flash Point by Pensky-Martens Closed Tester, Z11.7-1979 (ASTM D 93-79) for liquids with a viscosity equal to or greater than 45 SUS at 100°F (37.8°C), or that contains 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-structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

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

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

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

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

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

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

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

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

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

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

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

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

(d) **Hazard determination.** (1) Chemical manufacturers and importers shall evaluate chemicals produced in their workplaces or imported by them to determine if they are hazardous. Employers are not required to evaluate chemicals unless they choose not to rely on the evaluation performed by the chemical manufacturer or importer for the chemical to satisfy this requirement.

(2) Chemical manufacturers, importers or employers evaluating chemicals shall identify and consider the available scientific evidence concerning such hazards. For health hazards, evidence which is statistically significant and which is based on at least one positive study conducted in accordance with established scientific principles is considered to be sufficient to establish a hazardous effect if the results of the study meet the definitions of health hazards in this section.

Appendix A shall be consulted for the scope of health hazards covered, and Appendix B shall be consulted for the criteria to be followed with respect to the completeness of the evaluation, and the data to be reported.

(3) The chemical manufacturer, importer or employer evaluating chemicals shall treat the following sources as establishing that the chemicals listed in them are hazardous:

(i) 29 CFR part 1910, subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA); or,

(ii) Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment, American Conference of Governmental Industrial Hygienists (ACGIH) (latest edition). The chemical manufacturer, importer, or employer is still responsible for evaluating the hazards associated with the chemicals in these source lists in accordance with the requirements of this standard.

(4) Chemical manufacturers, importers and employers evaluating chemicals shall treat the following sources as establishing that a chemical is a carcinogen or potential carcinogen for hazard communication purposes:

(i) National Toxicology Program (NTP), Annual Report on Carcinogens (latest edition);

(ii) International Agency for Research on Cancer (IARC) Monographs (latest editions); or

(iii) 29 CFR part 1910, subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration.

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

(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 part 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% 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 1% (or in the case of carcinogens, less than 0.1%) could be released in concentrations which would exceed 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 representative, 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 sheets (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) includes 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) When 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:

(1) 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)(3) 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)(1) If OSHA determines that the specific chemical identity requested under paragraph (i)(3) of this section is not a bona fide trade secret, or that it is a trade secret, but the requesting health professional, employee, or designated representative has a legitimate medical or occupational health need for the information, has executed a written confidentiality agreement, and has shown adequate means to protect the confidentiality of the information, the chemical manufacturer, importer, or employer will be subject to citation by OSHA.

(ii) If a chemical manufacturer, importer, or employer demonstrates to OSHA that the execution of a confidentiality agreement would not provide sufficient protection against the potential harm from the unauthorized disclosure of a trade secret specific chemical identity, the Assistant Secretary may issue such orders or impose such additional limitations or conditions upon the disclosure of the requested chemical information as may be appropriate to assure that the occupational health services are provided without an undue risk of harm to the chemical manufacturer, importer, or employer.

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

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

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

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

#### **Appendix A to 1910.1200 Health Hazard Definitions (Mandatory)**

Although safety hazards related to the physical characteristics of a chemical can be objectively defined in terms of testing requirements (e.g. flammability), health hazard definitions are less precise and more subjective. Health hazards may cause measurable changes in the body--such as decreased pulmonary function. These changes are generally indicated by the occurrence of signs and symptoms in the exposed employees--such as shortness of breath, a non-measurable, subjective feeling. Employees exposed to such hazards must be apprized 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 Precautional 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 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<sub>50</sub>) of 50 milligrams or less per kilogram of body weight when administered orally to albino rats weights between 200 and 300 grams each.



(b) A chemical that has a median lethal dose (LD<sub>50</sub>) 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<sub>50</sub>) 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<sub>50</sub>) of more than 50 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<sub>50</sub>) 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<sub>50</sub>) 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 has 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 and Symptoms: Jaundice; liver enlargement

Chemicals: Carbon tetrachloride; nitrosamines

b. **Nephrotoxins:** Chemicals which produce kidney damage

Signs and Symptoms: Edema; proteinuria

Chemicals: Halogenated hydrocarbons; uranium

c. **Neurotoxins:** Chemicals which produce their primary toxic effects on the nervous system

Signs and Symptoms: Narcosis; behavioral changes; decrease in motor functions

Chemicals: Mercury; carbon disulfide

d. **Agents which act on the blood or hematopoietic system:** Decrease hemoglobin function; deprive the body tissues of oxygen

Signs and symptoms: Cyanosis; loss of consciousness

Chemicals: Carbon monoxide; cyanides

e. **Agents which damage the lung:** Chemicals which irritate or damage pulmonary tissue

Signs and 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 and symptoms: Birth defects; sterility

Chemicals: Lead; DBCP

g. **Cutaneous hazards:** Chemicals which affect the dermal layer of the body

Signs and symptoms: Defatting of the skin; rashes; irritation

Chemicals: Ketones; chlorinated compounds

h. **Eye hazards:** Chemicals which affect the eye or visual capacity

Signs and symptoms: Conjunctivitis; corneal damage

Chemicals: Organic solvents; acids

#### **Appendix B to 1910.1200 --Hazard Determination (Mandatory)**

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

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

(1) **Carcinogenicity:** As described in paragraph (d)(4) of this section and Appendix A of this section, a determination by the National Toxicology Program, the International Agency for Research on Cancer, or OSHA that a chemical is a carcinogen or potential carcinogen will be considered conclusive evidence for purposes of this section. In addition, however, all available scientific data on carcinogenicity must be evaluated in accordance with the provisions of this Appendix and the requirements of the rule.

2. **Human data:** Where available, epidemiological studies and case reports of adverse health effects shall be considered in the evaluation.

3. **Animal data:** Human evidence of health effects in exposed populations is generally not available for the majority of chemicals produced or used in the workplace.

Therefore, the available results of toxicological testing in animal populations shall be used to predict the health effects that may be experienced by exposed workers. In particular, the definitions of certain acute hazards refer to specific animal testing results (see Appendix A).

4. **Adequacy and reporting of data.** The results of any studies which are designed and conducted according to established scientific principles, and which report statistically significant conclusions regarding the health effects of a chemical, shall be a sufficient basis for a hazard determination and reported on any material safety data sheet. In vitro studies alone generally do not form the basis for a definitive finding of hazard under the HCS since they have a positive or negative result rather than a statistically significant finding.

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

#### **Appendix C to 1910.1200 --Information Sources (Advisory)**

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, Cosselin, 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 Services (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 Medlers NTIS Hazardline American Chemical Society Journal Excerpta Medica IRCS Medical Science Journal Pre-Med Intl Pharmaceutical Abstracts Paper Chem
Lockhead-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)
SDC-ORBIT, SDC Information Service, 2500 Colorado Avenue, Santa Monica, CA 90406.	CAS Files Chemdex, 2, 3 NTIS
National Library of Medicine..... Department of Health and Human Services, Public Health Service, National Institutes of Health, Bethesda, MD 20209.	Hazardous Substances Data Bank (NSDB) Medline Files Toxline Files Cancerlit RTECS Chemlime
Pergamon International Information Corp., 1340 Old Chain Bridge Road, McLean, VA 22101.	Laboratory Hazard Bulletin
Questel, Inc., 1625 Eye Street, NW, Sutie 818, Washington, DC 20006	CIS/ILO Cernernet
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

#### **Appendix D to 1910.1200--Definition of "Trade Secret" (Mandatory)**

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

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

Secrecy. The subject matter of a trade secret must be secret. Matters of public knowledge or of general knowledge in an industry cannot be appropriated by one as his secret. Matters which are completely disclosed by the goods which one markets cannot be his secret. Substantially, a trade secret is known only in the particular business in which it is used. It is not requisite that only the proprietor of the business know it. He may, without losing his protection, communicate it to employees involved in its use. He may likewise communicate it to others pledged to secrecy. Others may also know of it independently, as, for example, when they have discovered the process or formula by independent invention and are keeping it secret. Nevertheless, a substantial element of secrecy must exist, so that, except by the use of improper means, there would be difficulty in acquiring the information. An exact definition of a trade secret is not possible. Some factors to be considered in determining whether given information is one's trade secret are: (1) The extent to which the information is known outside of his business; (2) the extent to which it is known by employees and others involved in his business; (3) the extent of measures taken by him to guard the secrecy of the information; (4) the value of the information to him and his competitors; (5) the amount of effort or money expended by

him in developing the information; (6) the ease or difficulty with which the information could be properly acquired or duplicated by others.

Novelty and prior art. A trade secret may be a device or process which is patentable; but it need not be that. It may be a device or process which is clearly anticipated in the prior art or one which is merely a mechanical improvement that a good mechanic can make. Novelty and invention are not requisite for a trade secret as they are for patentability. These requirements are essential to patentability because a patent protects against unlicensed use of the patented device or process even by one who discovers it properly through independent research. The patent monopoly is a regard to the inventory. But such is not the case with a trade secret. Its protection is not based on a policy of regarding or otherwise encouraging the development of secret processes or devices. The protection is merely against breach of faith and reprehensible means of learning another's secret. For this limited protection it is not appropriate to require also the kind of novelty and invention which is a requisite of patentability. The nature of the secret is, however, an important factor in determining the kind of relief that is appropriate against one who is subject to liability under the rule stated in this Section. Thus, if the secret consists of a device or process which is a novel invention, one who acquires the secret wrongfully is ordinarily enjoined from further use of it and is required to account for the profits derived from his past use. If, on the other hand, the secret consists of mechanical improvements that a good mechanic can make without resort to the secret, the wrongdoer's liability may be limited to damages, and an injunction against future use of the improvements made with the aid of the secret may be inappropriate.

#### **Appendix E of 1910.1200 (Advisory)--Guidelines for Employer Compliance**

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) 219-4667.

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 to 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 paragraph (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 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 disease"). 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 chemicals, 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 any 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 chemicals hazards on the job which is provided by, for example, trade associations, unions, colleges, and professional schools. In addition, previous training, education and experience of a worker may relieve the employer of some of the burdens of informing and training that worker. Regardless of the method relied upon, however, the employer is always ultimately responsible for ensuring that employees are adequately trained. If the compliance officer finds that the training is deficient, the employer will be cited for the deficiency regardless of who actually provided the training on behalf of the employer.

#### D. Other Requirements

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

Does a list of the hazardous chemicals exist in each work area or at a central location?

Are methods the employer will use to inform employees of the hazards of non-routine tasks outlined?

Are employees informed of the hazards associated with chemicals contained in unlabeled pipes in their work areas?

On multi-employer worksites, has the employer provided other employers with information about labeling systems and precautionary measures where the other employers have employees exposed to the initial employer's chemicals?

Is the written program made available to employees and their designated representatives?

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

#### 5. Checklist for Compliance

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

- Obtained a copy of the rule
- Read and understood the requirements
- Assigned responsibility for tasks
- Prepared an inventory of chemicals
- Ensured containers are labeled
- Obtained MSDS for each chemicals
- 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 (20) 219-8151 for further assistance in identifying the appropriate contacts.

8. In Subsection 1928.21, paragraph (a)(5) is republished for the convenience of the user to read as follows:

#### **Subsection 1928.21 Applicable standards in 29 CFR Part 1910.**

(a) \* \* \*

(5) Hazard communication--Subsection 1910.1200.

\* \* \* \* \*

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## APPENDIX B

### OSHA STEPS TO COMPLIANCE

#### Introduction

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

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

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

#### What the Standard Requires

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

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

This program ensures that all employers receive the information they need to inform and train their employees properly and to design and put in place employee protection programs. It also provides

necessary hazard information to employees so they can participate in, and support, the protective measures in place at their workplaces.

#### How to Comply with the Standard

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

##### 1. Read the standard.

- \* Make sure you understand the provisions of the standard.
- \* Know your responsibility as an employer.

##### 2. List the hazardous chemicals in the workplace.

- \* Walk around the workplace, read all container labels, and list the identity of all materials that may be hazardous; the manufacturer's product name, location, and telephone number; and the work area where the product is used. Be sure to include hazardous chemicals that are generated in the work operation but are not in a container (e.g., welding fumes).
- \* Check with your purchasing department to ensure that all hazardous chemicals purchased are included on your list.
- \* Review your list and determine whether any substances are exempt (see paragraph (b) of the rule for exemptions).

- \* Establish a file on hazardous chemicals used in your workplace, and include a copy of the latest MSDS's, and any other pertinent information.

- \* Develop procedures to keep your list current. When new substances are used, add them to your list.

##### 3. Obtain material safety data sheets for all chemical substances.

- \* If you do not have a MSDS for a hazardous substance in your workplace, request a copy from the chemical manufacturer, distributor or importer as soon as possible. (See Tab H for a sample letter requesting an MSDS). An MSDS must accompany or precede the shipment and must be used to obtain identifying information such as the chemical name and the hazards of a particular substance.

## APÉNDICE B

### PASOS PARA CUMPLIR CON OSHA

#### Introducción

Cerca de 32 millones de trabajadores están potencialmente expuestos a uno o más químicos riesgosos. Existen aproximadamente 575,000 productos químicos, y anualmente se introducen cientos de nuevos productos. Esto representa un serio problema para los trabajadores expuestos y sus patrones. La exposición a químicos puede causar o contribuir a muchos efectos serios sobre la salud como problemas del corazón, daño a los pulmones y riñones, esterilidad, cáncer, quemaduras y salpullidos. Algunos químicos pueden ser riesgosos para la seguridad y tener el potencial de causar fuegos y explosiones así como otros accidentes serios.

Debido a la seriedad de estos problemas de seguridad y salud, y porque muchos patrones y trabajadores saben poco o nada respecto a ellos, la Administración de la Salud y Seguridad Ocupacional (OSHA) estableció en 1983, una norma llamada "Comunicación de Riesgos", la cual aplica a patrones en la industria de la manufactura. En 1987 se expandió el alcance de esta norma para incluir a patrones del sector no manufacturero.

El principal objetivo de esta norma es asegurar que los patrones y los trabajadores conozcan los riesgos de los químicos y cómo protegerse ellos mismos. A su vez, este conocimiento deberá de ayudar a reducir la incidencia de enfermedades y lesiones derivadas de los químicos.

#### Lo que la Norma Requiere

La Norma de Comunicación de Riesgos establece requerimientos uniformes para asegurar que los riesgos de todos los químicos importados a, producidos o usados en los lugares de trabajo de los Estados Unidos sean evaluados, y que la información resultante y las medidas de protección asociadas sean transmitidas a los patrones afectados y a sus trabajadores potencialmente expuestos.

Los fabricantes de químicos y los importadores deben de transmitir la información de riesgos que ellos obtengan de sus evaluaciones, a subsecuentes patrones por medio de etiquetas en los envases y de las hojas de datos de seguridad de los materiales (MSDS, por sus siglas en inglés). Además, todos los patrones cubiertos deben de establecer un programa de comunicación de riesgos para transmitir esta información a sus trabajadores a través de etiquetas en los envases, MSDS y entrenamiento.

Este programa asegura que todos los patrones reciban la información que ellos necesitan para informar y entrenar apropiadamente a sus trabajadores, y para diseñar y poner en práctica

programas de protección para trabajadores. También proporciona información de riesgos necesaria para los trabajadores de forma que ellos también puedan participar y dar soporte a las medidas de protección establecidas en sus lugares de trabajo.

#### Cómo Cumplir con la Norma

Los siguientes pasos deben de ayudarle a cumplir con la norma y a desarrollar su programa de comunicación de riesgos. (Ver programa modelo, Módulo #2)

##### 1. Lea la norma.

- Asegúrese de entender las estipulaciones de la norma.
- Conozca su responsabilidad como patrón.

##### 2. Enliste los químicos riesgosos presentes en su lugar de trabajo.

- Realice un recorrido por su lugar de trabajo, lea todas las etiquetas de los envases, y liste la identidad de todos los materiales que puedan ser de alto riesgo; el nombre del fabricante, dirección y teléfono; y el área de trabajo donde se utiliza el químico. Asegúrese de incluir los químicos riesgosos que se generan en las operaciones de trabajo pero que no se envasan (vapores de soldadura, por ejemplo).
- Verifique con su departamento de compras que todos los químicos riesgosos que se compran estén incluidos en su lista.
- Revise su lista para determinar si alguna de las sustancias está exenta (ver párrafo (b) de la regla de excepciones).
- Establezca un archivo para los químicos riesgosos que se utilizan en su lugar de trabajo, incluya una copia de las MSDS actualizadas y cualquier otra información pertinente.
- Desarrolle procedimientos para mantener su lista actualizada. Cuando se usen sustancias nuevas, añádalas a su lista.

##### 3. Obtenga hojas de datos de seguridad para todas las sustancias químicas.

- Si le falta una MSDS para alguna de las sustancias riesgosas en su lugar de trabajo, solicite tan pronto como sea posible, una copia al fabricante del químico, al distribuidor o al importador. (Ver muestra de carta para solicitar una MSDS). Una MSDS debe de ser utilizada para obtener información que identifique la sustancia, como nombre del químico y los riesgos que presenta este químico en particular.

\* Review each MSDS to be sure that it is complete and clearly written. The MSDS must contain the physical and chemical properties of a substance, as well as the physical and health hazards, routes of exposure, precautions for safe handling and use, emergency and first-aid procedures, and control measures. (See Tab F for a sample MSDS and other information).

\* If the MSDS is incomplete or unclear, contact the manufacturer or importer to get clarification on the missing information.

\* Make sure the MSDS is available to employees, designated representatives, and to the Assistant Secretary for Occupational Safety and Health.

#### **4. Make sure that all containers are labeled.**

The manufacturer, importer or distributor is responsible for labeling containers, but the employer must adhere to the following:

\* Ensure that all containers of hazardous substances in the workplace are labeled, tagged, or marked and include the identity of the hazardous chemical, and the appropriate hazard warnings. Container labels for purchased chemicals must also include the name and address of the chemical manufacturer, importer or other responsible party.

\* Check all incoming shipments of hazardous chemicals to be sure that they are labeled.

\* If a container is not labeled, obtain a label or the label information from the manufacturer, importer, or other responsible party or prepare a label using information obtained from these sources. Employers are responsible for ensuring that containers in the workplace are labeled, tagged, or marked.

\* Do not remove or deface existing labels on containers unless the container is immediately marked with the required information.

\* Instruct employees on the importance of labeling portable receptacles into which they have poured hazardous substances. If the portable container is for their immediate use, then the container does not have to be labeled.

#### **5. Develop and implement a written hazard communication program.**

This program must include:

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

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

- Revise cada MSDS para asegurarse de que está completa y escrita claramente. La MSDS debe de incluir las propiedades físicas y químicas de la sustancia, así como los riesgos físicos y de salud, las rutas de exposición, precauciones para su uso y manejo seguro, procedimientos de emergencia y primeros auxilios, y medidas de control. (Ver muestra de MSDS y otra información).
- Si la MSDS no está clara o está incompleta, contacte al fabricante o importador y pídale que clarifique o complete la información.
- Asegúrese de que las MSDS están disponibles para los trabajadores, los representantes designados y para el Assistant Secretary for Occupational Safety and Health (Secretario Asistente para la Seguridad y Salud Ocupacional).

#### **4. Asegúrese de que todos los envases tengan etiquetas.**

El fabricante, importador o distribuidor es responsable de etiquetar los envases, pero el patrón debe de cumplir con lo siguiente:

- Asegurar que todos los envases en el lugar de trabajo que contengan sustancias riesgosas estén etiquetados, marcados o identificados incluyendo la identidad del químico riesgoso y las precauciones necesarias. Las etiquetas de los envases de los químicos que se compran deben también de incluir el nombre y la dirección del fabricante del químico, del importador o de cualquier otra parte responsable.
- Verifique que todas las remesas (embarques) de químicos riesgosos que llegan tengan etiquetas.
- Si un envase no tiene etiqueta, obtenga una etiqueta o su información comunicándose con el fabricante, importador u otra parte responsable, o prepare una etiqueta utilizando la información que obtenga de estas partes. Los patrones son los responsables de asegurar que todos los envases en el lugar de trabajo estén etiquetados, marcados o identificados.
- No remueva o dañe la apariencia de las etiquetas a menos de que el envase vaya a ser inmediatamente marcado con la información requerida.
- Instruya a sus trabajadores respecto a la importancia de etiquetar los recipientes portátiles en los cuales han vaciado los químicos riesgosos. Si el envase portátil es para uso inmediato, entonces no necesita tener etiqueta.

#### **5. Desarrolle e implemente un programa por escrito de comunicación de riesgos.**

Este programa debe de incluir:

- Etiquetado de envases y otras formas de advertencia;

- Hojas de datos de seguridad de los materiales;
- Entrenamiento para los trabajadores basado en la lista de químicos, las MSDS, y la información de las etiquetas; y
- Métodos de comunicación de riesgos y otras medidas de precaución para empleados y otros.

Las siguientes secciones de este documento discutirán cada uno de estos pasos en mayor detalle, y le proporcionarán muestras del material discutido así como listas de productos, servicios y otros recursos.





## HAZARDOUS CHEMICALS LIST

### How to Identify Hazardous Chemicals

The responsibility for determining whether a chemical is hazardous lies with the chemical manufacturer or importer of a chemical. As a user of chemicals, you may rely on the evaluation received from these suppliers through labels on containers and material safety data sheets (MSDS's). To prepare a list of the chemicals in your facility that are covered by the rule, walk around and write down the names of chemicals that have a label indicating a potential hazard (e.g., "flammable" or "causes skin irritation"). Don't limit your self to chemicals in containers, however. Be aware of substances generated in work operations such as fumes or dusts, as these may be covered too.

Chemicals considered to be hazardous are those

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

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

### How to List Chemicals in the Workplace

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

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

## LISTA DE MATERIALES RIESGOSOS

### Cómo Identificar los Materiales Químicos Riesgosos

La responsabilidad de determinar si un químico es riesgoso descansa en el fabricante del químico o en su importador. Usted, como usuario del químico, puede confiar en la evaluación recibida de estos proveedores a través de las etiquetas en los envases y en las MSDS. Para preparar una lista de los químicos en sus instalaciones que están cubiertos por la norma, haga un recorrido y escriba los nombres de los químicos que tienen una etiqueta indicando un riesgo potencial (por ejemplo, "inflamable" o "causa irritación en la piel"). Sin embargo, no se limite a los químicos envasados. Esté atento a sustancias generadas por las operaciones de trabajo, como vapores y polvos, ya que ellos podrían estar cubiertos también.

Los químicos que se deben de considerar riesgosos son aquellos:

- Regulados por OSHA en 29 CFR 1910, Subparte Z, Sustancias Tóxicas y Riesgosas;
- Incluidos en la última edición de **Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment** de la Conferencia Gubernamental Americana de Higienistas Industriales (ACGIH, por sus siglas en inglés);
- Encontrados sospechosos o confirmados como carcinógenos en la última edición del **Annual Report on Carcinogens** del Programa Nacional de Toxicología, o en la última edición de **monographs** de la Agencia Internacional para la Investigación del Cáncer (IARC, por sus siglas en inglés)

Una vez que haya terminado la lista, debe de revisarla para determinar si alguno de los artículos está exento. En el párrafo (b)(6) de la norma, OSHA ha listado un número de artículos que se encuentran excluidos. Por ejemplo, el alcohol para frotar guardado en una estación de primeros auxilios puede estar exento bajo el párrafo (b)(6)(vi) debido a que está destinado para uso personal de los trabajadores. Por prudencia, algunos empleadores incluyen todos los químicos aún si éstos están exentos. En general, si hay alguna duda respecto a un químico en particular, lo mejor es incluirlo en el programa de comunicación de riesgos.

### Cómo Listar los Químicos en el Lugar de Trabajo

Todos los químicos riesgosos conocidos presentes en su lugar de trabajo, deben de ser listados utilizando la identidad que aparece en la MSDS y en la etiqueta apropiada para ese químico. La lista puede incluir también los nombres comunes o comerciales, números de registro del Chemical Abstract Service (CAS, por sus siglas en inglés), número de referencia de la MSDS, etc. (Ver muestra incluida). La lista puede ser compilada para todo el lugar de trabajo, o para cada área de trabajo individual en las diferentes secciones de sus instalaciones).

La lista será un inventario de todo aquello para el cual se pueda obtener una hoja de datos de seguridad del material. Ésta será una parte del programa escrito, y debe de estar disponible para los trabajadores cuando lo requieran.

The following list identifies some types of potentially hazardous chemicals that may be present in the workplace:

Acids	Insecticides
Adhesives	Herbicides
Aerosols	Janitorial supplies
Asbestos	Kerosene
Battery fluids	Lacquers
Benzene	Lead
Catalysts	Lye
Caustics	Oxalic Acid
Cleaning Agents	Paints
Coal tar pitch	Pesticides
Coatings	Plastics
Degreasing agents	Process chemicals
Detergents	Resins
Dusts	Sealers
Etching agents	Shellacs
Fiberglass	Solders
Flammables	Solvents
Foaming resins	Strippers
Fuels	Surfactants
Fungicides	Thinners
Gasoline	Varnishes
Glues	Water treatments
Greases	Wood preservatives
Industrial oils	Xylene

**Checklist**

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

La siguiente lista identifica algunos tipos de químicos riesgosos que podrían estar presentes en los lugares de trabajo:

Ácidos (Acids)	Insecticidas (Insecticides)
Adhesivos (Adhesives)	Herbicidas (Herbicides)
Aerosoles (Aerosoles)	Materiales de conserjería (Janitorial supplies)
Asbesto (Asbestos)	Keroseno (Kerosene)
Líquido de baterías (Battery fluids)	Lacas (Lacquers)
Benceno (Benzene)	Plomo (Lead)
Catalizadores (Catalysts)	Lejía (Lye)
Cáusticas (Caustics)	Ácido Oxálico (Oxalic Acid)
Agentes de limpieza (Cleaning agents)	Pinturas (Paints)
Pez de alquitrán de hulla (Coal tar pitch)	Pesticidas (Pesticides)
Revestimientos (Coatings)	Plásticos (Plastics)
Agentes desgrasantes (Degreasing agents)	Químicos de los procesos (Process chemicals)
Detergentes (Detergents)	Resinas (Resins)
Polvos (Dusts)	Selladores (Sealers)
Agentes para grabado (Etching agents)	Lacas (Shellacs)
Fibra de vidrio (Fiberglass)	Soldaduras (Solders)
Inflamables (Flammables)	Solventes (Solvents)
Resinas en espuma (Fuming resins)	Aguarrás (Strippers)
Combustibles (Fuels)	Surfactantes (Surfactants)
Fungicidas (Fungicides)	Disolvente (Thinners)
Gasolina (Gasoline)	Barnices (Varnishes)
Pegamentos (Glues)	Tratamientos de agua (Water treatments)
Grasas (Greases)	Preservativos para madera (Wood preservatives)
Aceites industriales (Industrial oils)	Xyleno (Xylene)

#### Lista de Verificación (Checklist)

	<b>Sí</b>	<b>No</b>
1. Lista de todos los químicos en nuestras instalaciones.	___	___
2. Establecimiento de un archivo para la información de los químicos riesgosos.	___	___
3. Obtención de las MSDS para cada químico riesgoso en uso.	___	___
4. Desarrollo de un sistema que asegure que todos los químicos riesgosos que llegan estén etiquetados.	___	___
5. Revisión de cada una de las MSDS para asegurarse de que están completas.	___	___
6. Aseguramiento de que las MSDS estén disponibles donde se necesiten.	___	___
7. Desarrollo de un programa escrito de comunicación de riesgos.	___	___
8. Desarrollo de un método de comunicación de riesgos para los trabajadores y otros.	___	___
9. Información a trabajadores sobre medidas de protección para químicos riesgosos que se utilizan en el lugar de trabajo.	___	___
10. Alertar a los trabajadores sobre otras formas de advertencia que pueden ser usadas.	___	___

# Material Safety Data Sheet (MSDS)

## Introduction

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

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

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

## OSHA Requirements

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

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

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

## Sections of an MSDS and Their Significance

OSHA specifies the information to be included on an MSDS, but does not prescribe the precise format for an MSDS. A non-mandatory MSDS form (see blank OSHA Form 174 at the end of this section) that meets the Hazard Communication Standard requirements has been issued and can be used as is or expanded as needed. The MSDS must be in English and must include at least the following information.

### Section I. Chemical Identity

- The chemical and common name(s) must be provided for single chemical substances.

An identity on the MSDS must be cross-referenced to the identity found on the label.

### Section II. Hazardous Ingredients

- For a hazardous chemical mixture that has been tested as a whole to determine its hazards, the chemical and common names of the ingredients that are associated with the hazards, and the common name of the mixture must be listed.
- If the chemical is a mixture that has not been tested as a whole, the chemical and common names of all ingredients determined to be health hazards and comprising 1 percent or greater of the composition must be listed.

## Hoja de Datos de Seguridad de los Materiales (MSDS)

### Introducción

Las Hojas de Datos de Seguridad de los Materiales (MSDS) contienen información preparada por el fabricante o importador de un químico y describen propiedades químicas y físicas, riesgos para la salud y físicos, rutas de exposición, precauciones para su manejo y uso seguro, procedimientos de emergencia y primeros auxilios, y medidas de control. La información contenida en una MSDS ayuda en la selección de productos seguros y ayuda a los patrones y trabajadores a prepararse para responder efectivamente a las situaciones diarias de exposición así como para las situaciones de emergencia.

Las MSDS son una fuente comprensiva de información para todos los tipos de patrones. En las MSDS puede haber información que no sea útil para usted, o que no sea importante para la seguridad y salud de sus operaciones en particular. Concéntrese en la información que es aplicable a su situación. Generalmente, la información sobre riesgos y las medidas de protección deben de ser el foco de su atención.

Este paquete contiene un glosario de términos usados en las MSDS (Ver Apéndice E). Algunos patrones que no estén muy familiarizados con la terminología química podrán encontrar gran ayuda aquí para leer y entender las MSDS.

### Requerimientos de OSHA

Los patrones deben de mantener las MSDS completas y actualizadas para cada químico riesgoso que se utilice en sus instalaciones. Tienen el derecho de obtener esta información automáticamente cuando compran el material. Cuando haya información nueva e importante referente a los riesgos de un producto, o respecto a las formas de protección contra los riesgos, los fabricantes, importadores o distribuidores deben de añadir esta información a sus MSDS en un periodo no mayor de tres meses, y proporcionarla a sus consumidores con el siguiente envío del químico. Los patrones deben de tener una MSDS para cada químico riesgoso utilizado en sus lugares de trabajo. Si hay múltiples proveedores del mismo químico, no hay necesidad de mantener múltiples MSDS para ese químico.

Aunque no se requiere que las MSDS estén físicamente anexadas al envío, éstas deben acompañar o preceder al envío. Cuando el fabricante o proveedor falle en enviar una MSDS con un envío identificado como químico riesgoso, el patrón debe de obtener una del fabricante del químico, importador o distribuidor tan pronto como sea posible. De igual forma, si la MSDS está incompleta o no es clara, el patrón debe de contactar al fabricante o importador para clarificar u obtener la información faltante. (Ver modelo de cartas para solicitar una MSDS o información adicional).

Cuando un patrón sea incapaz de obtener una MSDS de su proveedor o fabricante, el o ella debe de presentar una queja por escrito, con información completa sobre el caso, a la oficina de área de OSHA más cercana. OSHA llamará y enviará una carta certificada al proveedor o fabricante para obtener la información necesaria. Si el fabricante todavía falla en responder en un tiempo razonable, OSHA realizará una inspección en las instalaciones del proveedor o fabricante para tomar las acciones apropiadas de cumplimiento.

### Secciones de una MSDS y su Significado

OSHA especifica la información que debe de incluirse en una MSDS, pero no especifica el formato que debe de seguir. Se ha proporcionado una forma no mandataria de MSDS (ver Forma OSHA 174) que cumple con los requerimientos de la Norma de Comunicación de Riesgos, la cual puede ser utilizada como está o expandirse si es necesario. La MSDS debe de estar en inglés y debe de incluir por lo menos la siguiente información.

#### Sección I. Identidad Química

- Para sustancias con un solo químico, se deben de proporcionar los nombres químicos y los comunes.
- La identidad en la MSDS debe de corresponder a la identidad que se encuentra en la etiqueta.

#### Sección II. Ingredientes de Alto Riesgo

- Para una mezcla química que haya sido probada como un todo para determinar sus riesgos, se deben de listar los nombres químicos y comunes de los ingredientes asociados con los riesgos, así como el nombre común de la mezcla.
- Si el químico es una mezcla que no se haya probado como un todo, se deben de listar los nombres de todos los ingredientes determinados como riesgosos para la salud y que constituyan el uno por ciento o más de su composición.

- Chemical and common names of carcinogens must be listed if they are present in the mixture at levels of 0.1 percent or greater.
- All components of a mixture that have been determined to present a physical hazard must be listed.
- Chemical and common names of all ingredients determined to be health hazards and comprising less than 1 percent (0.1 percent for carcinogens) of the mixture must also be listed if they can still exceed an established Permissible Exposure Limit (PEL) or Threshold Limit Value (TLV) or present a health risk to exposed employees in these concentrations.

### **Section III. Physical and Chemical Characteristics**

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

### **Section IV. Fire and Explosion Hazard Data**

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

### **Section V. Reactivity Data**

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

### **Section VI. Health Hazards**

- The actual and chronic health hazards of the chemical, together with signs and symptoms of exposure, must be listed. In addition, any medical conditions that are aggravated by exposure to the compound, must be included. The specific types of chemical health hazards defined in the standard include carcinogens, corrosives, toxins, irritants, sensitizers, mutagens, teratogens, and effects on target organs (i.e., liver, kidney, nervous system, blood, lungs, mucous membranes, reproductive system, skin, eyes, etc.).
- The route of entry section describes the primary pathway by which the chemical enters the body. There are three principal routes of entry; inhalation, skin, and ingestion.
- This section of the MSDS supplies the OSHA PEL, the ACGIH TLV, and other exposure levels used or recommended by the chemical manufacturer.

If the compound is listed as a carcinogen (cancer-causing agent) by OSHA, the National Toxicology Program (NTP), or the International Agency for Research on Cancer (ARC), this information must be indicated on the MSDS.

### **Section VII. Precautions for Safe Handling and Use**

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

### **Section VIII. Control Measures**

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

### **Employer Responsibilities**

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

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

- Se deben de listar los nombres químicos y los nombres comunes de los carcinógenos si éstos están presentes en la mezcla a niveles de 0.1 por ciento o más.
- Se deben de listar todos los componentes de una mezcla si se ha determinado que pueden presentar un riesgo físico.
- Se deben de listar los nombres químicos y los nombres comunes de todos los ingredientes que se hayan determinado como riesgosos para la salud y que constituyan menos del uno por ciento de la mezcla (0.1 por ciento para carcinógenos) si éstos todavía pueden exceder el Límite de Exposición Permisible (PEL, por sus siglas en inglés) establecido, o el Límite Mínimo de Concentración (TLV, por sus siglas en inglés), o presentar un riesgo para la salud para los trabajadores expuestos a esas concentraciones.

### **Sección III. Características Físicas y Químicas**

- Se deben de listar las características físicas y químicas de la sustancia riesgosa. Esto incluye información como punto de ebullición y congelamiento, densidad, presión de vapor, gravedad específica, solubilidad, volatilidad, olor y apariencia general del producto. Estas características representan información importante para diseñar prácticas de trabajo seguras y saludables.

### **Sección IV. Datos sobre los Riesgos de Fuego y Explosión**

- Se debe de describir el potencial de la mezcla de explotar o encender fuego. Se debe de identificar el riesgo de fuego del químico y las condiciones bajo las cuales éste puede explotar o incendiarse. También se deben de describir los tipos de agentes extinguidores recomendados y los métodos para combatir el fuego.

### **Sección V. Datos de Reactividad**

- Esta sección presenta información referente a otros químicos y sustancias con las que este químico es incompatible, o con el cual reacciona. Se debe de incluir cualquier información sobre productos de descomposición riesgosos, como monóxido de carbono.

### **Sección VI. Riesgos para la Salud**

- Se deben de listar los riesgos del químico actuales y los crónicos, junto con signos y síntomas de exposición. Además, se debe de incluir cualquier condición médica que pueda agravarse con la exposición al químico. Los tipos específicos de riesgos a la salud definidos en la norma incluyen carcinógenos, corrosivos, toxinas, irritantes, sensibilizadores, mutágenos, teratógenos y efectos en órganos específicos (por ejemplo, hígado, riñón, sistema nervioso, sangre, pulmones, membranas mucosas, sistema reproductivo, piel, ojos, etc.).
- La sección de ruta de entrada describe la ruta principal por donde el químico entra en el cuerpo. Existen tres rutas principales de entrada: inhalación, piel e ingestión.
- Esta sección de la MSDS proporciona el PEL de OSHA, el TLV de la ACGIH, y otros niveles de exposición usados o recomendados por el fabricante del químico.
- Si el producto químico ha sido listado por OSHA como un carcinógeno (agente causante de cáncer), el Programa Nacional de Toxicología (NTP, por sus siglas en inglés), o la Agencia Internacional para la Investigación del Cáncer (ARC, por sus siglas en inglés), esta información debe de indicarse en la MSDS.

### **Sección VII. Precauciones para el Manejo y Uso Seguro**

- La norma requiere que el preparador describa las precauciones para un manejo y uso seguro del producto. Éstas incluyen las prácticas de higiene industrial recomendadas, las precauciones que se deben de tomar para reparar y mantener el equipo, y los procedimientos para limpieza de derrames y fugas. Algunos fabricantes también usan esta sección para incluir información útil que no está específicamente requerida por la norma, como los métodos de la EPA para la eliminación de desechos así como los requerimientos locales y estatales.

### **Sección VIII. Medidas de Control**

- La norma requiere que el preparador de la MSDS liste cualquier medida de control generalmente aplicable. Esto incluye controles de ingeniería, procedimientos de manejo seguro, y equipo de protección personal. Frecuentemente se incluye información sobre el uso de gafas de seguridad, guantes, trajes que protejan el cuerpo, respiradores y máscaras.

### **Responsabilidades del Patrón**

Los patrones deben de asegurar que cada empleado tenga el conocimiento básico sobre cómo encontrar información en una MSDS, y cómo usar esa información apropiadamente. Los patrones deben de asegurar lo siguiente:

- Que las MSDS completas y actualizadas estén disponibles para los trabajadores durante cada turno de trabajo, cuando éstos estén en sus áreas de trabajo.
- Que se proporcione información para cada químico riesgoso.



## Sample Letter Requesting an MSDS

Date

Blitz Manufacturing Company  
1923 Oak Grove Lane  
Springfield, Massachusetts 02110

Dear Sir:

The Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (29 CFR 1910.1200) requires employers be provided Material Safety Data Sheets (MSDS's) for all hazardous substances used in their facility, and to make these MSDS's available to employees potentially exposed to these hazardous substances.

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

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

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

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

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

Sincerely,

George Rogers, President  
XYZ Company

## Ejemplo de Carta para Solicitar una MSDS

Fecha

Blitz Manufacturing Company  
1923 Oak Grove Lane  
Springfield, Massachusetts 02110

Estimado Sr.:

La Norma de Comunicación de Riesgos (29 CFR 1910.1200) de la Administración de la Seguridad y Salud Ocupacional (OSHA, por sus siglas en inglés) requiere que los patrones proporcionen las Hojas de Datos de Seguridad del Material (MSDS, por sus siglas en inglés) para todas las sustancias riesgosas utilizadas en sus instalaciones, y que ponga estas MSDS a disposición de los trabajadores potencialmente expuestos a esas sustancias riesgosas.

Nosotros, por lo tanto, requerimos una copia de la MSDS de su producto listado bajo el número\_\_\_\_\_. No recibimos una MSDS con el envío inicial del Solvente Blitz 90, que recibimos de usted el 1ro de octubre. También, requerimos cualquier información adicional, MSDS suplementaria, o cualquier otro dato relevante que su compañía o sus proveedores tengan referente a los aspectos de seguridad y salud de este producto.

Por favor considere esta carta como una solicitud permanente a su compañía sobre cualquier información referente a los aspectos de seguridad y salud del uso de este producto que puedan conocerse en el futuro.

La MSDS y cualquier otra información relevante deben de ser enviadas para ser usadas en 10, 20, 30 días (**seleccione el tiempo apropiado**). Retrasos en el recibimiento de la información pueden impedir el uso de su producto. Por favor envíe la información solicitada a Mr. Robert Smith, Jefe de Seguridad y Salud, Compañía XYZ, Boston, Massachusetts 02109.

Por favor note que si no recibimos la MSDS del químico mencionado arriba para el (**fecha**), nosotros tendremos que notificar a OSHA de nuestra inhabilidad de obtener esta información. Es nuestra intención cumplir con todas las provisiones de la Norma de Comunicación de Riesgos (1910.1200) y las MSDS son una parte integral de este esfuerzo.

Su cooperación será grandemente apreciada. Gracias por su pronta respuesta a esta solicitud. Si usted tiene alguna pregunta referente a este asunto, por favor contacte al Sr. Smith al teléfono (617) 223-9460.

Sinceramente,

George Rogers, Presidente  
Compañía XYZ

## Sample Letter Requesting Additional MSDS Information

Date

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

Dear Mr. Winston:

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

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

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

Sincerely,

Robert Stevens  
Purchasing Agent  
XYZ Company

## Ejemplo de Carta para Solicitar Información Adicional para una MSDS

Fecha

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

Estimado Sr. Winston:

En un esfuerzo por cumplir con la Norma de Comunicación de Riesgos de la Administración de la Seguridad y Salud Ocupacional (OSHA, por sus siglas en inglés), mi compañía está buscando información adicional sobre un químico producido por ACE Chemical Company. La MSDS que nos fue enviada parece estar deficiente en:

1. Clean-VU 210 - no se mencionan los efectos sobre la salud.
2. Clean-up 34 - Solvente - no se mencionan los riesgos físicos.

Por favor note que para nosotros poder cumplir con la Norma de Comunicación de Riesgos, y para proveer entrenamiento a nuestros trabajadores, necesitamos contar con las MSDS completas, particularmente en referencia a los aspectos identificados arriba. Su cooperación será apreciada.

Sinceramente,

Robert Stevens  
Agente de Compras  
Compañía XYZ

## Material Safety Data Sheet Checklist

You must ensure that each MSDS contains the following information:

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

## Sample Training Program

### Introduction

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

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

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

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

- The provisions of the Hazard Communication Standard
- Any operations in employee's work areas where hazardous chemicals are present
- The location and availability of the company's written hazard communication program, including the required list(s) of hazardous chemicals and MSDS's required by the Hazard Communication Standard
- Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area
- The physical and health hazards of the chemicals in the work area

## Lista de Verificación para las Hojas de Datos de Seguridad de los Materiales (Material Safety Data Sheet Checklist)

Usted debe de asegurarse que cada MSDS contenga la siguiente información:

1. Identidad en la etiqueta del químico o producto utilizado. \_\_\_\_\_
2. Nombre y dirección del fabricante. \_\_\_\_\_
3. Nombre común y químico de cada ingrediente riesgoso. \_\_\_\_\_
4. Nombre, dirección y teléfono para información sobre riesgos y emergencias. \_\_\_\_\_
5. Fecha de preparación o revisión. \_\_\_\_\_
6. Características químicas y físicas del químico riesgoso, como presión de vapor y punto de llama (punto de inflamación). \_\_\_\_\_
7. Riesgos físicos, incluyendo el potencial de incendio, explosión y reactividad. \_\_\_\_\_
8. Riesgos para la salud conocidos. \_\_\_\_\_
9. Límite de exposición permitido (PEL) de OSHA, límite mínimo de concentración (TLV) de ACGIH, u otros límites de exposición. \_\_\_\_\_
10. Procedimientos de emergencia y primeros auxilios. \_\_\_\_\_
11. Si OSHA, NTP o IARC han listado el ingrediente como carcinógeno. \_\_\_\_\_
12. Precauciones para su manejo y uso seguros. \_\_\_\_\_
13. Medidas de control como controles de ingeniería, prácticas de trabajo, prácticas de higiene o equipo de protección personal requerido. \_\_\_\_\_
14. Principales rutas de entrada. \_\_\_\_\_
15. Procedimientos para derrames, fugas y limpieza. \_\_\_\_\_

### Ejemplo de Programa de Entrenamiento

#### Introducción

Como ya se ha dicho, el entrenamiento es una parte integral del programa de comunicación de riesgos.

Bajo la Norma de Comunicación de Riesgos, efectiva a partir del 23 de mayo de 1988, se requiere que cada empleador informe y entrene a sus trabajadores al momento de ser asignados a su primera tarea en un área de trabajo donde haya químicos riesgosos presentes, y siempre que un nuevo riesgo sea introducido dentro del área de trabajo.

Mientras que el listado de temas que deben de presentarse en un programa de información y entrenamiento de trabajadores es el mismo para todos los patrones, la información que realmente se debe de presentar debe de basarse en la información del riesgo específico transmitido por las etiquetas y MSDS para ese lugar o área de trabajo.

El siguiente es un listado de tópicos que deben de cubrirse en todos los programas de información y entrenamiento:

- Las provisiones de la Norma de Comunicación de Riesgos
- Cualquier operación en las áreas de trabajo del empleado donde haya químicos riesgosos presentes.
- La ubicación y disponibilidad del programa escrito de comunicación de riesgos de la compañía, incluyendo la lista de químicos riesgosos y MSDS requeridas por la Norma de Comunicación de Riesgos.
- Métodos y observaciones que se deben de usar para detectar la presencia o liberación de un químico riesgoso en el área de trabajo.
- Los riesgos físicos y contra la salud de los químicos presentes en el área de trabajo.

- The measures employees can take to protect themselves from these hazards, including information on work practices, emergency procedures and personal protective equipment required by the employer
- The details of the employer's written hazard communication program, including an explanation of the labeling system used by the employer, MSDS's, and how employees can obtain and use the appropriate hazard information on the labels and in the MSDS's.

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

### **Know the Provisions of the Hazard Communication Standard**

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

### **Identify Those Employees to be Trained**

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

### **Know the Hazardous Chemicals in Your Workplace**

Define hazardous chemicals: Any chemical that is a physical or health hazard.

- "Physical hazard" is one for which there is scientifically valid evidence that the chemical is a combustible liquid, a compressed gas, an explosive, a flammable substance, an organic peroxide, an oxidizer, a pyrophoric, or an unstable (reactive) or water-reactive substance.
- "Health hazard" is one that includes cancer-causing, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents that act on hematopoietic system, and agents that damage the lungs, skin, eyes, or mucous membranes. (Include additional information from Appendices A and B of the standard; see Appendix I of this kit for further explanations.)

### **Make a List of the Hazardous Chemicals in your Workplace**

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

- Las medidas que los trabajadores pueden tomar para protegerse de esos riesgos, incluyendo información sobre prácticas de trabajo, procedimientos de emergencia y equipo de protección personal requerido por el patrón.
- Los detalles del programa escrito de comunicación de riesgos, incluyendo una explicación del sistema de etiquetado usado por el patrón, las MSDS, y cómo los trabajadores pueden obtener y usar la apropiada información sobre riesgos mostrada en las etiquetas y en las MSDS.

Las siguientes secciones ilustran cómo puede diseñarse un programa de entrenamiento típico. Usando esta guía, junto con etiquetas y MSDS específicas para su establecimiento, los patrones podrán desarrollar programas de entrenamiento efectivos que logren el objetivo de la Norma de Comunicación de Riesgos.

### **Conozca las Provisiones de la Norma de Comunicación de Riesgos**

- Familiarícese con los requerimientos de la norma
- Conozca sus responsabilidades bajo la ley
- Informe a todos sus empleados sobre la ley y sus derechos que ella les confiere.

### **Identifique los Trabajadores a Entrenar**

- Evalúe la exposición actual y potencial de los trabajadores a los químicos riesgosos
- Determine las necesidades de entrenamiento en base a esta exposición, tanto durante el uso normal de los químicos riesgosos como durante las emergencias.
- Determine la forma apropiada de entrenar a los nuevos trabajadores y supervisores
- Entrene a los trabajadores y supervisores respecto a los químicos específicos presentes en su lugar de trabajo, así como en sus riesgos.

### **Conozca los Químicos Riesgosos en su Lugar de Trabajo**

Defina "Químico Riesgoso": Cualquier químico que presenta un riesgo físico o para la salud.

- "Riesgo físico" es aquel para el cual existe una evidencia científica válida de que el químico es un líquido combustible, un gas comprimido, un explosivo, una sustancia inflamable, un peróxido orgánico, un agente oxidante, un material pirofórico, o una sustancia inestable (reactiva) o que reacciona con el agua.
- "Riesgo para la salud" es aquel que incluye agentes tóxicos o altamente tóxicos que causan cáncer, toxinas reproductivas, irritantes, corrosivas, sensibilizadoras, hepatotoxinas, nefrotoxinas, neurotoxinas, agentes que actúan en el sistema hematopoyético, y agentes que dañan los pulmones, piel, ojos o membranas mucosas. (Incluya información adicional de los Apéndices A y B de la norma).

### **Elabore una Lista de los Químicos Riesgosos Presentes en su Lugar de Trabajo**

- Su lista debe de incluir los nombres de los químicos, sus riesgos, cualquier medida de protección a tomar, y procedimientos de emergencia y primeros auxilios.
- Identifique el proceso u operación donde se usan los químicos, y el nombre y dirección del fabricante.
- Asegúrese de que exista una hoja de datos de seguridad del material (MSDS) para cada químico, y que la lista refiera la MSDS correspondiente a cada químico.
- Asegúrese de que la lista esté fácilmente disponible para sus trabajadores (o para otros patrones trabajando en sus instalaciones, si ellos se lo solicitan).
- Asegúrese de que los trabajadores entiendan la información referente a los químicos listados en el lugar de trabajo.



### **Instruct Employees on How to Use and Interpret MSDS's**

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

### **Instruct Employees on Labeling Requirements**

Check each container entering the workplace for appropriate labeling (i.e., identity of chemicals, hazard warnings, name and address of manufacturer/responsible party).

Explain the importance of reading labels and of following directions for the safe handling of chemicals.

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

### **Review Existing Methods of Controlling Workplace Exposures**

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

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

#### **Consider Keeping a Record of Employee/Supervisor Training**

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

#### **Establish a Written Emergency Action Plan**

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

### **Instruya a sus Trabajadores Sobre Cómo Usar e Interpretar las MSDS**

- Asegúrese de que usted tiene una MSDS para cada producto químico riesgoso que se empaca, maneja o transfiere en sus instalaciones.
- Revise cada MSDS que usted recibe para asegurarse de que contiene toda la información requerida por la norma.
- Obtenga la MSDS o información cuando sea necesario (Por ejemplo, cuando no reciba una MSDS del fabricante, importador o proveedor, o cuando la MSDS esté incompleta. Ver ejemplo de carta para solicitar MSDS).

### **Instruya a sus Trabajadores Sobre los Requerimientos de Etiquetado**

Verifique que cada recipiente que llegue a sus instalaciones cuente con una etiqueta apropiada. (Por ejemplo, que incluya identidad del químico, advertencias sobre riesgos, nombre y dirección del fabricante/parte responsable).

Explique la importancia de leer las etiquetas y de seguir las direcciones sobre el manejo seguro de los químicos.

- Etiquete, identifique o marque los recipientes a los cuales se transfieren los químicos riesgosos con la identidad del químico y las advertencias sobre sus riesgos.
- Las advertencias sobre los riesgos deben de transmitir información específica sobre los riesgos físicos o contra la salud. Explique que palabras como “precaución”, “peligro”, “dañino si es absorbido por la piel”, etc., son una manifestación de precaución, pero no identifican los riesgos específicos.
- Explique las excepciones en el etiquetado de recipientes portátiles o de procesos estacionarios.
- Etiquete recipientes portátiles cuando éstos no sean para “uso inmediato” (Nota: Los recipientes portátiles no requieren etiquetas cuando los químicos que se transfieren a ellos provienen de recipientes etiquetados, y cuando los químicos van a ser usados inmediatamente por el trabajador que los está transfiriendo).
- En equipo de proceso estacionario, en lugar de etiquetas, se pueden usar hojas de procesos, boletas de lote, procedimientos estándares de operación, u otros materiales escritos si éstos contienen la misma información que una etiqueta, y si están ampliamente disponibles para los trabajadores en sus estaciones o áreas de trabajo.
- Refiera los identificadores del químico en las etiquetas a las MSDS y a las listas de químicos riesgosos.
- Esté consciente de otros químicos riesgosos que puedan tener etiquetas específicas, requerimientos bajo otras normas (como por ejemplo, asbestos, plomo, etc.).

### **Revise los Métodos Existentes de Control de Exposición en el Lugar de Trabajo**

- Controles de Ingeniería: cambios en la maquinaria, operaciones de trabajo, o distribución de la planta que reducen o eliminan los riesgos (por ejemplo, controles de ventilación, cercado/cobertura de procesos, aislamiento, etc.)
- Controles Administrativos: buenas prácticas de mantenimiento, prácticas de trabajo seguras, monitoreo personal y médico, turnos más cortos o cambio en los horarios de trabajo, etc.
- Equipo de Protección Personal: lentes de seguridad, gafas, máscaras de protección, protección para los oídos, respiradores, guantes, capuchas, botas y trajes de cuerpo entero.

### **Revise sus Procedimientos Actuales para el Manejo de Químicos y Compárelos con las Prácticas Recomendadas en las MSDS y en las Etiquetas**

#### **Considere Mantener un Registro de Entrenamiento de Supervisores y Trabajadores**

- Dé seguimiento y evalúe su programa de entrenamiento para asegurarse de que sus trabajadores saben cómo manejar los químicos que están usando, y si están aplicando el entrenamiento que usted les ha dado.

#### **Establezca un Plan por Escrito de Acción Durante las Emergencias**

- Entrenamiento en procedimientos como controles de emergencia y números de teléfono, planes de evacuación, sistemas de alarma, procedimientos de reporte y apagado del proceso, primeros auxilios, protección personal, etc.
- Cómo y cuándo reportar las fugas y derrames.

**TRAINING CHECKLIST**

	<b>Complete</b>	<b>Incomplete</b>
1. Establish a thorough training program.	_____	_____
2. Identified employees who need training.	_____	_____
3. Training program ensures that new employees are trained before their first assignment.	_____	_____
4. Informed employees of the specific information and training requirements of the Hazard Communication Standard.	_____	_____
5. Informed employees of the requirements of the standard, and their rights under the law.	_____	_____
6. Informed employees of our written program and training requirements.	_____	_____
7. Informed employees of the different types of chemicals and the hazards associated with them.	_____	_____
8. Informed employees of specific hazards of the chemicals and processes they work with and their proper use and handling.	_____	_____
9. Informed employees of the hazards associated with performing non-routine tasks.	_____	_____
10. Employees know how to detect the presence or release of hazardous chemicals in the workplace.	_____	_____
11. Trained employees in the use of proper work practices, personal protective equipment and clothing, and other controls to reduce or eliminate their exposure to the chemicals in their work area.	_____	_____
12. Trained employees in emergency and first-aid procedures and signs of overexposure.	_____	_____
13. Listed all the hazardous chemicals in our workplace.	_____	_____
14. Employees know when and how to update our hazardous chemical list.	_____	_____
15. Obtained or developed a material safety data sheet for each hazardous chemical in the workplace.	_____	_____
16. Explained how to use an MSDS.	_____	_____
17. Informed employees of the list of hazardous chemicals and MSDS's and where they are located.	_____	_____
18. Explained labels and their warnings to employees.	_____	_____
19. Developed a system to ensure that all incoming hazardous chemicals are checked for proper labels and data sheets.	_____	_____
20. Established procedures to ensure proper labeling or warning signs for containers that hold hazardous chemicals.	_____	_____
21. Developed a way to identify and inform employees of new hazardous chemicals before they are introduced into a work area	_____	_____
22. Establish a way to inform employees of new hazards associated with the chemicals they already use	_____	_____
23. Develop a way to evaluate the effectiveness of the training program and to keep track of who has received training.	_____	_____

## LISTA DE VERIFICACIÓN PARA EL ENTRENAMIENTO

	Completo	Incompleto
1. Establecer un programa comprensivo de entrenamiento.	_____	_____
2. Identificar a los trabajadores que necesitan entrenamiento.	_____	_____
3. El programa de entrenamiento asegura que los nuevos trabajadores sean entrenados antes de que se les asigne su primera tarea.	_____	_____
4. Informar a los trabajadores sobre los requerimientos de entrenamiento e información específica de la Norma de Comunicación de Riesgos.	_____	_____
5. Informar a los trabajadores sobre los requerimientos de la norma, y de sus derechos bajo la ley.	_____	_____
6. Informar a los trabajadores sobre los requerimientos de nuestro programa escrito y de entrenamiento.	_____	_____
7. Informar a los trabajadores sobre los diferentes tipos de químicos y los riesgos asociados con ellos.	_____	_____
8. Informar a los trabajadores sobre los riesgos específicos de los químicos y procesos con los que trabajan, y sobre su uso y manejo apropiado.	_____	_____
9. Informar a los trabajadores sobre los riesgos asociados con el desempeño de tareas no rutinarias.	_____	_____
10. Los trabajadores saben cómo detectar la presencia o liberación de químicos riesgosos en el lugar de trabajo.	_____	_____
11. Entrenar a los trabajadores en el uso de prácticas apropiadas de trabajo, equipo y ropa de protección personal, y otros controles para reducir o eliminar la exposición a los químicos en su área de trabajo.	_____	_____
12. Entrenar a los trabajadores en procedimientos de emergencia y de primeros auxilios, y en señales de sobre exposición.	_____	_____
13. Listado de todos los químicos riesgosos presentes en el lugar de trabajo.	_____	_____
14. Los trabajadores saben cómo y cuándo actualizar la lista de químicos riesgosos.	_____	_____
15. Obtención o desarrollo de una hoja de datos de seguridad del material para cada químico riesgoso presente en el lugar de trabajo.	_____	_____
16. Explicación de cómo usar una MSDS.	_____	_____
17. Informar a los trabajadores sobre la lista de materiales riesgosos, las MSDS y dónde se localizan.	_____	_____
18. Explicar a los trabajadores las etiquetas y sus advertencias.	_____	_____
19. Desarrollar un sistema que asegure que todos los químicos riesgosos que llegan sean revisados para que cuenten con las etiquetas y hojas de datos apropiadas.	_____	_____
20. Establecer procedimientos que aseguren que los recipientes que contienen químicos riesgosos cuenten con las etiquetas y advertencias apropiadas.	_____	_____
21. Desarrollar una forma de identificar e informar a los trabajadores sobre nuevos químicos riesgosos antes de que éstos sean introducidos en el área de trabajo.	_____	_____
22. Establecer una forma de informar a los trabajadores sobre nuevos riesgos asociados con los químicos que ya están usando.	_____	_____
23. Desarrollar una forma de evaluar la efectividad del programa de entrenamiento y guardar un registro de quiénes han recibido entrenamiento.	_____	_____

## APPENDIX C

### LABELING REQUIREMENTS AND ALTERNATIVES

In the Hazard Communication Standard, OSHA states that employers must label, tag or mark in-plant containers with the following information:

- (i) The **IDENTITY** of the hazardous chemicals in the container and...
- (ii) **APPROPRIATE HAZARD WARNINGS**, or alternatively, words, pictures, symbols or a combination thereof, which provide at least general information regarding the hazards of the chemicals, and which, in conjunction with other information immediately available to employees under the hazard communication program, will provide employees with specific information regarding the physical and health hazards of the hazardous chemical.

On February 9, 1994, an amended Hazard Communication Standard was issued which changed the definition of **HAZARD WARNING**. This definition now states that "target organ effects) of the hazardous chemicals must now be included. This revision has particular significance when certain proprietary labeling systems are being used.

OSHA has always tended to view the various numeric/color-coded hazard labeling systems as auxiliary labeling, permissible only if they convey the hazard information required by the standard with the same immediacy as a label which provides a direct, written hazard warning. In order to accommodate this, users of these coded label systems must often rely on nearby posters or pocket cards or other nearby information to cue them on the meaning of the various hazard codes ("Red/One", "Blue/Three", etc.). With some systems, however, the hazard descriptions provided by these posters and cue cards are too general in nature to adequately describe the specific nature of the hazard, particularly with respect to multiple health effects.

Let's look at an example of how this works. One system of numeric/color coding may use a "Blue/Five" to signify a maximum health hazard rating for a chemical. In this case it indicates an extremely toxic material which may be fatal upon acute exposure. It also indicates that special personal protective equipment may be required. If we apply a Blue/Five hazard sticker to a container of, for instance, formaldehyde, would that general hazard warning convey the fact that formaldehyde is an irritant to the eyes and skin, a sensitizer of the skin and lungs and a carcinogen, too? Not likely without some additional training of the employees about those toxic properties. OSHA has recognized this limitation as well and stipulates in its compliance guidelines that, where the labels fail to convey hazard information to employees, the employer must compensate for that in their training program.

With the passage of the amended standard, employers will now be required to ensure that target organ effects be included on the label. Again, if you are using a coded system and decide to use additional labels where you simply indicate the target organ, your training must then fill in the blanks, ensuring that the employees are knowledgeable of the toxic effects and not just the sites of toxic activity.

## APÉNDICE C

### REQUERIMIENTOS DE ETIQUETADO Y ALTERNATIVAS

En la Norma de Comunicación de Riesgos, OSHA establece que los patrones deben de etiquetar, marcar o identificar los recipientes presentes en sus instalaciones, con la siguiente información:

- (i) La **IDENTIDAD** de los químicos riesgosos en el recipiente y...
- (ii) **ADVERTENCIAS APROPIADAS SOBRE LOS RIESGOS**, o alternativamente, palabras, fotos, símbolos, o una combinación de éstos, que proporcione por lo menos información general sobre los riesgos de los químicos, las cuales, en conjunto con otra información inmediatamente disponible para los trabajadores bajo el programa de comunicación de riesgos, proveerán a los trabajadores con información específica referente a los riesgos físicos y contra la salud de los químicos riesgosos.

El 9 de febrero de 1994, se emitió la Norma de Comunicación de Riesgos enmendada, la cual cambió la definición de **ADVERTENCIA SOBRE RIESGO**. La definición ahora establece que se deben de incluir los efectos de los químicos riesgosos sobre los "órganos específicos" (target organ effects). Esta revisión tiene particular importancia cuando se están usando ciertos sistemas de etiquetado.

OSHA siempre se ha inclinado a ver los diferentes sistemas de etiquetado de riesgos numéricos ó de código de colores como etiquetado auxiliar, permitidos únicamente si transmiten la información sobre riesgos requerida por la norma con la misma proximidad que una etiqueta, la cual proporciona una advertencia directa y por escrito de los riesgos. Para acomodar esto, los usuarios de estos sistemas de etiquetado por código con frecuencia deben de depender de pósters cercanos, tarjetas de bolsillo u otra información cercana que pueda guiarlos respecto al significado de los diferentes códigos de riesgos ("Rojo/Uno", "Azul/Tres", etc.). Sin embargo, con algunos sistemas las descripciones de los riesgos proporcionadas por estos pósters y tarjetas son por naturaleza muy generales para poder describir adecuadamente la naturaleza específica del riesgo, particularmente con respecto a los múltiples efectos en la salud.

Veamos un ejemplo y cómo funciona. Un sistema numérico/código de colores puede usar un "Azul/Cinco" para indicar un índice máximo de riesgo para la salud de un químico. En este caso, éste indica un material extremadamente tóxico el cual puede ser fatal si existe exposición aguda. También indica que se puede requerir equipo de protección personal especial. Si nosotros le ponemos una etiqueta de riesgo Azul/Cinco al recipiente de un químico como el formaldehído por ejemplo, ¿Podrá esa etiqueta general de advertencia sobre el riesgo transmitir el hecho de que el formaldehído es un irritante que ataca los ojos y la piel, un sensibilizador de la piel y los pulmones y también un carcinógeno? Muy poco probable, si no se proporciona a los trabajadores entrenamiento adicional respecto a esas propiedades tóxicas. OSHA ha reconocido esta limitación también y estipula en su guía de cumplimiento que cuando las etiquetas fallen en transmitir información sobre riesgos a los empleados, el patrón debe de compensar por ello en su programa de entrenamiento.

Con la enmendación de la norma, ahora se requerirá que los patrones se aseguren de incluir en la etiqueta los efectos en los órganos específicos. De nuevo, si usted está utilizando un sistema de código y decide usar etiquetas adicionales donde usted simplemente indica el órgano afectado, entonces su entrenamiento debe de llenar los espacios vacíos para asegurar que los trabajadores conocen los efectos tóxicos y no sólo los lugares de actividad tóxica.

## APPENDIX D

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### TRAINING TECHNIQUES

Material Safety Data Sheets (MSDS) will likely be your primary sources of training information. These documents, developed by chemical manufacturers and distributors, are supplied with manufacturing or construction materials and describe the components or ingredients of a product (also its hazardous by-products, if the material is degraded by heat or physical force such as welding or grinding). MSDS's also describe the hazards of the substances, protective equipment to be used, safe handling procedures and emergency responses. By reviewing these MSDS's carefully, you can identify employees in need of training and provide them with the instruction they need in order to safely handle chemicals and what types of personal protection they should be utilizing.

In developing a training plan, you should consider the following process:

1. Determining Training Needs - Who in your employment is in need of training? With regard to Hazard Communication compliance, any employee who works with or who may be exposed to a hazardous chemical (either as a direct result of their work activities or as a result of accidental or potential exposure) must receive training.

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

- Using company accident and injury records to identify how they occur and how they may be prevented through better training.
  - Requesting employees to provide, in writing and in his own words, descriptions of their own jobs. These should include the tasks performed, tools, materials and equipment used.
  - Observing employees at the worksite as they perform tasks, asking about their work, and recording their answers. Safety and health hazards can be identified through the employees responses to such questions as whether anything about their jobs frightens them, if they had any near-miss incidents, if they feel they are taking risks or if they believe their jobs involve hazardous operations or substances.
2. Developing Learning Activities - Learning activities enable employees to demonstrate they have acquired the desired skills and knowledge. To make your lesson meaningful in terms of the employees' daily work, the learning situation should simulate the actual job as closely as possible. For example, if you are teaching employees how to perform a particular multi-step procedure, instructing them in their work environment, with familiar equipment and situations is most desirable.
  3. Another question relates to the mode of instruction. Do you use video based training, seminars, classroom training, role playing, demonstrations or one-on-one training? To some extent, combinations of these methods are optimal, because each has its distinct advantages (quality of instruction, variety of presentation, ability to interact and demonstrate learning objectives, etc). Each method has its own appeal tot he various learning styles of your employees.

Generally speaking, adult education is best facilitated through the use of multi-media presentations. Charts, diagrams, manuals, slides, films, pamphlets, overhead transparencies, videos, blackboards or any combination of these can help. The test of you effectiveness, regardless of the chosen method, should be whether your employees can demonstrate that they have learned what you set forth in your objectives. This is the concept of hazard communication, not just telling your employees and documenting the activity, but actually getting your point across to the employees.

## APÉNDICE D

### TÉCNICAS DE ENTRENAMIENTO

Las Hojas de Datos de Seguridad del Material (MSDS) seguramente serán su principal fuente de información para el entrenamiento. Estos documentos, desarrollados por los fabricantes o distribuidores del químico, son proporcionados con los materiales de manufactura o construcción y describen los componentes o ingredientes de un producto (también sus subproductos riesgosos, si el material es degradado por calor o fuerza física como soldadura o esmerilado). Las MSDS también describen los riesgos de las sustancias, equipo de protección a usar, procedimientos para manejo seguro y para responder a emergencias. A través de la revisión cuidadosa de las MSDS, usted puede identificar a los trabajadores que necesitan ser entrenados, y proporcionarles la instrucción necesaria para que puedan manejar los químicos de forma segura, así como los tipos de equipo de protección personal que deben de estar utilizando.

Usted debe de considerar el siguiente proceso al desarrollar su plan de entrenamiento:

1. Determinar las Necesidades de Entrenamiento.- ¿Quiénes de sus trabajadores necesitan entrenamiento? En lo referente al cumplimiento de la Comunicación de Riesgos, cualquier empleado que trabaje con o que pueda ser expuesto a químicos riesgosos (ya sea como resultado directo de sus actividades laborales, o como resultado de una exposición accidental o potencial) debe de recibir el entrenamiento.  
Si las necesidades de aprendizaje de un empleado pueden cumplirse a través de la revisión de un programa existente de entrenamiento más que por el desarrollo de un nuevo programa, o si el trabajador ya cuenta con algo de conocimientos sobre el proceso o sistema que se usará, el contenido del entrenamiento se debe de desarrollar por medio de:
  - El uso de registros de accidentes y lesiones de la compañía para identificar cómo ocurren y cómo pueden prevenirse a través de un mejor entrenamiento.
  - Solicitando a los trabajadores que proporcionen, por escrito y con sus propias palabras, las descripciones de sus propios trabajos. Estas deben de incluir las tareas realizadas, herramientas, materiales y equipo usado.
  - Observando a los trabajadores en su lugar de trabajo mientras realizan sus tareas, preguntándoles acerca de su trabajo y registrando sus respuestas. Los riesgos para la salud y la seguridad pueden identificarse a través de las respuestas de los trabajadores a preguntas como si existe algo respecto a sus trabajos que les preocupe, si han estado cerca de accidentarse, si sienten que se están arriesgando o si creen que sus trabajos involucran operaciones o sustancias riesgosas.
2. Desarrollo de Actividades para el Aprendizaje- Las actividades para el aprendizaje le permiten a los trabajadores demostrar que han adquirido el conocimiento y las habilidades deseadas. Para hacer que sus lecciones tengan un significado en términos del trabajo diario de sus empleados, los casos o ejemplos que se presenten en la lección deben de simular tan cerca como sea posible, la situación en el trabajo real. Por ejemplo, si usted les está enseñando a sus trabajadores cómo realizar un procedimiento particular que requiere de múltiples pasos, lo más deseable es que los instruya en su propio ambiente de trabajo, con equipo y situaciones que les sean familiares.
3. Forma de Instrucción- ¿Su entrenamiento se basa en video, seminarios, instrucción en el salón de clase, simulación de casos, demostraciones o entrenamiento uno-a-uno? Hasta cierto punto, la combinación de estos métodos es lo óptimo, porque cada uno tiene sus ventajas distintivas (calidad de la instrucción, variedad de presentación, habilidad para interactuar y demostrar los objetivos de aprendizaje, etc.). Cada método tiene su propio atractivo para acomodar los diferentes estilos de aprendizaje de sus trabajadores.

En general, la educación de adultos se facilita a través del uso de presentaciones multimedia. Tablas, diagramas, manuales, filminas, películas, panfletos, transparencias, videos, pizarrones o cualquier combinación de éstos puede ayudar. Para probar su efectividad, sin tomar en cuenta el método utilizado, debe de analizar si sus trabajadores pueden demostrar que han aprendido los objetivos que usted previamente estableció. Éste es el concepto de comunicación de riesgos, no sólo decírselo a sus trabajadores y registrar la actividad, si no realmente lograr transmitir el punto a sus trabajadores.



4. Conducting the Training - Now you're ready to actually do the training. Some pointers on setting the proper climate for an effective training session:

- Have all of your classroom arrangements worked out well in advance--seating, speaker location, refreshments, breaks, good ventilation and temperature control, good lighting, audio/visual equipment all checked out and ready to go.
- Have all of your materials organized so you can locate them without fumbling around and wasting time--charts, handouts, demonstration materials, slides videos, etc.
- Know your lesson plan--Do you have an objective? What points do you want to emphasize? What do you want them to carry away from the session? Have you considered the group's reactions and responses?
- Show some enthusiasm--If you're bored, you can forget getting your employees to buy into your message.
- Permit an adequate amount of time for training. Schedule the session at a time when distractions are minimized (e.g., mid-day on your time as opposed to just before quitting time, on a Friday, just before or after lunch, cutting into their personal time away from work).
- Be relaxed and conversational. If you are doing a lecture type presentation, you will need to provide challenge and stimulation to keep them interested. You either win or lose a group in the first three minutes of your talk.
- Consider the experiences of your group. Know to who you are speaking and recognize that some are going to struggle to understand the material while others may feel their intelligence is being insulted. Get the latter group involved if you can and be aware that refresher or follow up training may be needed for some of the others.
- Wait until the end of the session to distribute handouts. Otherwise you may lose their attention for the entire session.

For those of you who get sweaty palms at the thought of speaking to a group, there are some pretty good books designed to help you put together good presentations. One of the best is written by Ron Hoff entitled "I Can See You Naked--A Fearless Guide to making Great Presentations". Published by Andrews and McMeel, it is an excellent organizational and motivational source book. A number of books have been written on the subject of public speaking and presentations. Check you local library or book store for more information.

Some periodicals also geared toward training include:

Training and Development Journal  
Published by the American Society for Training and Development  
600 Maryland Avenue, SW, Suite 305  
Washington, D.C. 20024

Training:: The Magazine o Human Resources Development  
Published by Lakewood Publications Inc.  
731 Hennepin Avenue  
Minneapolis, MN

Finally, you should take some time to assess and evaluate your training effort. There are a number of tools to help you with this. Pre and post tests are useful in assessing whether you got your point across to employees, although they can be sort of intimidating. Instructor critiques are also useful in learning which aspects of your training effort were successful and which parts needed improvement.

If you would like to learn more about training of employees and tools available for training, you may contact Safe State for additional information.

4. Conducción del Entrenamiento- Ahora usted está listo para impartir el entrenamiento. Aquí se le presentan algunos puntos para establecer el ambiente apropiado para una efectiva sesión de entrenamiento:

- Arregle su salón de clase con bastante anticipación- asientos, ubicación del instructor, bocadillos, descansos, control de la temperatura y buena ventilación, buena luz, revise el equipo visual y auditivo y téngalo listo para ser usado.
- Organice todos sus materiales de forma que los pueda localizar sin problema y sin perder tiempo- gráficas, materiales para los trabajadores, materiales para las demostraciones, filminas, videos, etc.
- Planee sus lecciones- ¿Tiene un objetivo? ¿Qué puntos quiere enfatizar? ¿Qué quiere que los trabajadores obtengan de esta sesión? ¿Ha considerado las posibles reacciones del grupo y como responder a ellas?
- Muestre entusiasmo- Si usted está aburrido, olvídense de que sus trabajadores captarán su mensaje.
- Permita un tiempo adecuado para el entrenamiento. Programe la sesión a una hora en la que las distracciones sean mínimas (por ejemplo, a mitad del turno en vez de hacerlo justo antes de la salida, en un viernes, justo antes del almuerzo, interrumpiendo su tiempo personal de descanso).
- Relájese y sea conversacional. Si usted está dando una presentación tipo lectura, necesitará proporcionar retos y simulaciones, para mantenerlos interesados. Usted pierde o gana un grupo en los primeros tres minutos de su plática.
- Considere las experiencias de su grupo. Conozca a quiénes les está hablando y reconozca que algunos tendrán problemas para entender el material mientras que otros sentirán que su inteligencia está siendo insultada. Trate de involucrar a todo el grupo y esté alerta para detectar si algunos de los trabajadores requerirán una secuencia del entrenamiento o será necesario refrescárselos.
- Espere hasta el final de la sesión para distribuir los materiales a los trabajadores. De lo contrario, ellos podrían perder la atención durante toda la sesión.

Para aquellos de ustedes a los que les sudan las manos con sólo pensar en hablar frente a un grupo, existen algunos libros bastante buenos diseñados para ayudarles a preparar buenas presentaciones. Uno de los mejores ha sido escrito por Ron Hoff y su título es "I Can See You Naked—A Fearless Guide to Making Great Presentations". Publicado por Andrews and McMeel, es un excelente libro organizacional y motivacional. Se han escrito numerosos libros sobre presentaciones y para hablar en público. Para mayor información consulte su biblioteca o librería local.

Algunas publicaciones periódicas orientadas hacia entrenamiento:

Training and Development Journal  
Publicado por American Society for Training and Development  
600 Maryland Avenue, SW, Suite 305  
Washington, D.C. 20024

Training: The Magazine of Human Resources Development  
Publicado por Lakewood Publications Inc.  
731 Hennepin Avenue  
Minneapolis, MN

Finalmente, usted debe de tomarse algún tiempo para evaluar sus esfuerzos de entrenamiento. Existen un número de herramientas que pueden ayudarle. Exámenes antes y después del entrenamiento ayudan a evaluar si usted logró transmitir la información a sus trabajadores, aunque éstos pueden ser un poco intimidantes. Críticas al instructor también son útiles para aprender qué partes de su entrenamiento fueron exitosas y cuáles necesitan mejorarse.

Si usted desea aprender más acerca del entrenamiento de trabajadores y de las herramientas disponibles para ello, puede contactar Safe State para obtener mayor información.

## APPENDIX E

### MSDS GLOSSARY

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

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

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

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

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

**Adenocarcinoma** A tumor with glandular (secreting) elements.

**Adenosis** Any disease of a gland.

**Adhesion** A union of two surfaces that are normally separate.

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

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

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

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

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

**Amenorrhea** Absence of menstruation.

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

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

**Antidote** A remedy to relieve, prevent, or counteract the effects of a poison.

**API** American Petroleum Institute is an organization of the petroleum industry.

**Appearance** A description of a substance at normal room temperature and normal atmospheric conditions.

Appearance includes the color, size and consistency of a material.

**Acquatic Toxicity** The adverse effects to marine life that result from being exposed to a toxic substance.

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

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

**Asymptomatic** Showing no symptoms.

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

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

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

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

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

**BCM** Blood-clotting mechanism effects.

**Benign** Not recurrent or not tending to progress. No cancerous.

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

**Biopsy** Removal and examination of tissue from the living body.

**BLD** Blood effects.

## APÉNDICE E

### GLOSARIO PARA HOJAS DE DATOS DE SEGURIDAD DE LOS MATERIALES (MSDS GLOSSARY)

El siguiente glosario presenta breves explicaciones de los términos y acrónimos comúnmente usados por los fabricantes de químicos y sus hojas de datos de seguridad de los materiales (MSDS). Se han incluido términos en inglés con su respectiva traducción al español.

**ACGIH** Siglas en inglés para American Conference of Governmental Industrial Hygienists, una organización de personal profesional en agencias de gobierno o instituciones educativas involucradas en programas de seguridad y salud ocupacional. La ACGIH establece los límites de exposición ocupacionales recomendados para sustancias químicas y agentes físicos. Ver TLV.

**Acid (Ácido)** Cualquier químico que se descompone en el agua para formar iones de hidrógeno. Los ácidos tienen sabor agrio y pueden causar quemaduras severas en la piel. Los ácidos pintan de rojo el papel tornasol y tienen valores de pH de 0 a 6.

**Acute Effect (Efecto Agudo)** Efecto negativo en el humano o en animales, el cual tiene síntomas severos que se desarrollan rápidamente convirtiéndose pronto en una crisis.

**Acute Toxicity (Toxicidad Aguda)** Efectos agudos que resultan de una sola dosis, o exposición a una sustancia. Normalmente usado para describir los efectos en animales de laboratorio.

**Adenocarcinoma** Un tumor con elementos glandulares (secretando).

**Adenosis** Cualquier enfermedad de una glándula.

**Adhesion (Adhesión)** La unión de dos superficies que normalmente están separadas.

**Aerosol** Suspensión en el aire de partículas suficientemente pequeñas en tamaño para conferir algún grado de estabilidad por sedimentación (por ejemplo, humo o neblina).

**Air-Line Respirator (Respirador con Línea de Aire)** Respirador que está conectado a una fuente de aire comprimido respirable a través de una manguera de diámetro interior pequeño. El aire es entregado continuo o intermitentemente en un volumen suficiente para cumplir con los requerimientos de respiración de la persona que lo está usando.

**Air-Purifying Respirator (Respirador Purificador de Aire)** Respirador que usa químicos para remover específicos gases y vapores del aire, o que usa un filtro mecánico para remover partículas de materia. Un respirador purificador de aire debe de ser usado sólo cuando existe suficiente oxígeno para mantener vida y el nivel de contaminante del aire es menor que los límites de concentración del aparato.

**Alkali (Álcali)** Cualquier sustancia química que forma jabones solubles con ácidos grasos. Los álcalis también se conocen como bases. Pueden causar quemaduras severas en la piel. Los álcalis convierten el papel tornasol a azul y tienen valores de pH entre 8 y 14.

**Allergic Reaction (Reacción Alérgica)** Una respuesta fisiológica anormal al químico o a la estimulación física.

**Amenorrhea (Amenorrea)** Ausencia de la menstruación.

**Anesthetic (Anestésico)** Químico que causa pérdida total o parcial de la sensación. Sobre exposición a los anestésicos puede causar problemas para expresar opiniones, mareos, sueño, dolor de cabeza, pérdida del conocimiento y hasta la muerte. Ejemplos incluyen alcohol, agentes para remover pintura y desengrasantes.

**ANSI** Siglas en inglés para American National Standards Institute, una organización con fondos privados y con membresía voluntaria, que identifica las necesidades públicas e industriales de normas de consenso nacional y coordina el desarrollo de esas normas.

**Antidote (Antídoto)** Un remedio para aliviar, prevenir o contraatacar los efectos de un veneno.

**API** Siglas en inglés para American Petroleum Institute, organización para la industria del petróleo.

**Appearance (Apariencia)** Descripción de una sustancia a temperatura normal de habitación y condiciones atmosféricas normales. La apariencia incluye color, tamaño y consistencia de un material.

**Aquatic Toxicity (Toxicidad Acuática)** Efectos adversos en la vida marina que resultan de la exposición a una sustancia tóxica.

**Asphyxiant (Asfixiante)** Un vapor o gas que puede causar pérdida del conocimiento o muerte por sofocación (falta de oxígeno). Los asfixiantes más simples son dañinos para el cuerpo sólo cuando están tan concentrados que reducen el oxígeno en el aire (normalmente el 21%) a niveles peligrosos (18% o menos). Asfixia es uno de los principales riesgos potenciales presentes al trabajar en espacios cerrados y confinados.

**ASTM** Siglas en inglés para American Society for Testing and Materials, la mayor fuente mundial de normas por consenso voluntario para materiales, productos, sistemas y servicios. ASTM (por sus siglas en inglés) es un recurso para métodos de muestreo y pruebas, aspectos de seguridad y salud de los materiales, guías para su manejo seguro, efectos de agentes físicos, químicos y biológicos.

**Asymptomatic (Asintomático)** Que no muestra síntomas.

**Atm** Atmósfera, una unidad de presión que equivale a 760 mmHg (mercurio) al nivel del mar.

**Atmosphere-Supplying Respirator (Respirador de Suministro de Atmósfera)** Respirador que proporciona aire respirable de una fuente independiente a la atmósfera que lo rodea. Existen dos tipos: aparato de respiración con línea de aire y autocontenido.

**Auto-Ignition Temperature (Temperatura de Autoignición)** La temperatura a la cual un recipiente cerrado o casi cerrado, debe de calentarse para que un líquido inflamable, cuando es introducido en el recipiente, se incendie espontáneamente o se queme.

**BAL** Siglas en inglés para British Anti-Lewisite. Nombre para la droga dimercaprol -un tratamiento para inhalaciones tóxicas.

**Base** Sustancia que (1) libera iones de hidróxido (OH) cuando se disuelve en agua, (2) recibe iones de hidrógeno de un ácido fuerte para formar un ácido más débil, y (3) neutraliza un ácido. Las bases reaccionan con ácidos para formar sales y agua. Las bases tienen un pH mayor de 7 y cambian el papel tornasol a azul. Ver Álcali.

**BCM** Efectos del mecanismo de coagulación de la sangre.

**Benign (Benigno)** No recurrente o que no tiende a progresar. No canceroso.

**Biodegradable** Capaz de descomponerse para formar productos inocuos por la acción de cosas vivientes.

**Biopsy (Biopsia)** Remoción y examen de tejido de un cuerpo viviente.

**BLD** Efectos sanguíneos.

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

Flammable materials with low boiling points generally present special fire hazards. Some approximate boiling points:

Propane	-44°F
Anhydrous Ammonia	-28°F
Butane	31°F
Gasoline	100°F
Allyl Chloride	113°F
Ethylene Glycol	387°F

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

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

**Bulk Density** Mass of powdered or granulated solid material per unit of volume.

**C** Centigrade, a unit of temperature.

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

**ca** Approximately.

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

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

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

**Carcinogenicity** The ability to produce cancer.

**Carcinoma** A malignant tumor. a form of cancer.

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

**Caustic** See Alkali.

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

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

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

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

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

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

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

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

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

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

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

**Chronic Exposure** Long-term contact with a substance.

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

**Clean Air Act** See CAA.

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

**SMA** Chemical Manufacturers Association. See CHEMTREC.

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

**CO<sub>2</sub>** Carbon Dioxide is a heavy, colorless gas that is produced by the combustion and decomposition of organic substances and as a byproduct of many chemical processes. CO<sub>2</sub> will not burn and is relatively nontoxic (although high concentrations, especially in confined spaces, can create hazardous oxygen-deficient environments).

**Boiling Point- BP (Punto de Ebullición)** Temperatura a la cual un líquido cambia a estado de vapor a una presión dada. El punto de ebullición usualmente se expresa en grados Fahrenheit a la presión del nivel del mar (760 mmHg, o una atmósfera). Para una mezcla, se pueden dar el punto de ebullición inicial o el rango de ebullición.

Los materiales inflamables con bajos puntos de ebullición generalmente presentan riesgos especiales de fuego.

Algunos puntos de ebullición aproximados:

Propano	-44°F
Amonio Anhídrido	-28°F
Butano	31°F
Gasolina	100°F
Cloruro de Alilo	113°F
Etilenglicol	387°F

**BOM, o BuMines** Siglas en inglés para US Bureau of Mines, del Departamento del Interior de los Estados Unidos.

**Bonding (Conexión)** La interconexión de dos objetos por medio de una abrazadera y alambre sin aislamiento (pelado). El propósito es igualar el potencial eléctrico entre los objetos para prevenir una descarga estática cuando se transfiere un líquido inflamable de un recipiente a otro. El camino conductor es proveído por las abrazaderas que hacen contacto con el objeto cargado y un cable flexible de baja resistencia el cual permite igualar la carga. Ver Conexión a Tierra.

**Bulk Density (Densidad a Granel)** Masa de un material sólido granulado o en polvo por una unidad de volumen.

**C** Centígrados, una unidad de temperatura.

**Ceiling Limit (PEL o TLV)** Siglas en inglés para límite máximo permisible de exposición humana a una sustancia transmitida por el aire el cual no debe de ser excedido ni por un momento.

**CAA** Siglas en inglés para **Clean Air Act**, la cual fue establecida para regular/reducir la contaminación del aire. La CAA es administrada por la Agencia de Protección Ambiental de los Estados Unidos.

**Carcinogen (Carcinógeno)** Una sustancia o agente capaz de causar o producir cáncer en mamíferos, incluyendo humanos. Un químico se considera carcinógeno si:

- Ha sido evaluado por la Agencia Internacional de Investigación contra el Cáncer (IARC, por sus siglas en inglés) y ha sido encontrado carcinógeno o potencialmente carcinógeno; o
- Es listado como un carcinógeno o potencialmente carcinógeno en la última edición del **Annual Report on Carcinogens** publicado por el Programa Nacional de Toxicología (NTP, por sus siglas en inglés); o
- Está regulado por OSHA como un carcinógeno.

**Carcinogenicity (Carcinogenisidad)** La habilidad para producir cáncer.

**Carcinoma** Un tumor maligno. Una forma de cáncer.

**CAS** Siglas en inglés para Chemical Abstract Service, organización perteneciente a la Sociedad Americana de Química. CAS resume e indexa literatura química de todo el mundo en "Chemical Abstracts". Los "CAS Numbers" se usan para identificar químicos o mezclas específicas.

**Caustic (Cáustico)** Ver Álcali.

**cc** Centímetro cúbico es una medida de volumen en el sistema métrico que es equivalente en capacidad a un mililitro (ml). Un cuarto es aprox. 946 centímetros cúbicos.

**Central Nervous System (Sistema Nervioso Central)** El cerebro y la médula espinal. Estos órganos supervisan y coordinan la actividad de todo el sistema nervioso. Se transmiten impulsos sensores al sistema nervioso central, e impulsos motores se transmiten hacia afuera.

**CERCLA** Siglas en inglés para Comprehensive Environmental Response, Compensation, and Liability Act of 1980. El Acta requiere que el Centro de Respuesta Nacional de Guardacostas

sea notificado en el evento de que una sustancia riesgosa sea liberada. El Acta también proporciona un fondo (el Superfund) para que sea usado en la limpieza de lugares de deshecho de desperdicios riesgosos abandonados.

**CFR** Siglas en inglés para Code of Federal Regulations. Una colección de regulaciones que han sido promulgadas bajo la Ley de los Estados Unidos.

**Chemical (Químico)** Un elemento (por ejemplo, cloro) o un compuesto (por ejemplo, bicarbonato de sodio) producido por una reacción química.

**Chemical Cartridge Respirator (Respirador con Cartucho Químico)** Respirador que usa varias sustancias químicas para purificar el aire inhalado de ciertos gases y vapores. Este tipo de respirador es efectivo para concentraciones no mayores de diez veces el TLV del contaminante, si el contaminante tiene propiedades de alerta (olor o irritación) por debajo del TLV.

**Chemical Family (Familia Química)** Un grupo de elementos individuales o compuestos con un nombre común general. Por ejemplo: acetona, metil etil ketona (MEK), y metil isobutil ketona (MIBK) son de la familia "Ketona"; acroleína, furfural y acetaldehído pertenecen a la familia "aldehído".

**Chemical Name (Nombre Químico)** Nombre dado a un químico en el sistema de nomenclatura desarrollado por la Unión Internacional de Química Pura y Aplicada (IUPAC, por sus siglas en inglés), o el Servicio de Abstractos Químicos (CAS). Una designación científica de un químico o un nombre que claramente identificará al químico para propósitos de evaluación de riesgos.

**Chemical Pneumonitis (Neumonitis Química)** Inflamación de los pulmones causada por la acumulación de fluidos debido a irritación química.

**CHEMTREC** Siglas en inglés para Chemical Transportation Emergency Center, centro nacional establecido por la Asociación de Fabricantes de Químicos (CMA, por sus siglas en inglés) para proporcionar información de emergencia pertinente a químicos específicos a solicitud de individuos. CHEMTREC tiene un servicio telefónico gratuito (800-424-9300) disponible las 24 hrs para ayudar a responder a emergencias de transporte de químicos.

**Chronic Effect (Efecto Crónico)** Cualquier efecto adverso en el cuerpo humano o en animales, con síntomas que se desarrollan lentamente sobre un periodo de tiempo largo o que ocurren con frecuencia. Ver también Agudo.

**Chronic Exposure (Exposición Crónica)** Contacto prolongado con una sustancia.

**Chronic Toxicity (Toxicidad Crónica)** Efectos adversos (crónicos) que resultan de dosis repetidas o exposición a una sustancia sobre un periodo de tiempo relativamente prolongado. Normalmente usado para denotar los efectos en animales experimentales.

**Clean Air Act, CAA (Acta de Aire Limpio)** Ver CAA  
**Clean Water Act, CWA (Acta de Agua Limpia)** Ley federal establecida para regular/reducir la contaminación del agua. CWA es administrada por la EPA.

**CMA** Siglas en inglés para Chemical Manufacturers Association. Ver CHEMTREC.

**CO** El monóxido de carbono es un gas incoloro, inodoro, inflamable y muy tóxico producido por la combustión incompleta del carbono. También es un subproducto de muchos procesos químicos. Un químico asfixiante que reduce la habilidad de la sangre para acarrear el oxígeno. La hemoglobina absorbe el CO doscientas veces más fácilmente que el oxígeno.

**CO<sub>2</sub>** El Dióxido de Carbono es un gas pesado e incoloro que se produce por la combustión y descomposición de sustancias orgánicas y como un subproducto de muchos procesos químicos. CO<sub>2</sub> no se quemará y es relativamente no tóxico (aunque en altas concentraciones, especialmente en espacios confinados, puede crear ambientes riesgosos deficientes de oxígeno).

**COC** Cleveland Open Cup is a flash point test method.

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

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

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

**Compressed Gas:**

- (a) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 pounds per square inch (psi) at 70°F (21.1°C); or
- (b) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130°F (54.4°C) regardless of the pressure at 70°F (21.1°C); or
- (c) A liquid having a vapor pressure exceeding 40 psi at 100°F (37.8°C) as determined by ASTM D-323-72.

**Conc** See Concentration.

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

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

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

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

**Container** Any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical. For purposes of MSDS or HCS, pipes or piping systems are not considered to be containers.

**Corrosive** A chemical that causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the site of contact. For example, a chemical is considered to be corrosive if, when tested on the intact skin of albino rabbits by the method described by the DOT in Appendix A to 48 CFR Part 173, it destroys or changes irreversibly the structure of the tissue at the site of contact following an exposure period of 4 hours. This term shall not refer to action on inanimate surfaces.

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

**Curettage** Cleansing of a diseased surface.

**Cutaneous Toxicity** See "Dermal Toxicity".

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

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

**Cytology** The scientific study of cells.

**Decomposition** Breakdown of a material or substance (by heat, chemical reaction, electrolysis, decay, or other processes) into parts or elements or simpler compounds.

**Density** The mass (weight) per unit volume of a substance. For example, lead is much more dense than aluminum.

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

**Dermal** Relating to the skin.

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

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

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

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

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

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

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

**Dysmenorrhea** Painful menstruation.

**Dysplasia** An abnormality of development.

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

**Extopic pregnancy** The fertilized ovum becomes implanted outside of the uterus.

**Edema** An abnormal accumulation of clear water fluid in the tissues.

**Endocrine glands** Glands that regulate body activity by secreting hormones.

**Endometrium** The mucous membrane lining the uterus.

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

**EPA** U.S. Environmental Protection Agency.

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

**Epithelium** The covering of internal and external surfaces of the body.

**Estrogen** Principal female sex hormone.

**COC** Siglas en inglés para Cleveland Open Cup, método de prueba para el punto de inflamación.

**Combustible** Término utilizado por NFPA, DOT, y otros para clasificar ciertos líquidos que se quemarán, en base a sus puntos de inflamación. Ambos, NFPA y DOT generalmente definen "líquido combustible" como aquel que tiene un punto de inflamación de 100°F (37.8°C) o mayor pero por menor de 200°F (93.3°C). Ver también "inflamable". Sustancias no líquidas como la madera y el papel están clasificadas como "combustibles ordinarios" por la NFPA.

**Combustible Liquid (Líquido Combustible)** Cualquier líquido que tenga un punto de inflamación igual o mayor de 100°F (37.8°C), pero menor de 200°F (93.3°C), excepto cualquier mezcla que tenga componentes con puntos de inflamación de 200°F (93.3°C) o mayores, el volumen total del cual conforma hasta el 99% o más del volumen total de la mezcla.

**Common Name (Nombre Común)** Cualquier medio utilizado para identificar un químico otro que su nombre químico (por ejemplo, nombre de código, marca, nombre genérico). Ver Genérico.

**Compressed Gas (Gas Comprímido):**

- (a) Un o mezcla de gases teniendo, en un recipiente, una presión absoluta en exceso de 40 libras por pulgada cuadrada (psi) a 70°F (21.1°C); o
- (b) Un gas o mezcla de gases teniendo, en un recipiente, una presión absoluta excediendo 104 psi a 130°F (54.4°C) sin importar la presión a 70°F (21.1°C); o
- (c) Un líquido teniendo una presión de vapor excediendo 40 psi a 100°F (37.8°C) como lo determina ASTM D-323-72.

**Conc** Ver Concentración.

**Concentration (Concentración)** La cantidad relativa de una sustancia cuando combinada o mezclada con otras sustancias. Ejemplos: 2ppm de dióxido de sulfuro en el aire, o una solución cáustica al 50 por ciento.

**Conditions to Avoid (Condiciones a Evitar)** Condiciones encontradas durante el manejo o almacenamiento que pueden causar que una sustancia se vuelva inestable.

**Confined Space (Espacio Confinado)** Cualquier área que tiene espacios limitados para entrar y salir que pudieran dificultar el escape en caso de emergencia, que le falta ventilación, que contiene riesgos conocidos y potenciales, y que no ha sido diseñada con la intención de que sea ocupada continuamente por humanos.

**Conjunctivitis (Conjuntivitis)** Inflamación de la conjuntiva, la delicada membrana que recubre el interior del párpado y el globo ocular.

**Container (Recipiente)** Cualquier bolsa, barril, bote, lata, cilindro, tambor, vaso de reacción, tanque de almacenamiento, o similar que contenga un químico riesgoso. Para propósitos de las MSDS o HCS, los tubos y sistemas de tuberías no se consideran recipientes.

**Corrosive (Corrosivo)** Un químico que causa destrucción visible de, o cambios irreversibles en, tejido vivo por una acción química en el lugar de contacto. Por ejemplo, un químico se considera corrosivo si, cuando se prueba en la piel intacta de conejos albinos por el método descrito por el DOT en el Apéndice A del 48 CFR Parte 173, éste destruye o cambia irreversiblemente la estructura del tejido en el sitio de contacto después de un periodo de exposición de 4 horas. Este término no se debe de referir a la acción en

**CPSC** Siglas en inglés para Consumer Products Safety Commission, la cual tiene la responsabilidad de regular los materiales riesgosos cuando éstos aparecen en bienes de consumo. Para propósitos de la CPSC, los riesgos se definen en el Hazardous Substances Act y el Poison Prevention Packaging Act de 1970.

**Curettage (Curación)** Limpieza de una superficie enferma.

**Cutaneous Toxicity (Toxicidad Cutánea)** Ver "Toxicidad Dermatológica"

**CWA** Siglas en inglés para Clean Water Act, la cual fue creada para regular/reducir la contaminación del agua. Es administrada por la EPA.

**Cyst (Quiste)** Un saco conteniendo un líquido. La mayoría de quistes no hacen daño.

**Cytology (Citología)** Ciencia que estudia las células.

**Decomposition (Descomposición)** Rompimiento de un material o sustancia (por calor, reacción química, electrólisis, descomposición u otro proceso) en partes, elementos o compuestos más simples.

**Density (Densidad)** La masa (peso) por unidad de volumen de una sustancia. Por ejemplo, el plomo es mucho más denso que el aluminio.

**Depressant (Depresor)** Una sustancia que reduce una actividad funcional del cuerpo o deseo instintivo, como el apetito.

**Dermal** Relativo a la piel.

**Dermal Toxicity (Toxicidad Dermal)** Efectos adversos que resultan de la exposición de la piel a una sustancia. Normalmente usada para denotar los efectos en animales de laboratorio.

**DHHS** Siglas en inglés para el U.S. Department of Health and Human Services. NIOSH y el Public Health Service (PHS) son parte de DHHS.

**Dike (Dique)** Barrera construida para controlar sustancias riesgosas y prevenir que entren en los sistemas de desagüe, canales u otras corrientes de agua fluyente.

**Dilution Ventilation (Ventilación Diluida)** Flujo de aire diseñado para diluir contaminantes a un nivel aceptable. Ver también ventilación general o escape.

**DOL** Siglas en inglés para el U.S. Department of Labor. OSHA y MSHA son parte de DOL.

**DOT** Siglas en inglés para el U.S. Department of Transportation, regulación de transporte de químicos y otras sustancias.

**Dry Chemical (Químico Seco)** Agente en polvo extintor de fuego usualmente compuesto de bicarbonato de sodio, bicarbonato de potasio, etc.

**Dysmenorrhea (Dismenorrea)** Menstruación dolorosa.

**Dysplasia (Displasia)** Una anomalía del desarrollo.

**Dyspnea (Disnea)** Sensación de dificultad para respirar, falta de aliento.

**Ectopic Pregnancy (Embarazo Ectópico)** El óvulo fertilizado es implantado fuera del útero.

**Edema** Acumulación anormal de fluido líquido claro en el tejido.

**Endocrine Glands (Glándulas Endocrinas)** Glándulas que regulan la actividad del cuerpo a través de la secreción de hormonas.

**Endometrium (Endometrio)** Membrana mucosa que cubre el útero.

**Environmental Toxicity (Toxicidad ambiental)** Información obtenida como resultado de la conducción de pruebas ambientales diseñadas para estudiar los efectos en la vida acuática y de las plantas.

**EPA** Siglas en inglés para U.S. Environmental Protection Agency.

**Epidemiology (Epidemiología)** Ciencia dedicada al estudio de las enfermedades de la población en general. Determinación de la incidencia (rango de ocurrencia) y distribución de una enfermedad en particular (por edad, sexo u ocupación) que puede proveer información respecto a la causa de la enfermedad.

**Epithelium (Epitelio)** La cubierta de las superficies internas y externas del cuerpo.

**Estrogen (Estrógeno)** Principal hormona del sexo femenino.



**Evaporation Rate** The rate at which a material will vaporize (evaporate) when compared to the known rate of vaporization of a standard material. The evaporation rate can be useful in evaluating the health and fire hazards of a material. The designated standard material is usually normal butyl acetate (NBUAC or n-BuAc), with a vaporization rate designated as 1.0. Vaporization rates of other solvents or materials are then classified as:  
- FAST evaporating if greater than 3.0. Examples: Methyl Ethyl Ketone = 3.8, Acetone = 5.6, Hexane = 8.3.  
- MEDIUM evaporating if 0.8 to 3.0.  
Examples: 190 proof (95%) Ethyl Alcohol = 1.4, VM&P Naptha = 1.4, MIBK = 1.5  
- SLOW evaporating if less than 0.8.  
Examples: Xylene = 0.6, Isobutyl Alcohol = 0.6, Normal Butyl Alcohol = 0.4, Water = 0.3, Mineral Spirits = 0.1.

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

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

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

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

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

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

**FDA** U.S. Food and Drug Administration.

**Fetal** Pertaining to the fetus.

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

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

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

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

**Flammable** A chemical that includes one of the following categories:  
(a) "Aerosol, flammable." An aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;  
(b) "Gas, flammable." (1) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13 percent by volume or less; or (2) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12 percent by volume, regardless of the lower limit;  
(c) "Liquid, flammable." Any liquid having a flashpoint below 100°F (37.8°C), except any mixture having components with flashpoints of 100°F (37.8°C) or higher, the total of which make up 99 percent or more of the total volume of mixture.

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

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

**Flashpoint** The minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested by the following methods:  
(a) Tagliabue Closed Tester (see American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24 1979 [ASTM D56-79]).  
(b) Pensky-Martens Closed Tester (see American National Standard Method of Test for Flash Point by Pensky-Martens Closed Tester Z11.7-1979 [ASTM D93-79]).  
(c) Setaflash Closed Tester (see American National Standard Method of Test for Flash Point by Setaflash Closed Tester [ASTM D3278-78]).

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

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

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

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

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

**Genetic** Pertaining to or carried by genes. Hereditary.

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

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

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

**Gynecology** The study of the reproductive organs in women.

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

**Evaporation Rate (Rango de Evaporación)** Rango al cual un material se va a vaporizar cuando es comparado con el rango conocido de vaporización de un material estándar. El rango de evaporación puede ser útil cuando se evalúa un material sobre sus riesgos de fuego y para la salud. El material estándar asignado es usualmente el butil acetato normal (normal butyl acetate, NBUAC o n-BuAc), con un rango de vaporización designado de 1.0. Los rangos de vaporización de otros solventes o materiales están entonces clasificados como:

- EVAPORACIÓN RÁPIDA si es mayor de 3.0, ejemplos: Metil Etil Cetona= 3.8, Acetona= 5.6, Hexano= 8.3.
- EVAPORACIÓN MEDIANA si 0.8 a 3.0, ejemplos: Etil Alcohol al 95%= 1.4, VM&P Naptha = 1.4, MIBK = 1.5
- EVAPORACIÓN LENTA si es menor de 0.8, ejemplos: Xileno= 0.6, Alcohol Isobutílico= 0.6, Alcohol Butílico Normal= 0.4, Agua= 0.3, Alcohol Mineral= 0.1

**Explosive (Explosivo)** Un químico que causa la liberación repentina, casi instantánea, de presión, gas y calor cuando se somete a un cambio repentino, presión o alta temperatura.

**Exposure or Exposed (Exposición o Expuesto)** Estar abierto y vulnerable a químicos riesgosos por medio de la inhalación, ingestión, contacto con la piel, absorción o cualquier otra forma; incluye exposición potencial (accidental o posible).

**Extinguishing Media (Medio para Extinguir)** Sustancia apaga fuegos a ser usada para el control de un material en el evento de un fuego. Usualmente identificada por su nombre genérico, como neblina, espuma, agua, etc.

**Eye Protection (Protección para los Ojos)** Lentes de seguridad, gafas para salpicaduras químicas, mascarillas para la cara, etc. recomendados para usarse cuando se manejan materiales riesgosos.

**F Fahrenheit** es una escala para medición de temperatura. En la escala Fahrenheit, el agua hierve a 212 °F y se congela a 32 °F.

**f/cc** Fibras por centímetro cúbico de aire.

**FDA** Siglas en inglés para la U.S. Food and Drug Administration.

**Fetal** Pertinente al feto.

**Fetus (Feto)** Ser que se está desarrollando en el útero desde la séptima semana de gestación hasta el nacimiento.

**Fibrosis** Engrosamiento anormal del tejido conectivo fibroso, usualmente en los pulmones.

**FIFRA** Siglas en inglés para Federal Insecticide, Fungicide, and Rodenticide Act; la cual requiere que ciertos venenos útiles, como los pesticidas químicos que son vendidos al público, tengan etiquetas que mencionen los riesgos para la salud para protección de los usuarios. Es administrada por la EPA.

**First Aid (Primeros Auxilios)** Medidas de emergencia a ser tomadas cuando una persona está sufriendo una sobre exposición a un material riesgoso, antes de que la ayuda médica pueda ser obtenida.

**Flammable (Inflamable)** Un químico que incluye una de las siguientes categorías:

- (a) "Aerosol, Inflamable". Un aerosol que cuando es probado por el método descrito en 16 CFR 1500.45, produce una flama proyectada excediendo 18 pulgadas a válvula completamente abierta, o una flama extendida de regreso hacia la válvula (flashback) a cualquier grado de abertura de la válvula;
- (b) "Gas, Inflamable". (1) Un gas que a presión y temperatura ambiental, forma una mezcla inflamable con el aire a una concentración de 13% por volumen o menos; o (2) Un gas que a presión y temperatura ambiental, forma un rango de mezclas inflamables con el aire mayores que el 12% por volumen, sin importar el límite inferior;
- (c) "Líquido, Inflamable". Cualquier líquido que tenga un punto de inflamación menor de 100 °F (37.8 °C), excepto cualquier mezcla

que tenga componentes con puntos de inflamación de 100 °F (37.8 °C) o mayores, el total de los cuales constituye el 99% o más del volumen total de la mezcla.

(d) "Sólido, Inflamable". Un sólido, diferente a un agente explosivo según lo definido en 1910.109(a), el cual es responsable de causar fuego a través de fricción, absorción de humedad, cambio químico espontáneo, o calor retenido por manufactura o procesamiento, o aquel que puede ser incendiado ampliamente y cuando se incendia quema vigorosa y persistentemente como para crear un riesgo serio. Un sólido es un sólido inflamable si cuando se prueba bajo el método descrito en 16 FCR 1500.44, éste se incendia y quema con una flama autosostenida a un rango mayor que una décima de pulgada por segundo a lo largo de su eje mayor.

**Flashback** Ocurre cuando la flama de una antorcha quema de regreso hacia la parte de atrás de la punta, la antorcha, o la manguera. Con frecuencia es acompañada por un silbido agudo o un chillido con una flama humeante o de punta afilada.

**Flashpoint (Punto de Inflamación)** Temperatura mínima a la cual un líquido libera un vapor en suficiente concentración para incendiar cuando se prueba por los siguientes métodos:

(a) Tagliabue Closed Tester (ver American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24 1979 [ASTM D56-79]).

(b) Pensky-Martens Closed Tester (ver American National Standard Method of Test for Flash Point by Pensky-Martens Closed Tester Z11.7-1979 [ASTM D93-79]).

(c) Setaflash Closed Tester (ver American National Standard Method of Test for Flash Point by Setaflash Closed Tester [ASTM D3278-78]).

**Foreseeable Emergency (Emergencia Predecible)** Cualquier ocurrencia potencial como, pero no limitada a, falla de equipo, rompimiento de recipientes (contenedores), o falla del equipo de control el cual puede resultar en la liberación descontrolada de un químico riesgoso dentro del lugar de trabajo.

**Fume (Emanación)** Partícula de condensación sólida de diámetro extremadamente pequeño, comúnmente generada por la fundición de metal como emanación de metal.

**g** Gramo es una unidad métrica de peso. Una onza estadounidense equivale a 28.4 gramos aproximadamente.

**General Exhaust (Escape General)** Un sistema para extraer aire conteniendo contaminantes de un área de trabajo general. Consultar también Escape Local.

**Generic Name (Nombre Genérico)** Asignación usada para identificar un químico por otro que su nombre químico (ejemplo, nombre de código, número de código, nombre comercial, nombre de marca).

**Genetic (Genético)** Perteneciente a o transmitido por medio de los genes. Hereditario.

**Gestation (Gestación)** Desarrollo del feto en el útero desde su concepción hasta el nacimiento; embarazo.

**g/kg** Gramos por kilogramo es una expresión de dosis usada en pruebas de toxicología orales y de la piel para denotar gramos de una sustancia administrada por kilogramo de peso del cuerpo del animal. Ver también "kg" (kilogramo).

**Grounding (Conexión a Tierra)** Procedimiento usado para transportar una carga eléctrica a tierra a través de un camino conductivo. Una típica conexión a tierra puede ser conectada directamente a una tubería de agua conductiva o a una barra de conexión a tierra (grounding bus) y un electrodo para conexión a tierra (ground rod). Ver Conexión (Bonding).

**Gynecology (Ginecología)** Estudio de los órganos reproductores de la mujer.

**Hand Protection (Protección para las Manos)** Tipo específico de guantes u otra protección para las manos requerida para prevenir exposición a materiales riesgosos.

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

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

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

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

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

**Hematoma** A blood clot under the surface of the skin.  
**Hematopoietic System** The blood-forming mechanism of the human body.

**Hematuria** The presence of blood in the urine.

**Hepatotoxin** A substance that causes injury to the liver.

**Highly toxic** A chemical in any of the following categories:  
(a) A chemical with a median lethal dose (LD<sub>50</sub>) of 50 milligrams or less per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.

(b) A chemical with a median lethal dose (LD<sub>50</sub>) 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 2 and 3 kilograms each.

(c) A chemical that has a median lethal concentration (LC<sub>50</sub>) 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 1 hour (or less if death occurs within 1 hour) to albino rats weighing between 200 and 300 grams each.

**Hormones** Act as chemical messengers to body organs.

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

**IARC** International Agency for Research on Cancer.

**Ignitable** Capable of being set afire.

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

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

**Ingestion** Taking in by the mouth.

**Inhale** See inhalation.

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

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

**Insol** See insoluble.

**Insoluble** Incapable of being dissolved in a liquid.

**Intrauterine** Within the uterus.

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

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

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

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

**Lacrimatin** Secretion and discharge of tears.

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

**Lactation** The secretion of milk by the breasts.

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

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

**LC<sub>50</sub>** The concentration of a material in air that will kill 50 percent of a group of test animals with a single exposure (usually 1 to 4 hours). The LC<sub>50</sub> is expressed as parts of material per million parts of air, by volume (ppm) for gases and vapors, or as micrograms of material per cubic meter of air (mg/m<sup>3</sup>) for dusts and mists, as well as for gases and vapors.

**LB** Lethal dose is the quantity of a substance being tested that will kill.

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

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

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

**Lesion** Any damage to a tissue.

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

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

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

**m<sup>3</sup>** Cubic meter is a metric measure of volume, approximately 35.3 cubic feet or 1.3 cubic yards.

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

**Hazardous Chemical (Químico Riesgoso)** Cualquier químico cuya presencia o uso es un riesgo físico o un riesgo para la salud.

**Hazardous Warning (Alerta contra Riesgos)** Palabras, fotos, símbolos o combinación de éstos presentada en una etiqueta u otra forma apropiada para informar sobre la presencia de varios materiales.

**HCS** Siglas en inglés para Hazard Communication Standar, Norma para la Comunicación de Riesgos, una regulación de OSHA expedida bajo el 29 CFR Parte 1910.1200.

**Health Hazard (Riesgo para la Salud)** Un químico para el cual existe evidencia significativa, basada en por lo menos un estudio conducido de acuerdo con principios científicos establecidos, que pueden ocurrir efectos agudos o crónicos en la salud de trabajadores expuestos. El término "riesgo para la salud" incluye químicos que son carcinógenos, agentes tóxicos o altamente tóxicos, toxinas reproductivas, irritantes, corrosivas, sensibilizadoras, hepatotoxinas, neprotóxicas, neurotoxinas, agentes que actúan en el sistema hematopoyético, y agentes que dañan los pulmones, piel, ojos o membranas mucosas.

**Hemoglobin (Hemoglobina)** Una proteína conjugada que contiene hierro o pigmento respiratorio presente en las células rojas de la sangre de los vertebrados.

**Hematoma** Un coágulo sanguíneo bajo la superficie de la piel.

**Hematopoietic System (Sistema Hematopoyético)** Mecanismo del cuerpo humano para la formación de la sangre.

**Hematuria** Presencia de sangre en la orina.

**Hepatotoxin (Hepatotoxina)** Sustancia que causa lesiones en el hígado.

**Highly Toxic (Altamente tóxico)** Un químico en cualquiera de las siguientes categorías:

(a) Un químico con una dosis letal media (LD<sub>50</sub>) de 50 miligramos o menos por kilogramo de peso del cuerpo cuando se administra oralmente a ratas albinas pesando entre 200 y 300 gramos cada una.

(b) Un químico con una dosis letal media (LD<sub>50</sub>) de 200 miligramos o menos por kilogramo de peso del cuerpo cuando se administra por contacto continuo por 24 hrs (o menos si ocurre muerte en 24 hrs) con la piel desnuda de conejos albinos pesando entre 2 y 3 kilogramos cada uno.

(c) Un químico que tiene una concentración letal media (LC<sub>50</sub>) en aire de 200 partes por millón por volumen o menos de gas o vapor, o 2 miligramos por litro o menos de neblina, emanaciones o polvo, cuando se administra por inhalación continua por 1 hora (o menos si ocurre muerte en 1 hora) a ratas albinas pesando entre 200 y 300 gramos cada una.

**Hormones (Hormonas)** Actúan como mensajeros químicos para los órganos del cuerpo.

**Hyperplasia (Hiperplasia)** Incremento en el volumen de un tejido u órgano causado por el crecimiento de nuevas células.

**IARC** Siglas en inglés para International Agency for Research on Cancer.

**Ignitable (Incendiable)** Capaz de ser incendiado.

**Impervious (Impenetrable)** Un material que no permite a otra sustancia pasar a través de él o penetrarlo.

**Incompatible** Materiales que pueden causar reacciones peligrosas por contacto directo uno con el otro.

**Ingestion (Ingestión)** Tomar por la boca.

**Inhale (Inhalar)** Ver inhalación.

**Inhalation (Inhalación)** Respirar una sustancia en forma de gas, vapor, emanación, neblina o polvo.

**Inhibidor** Un químico añadido a otra sustancia para prevenir un cambio químico no deseado.

**Insol** Ver Insoluble.

**Insoluble** Incapaz de disolverse en un líquido.

**Intrauterine (Intrauterino)** Dentro del útero.

**Irritant (Irritante)** Químico no corrosivo que causa un efecto inflamatorio reversible en tejido vivo por acción química en el lugar de contacto. Un químico es un irritante para la piel si, cuando se prueba en la piel intacta de conejos albinos por los métodos del 16 CFR 1500.41 por exposiciones de 4 horas o por otras técnicas apropiadas, resultando en una calificación empírica de 5 o mayor. Un químico es un irritante para los ojos si así se le determina bajo el procedimiento listado en 16 CFR 1500.42 u otras técnicas apropiadas.

**Irritating (Irritante)** Según lo definido por DOT, una propiedad de una sustancia sólida o líquida la cual, por contacto con fuego o cuando es expuesta al aire, libera emanaciones intensamente irritantes intensas o peligrosas (no incluye materiales venenosos). Ver Veneno, Clase A y Veneno, Clase B.

**Kg** Kilogramo es una unidad métrica de peso, aproximadamente 2.2 libras estadounidenses. Ver también "g/kg", "g" y "mg".

**L** Litro es una unidad métrica de capacidad. Un cuarto estadounidense es aproximadamente 9/10 de un litro.

**Lacrimation (Lagrимación)** Secreción y descarga de lágrimas.

**Label (Etiqueta)** Nota añadida a un recipiente mostrando información referente a su contenido.

**Lactation (Lactancia)** Secreción de leche por medio de los senos.

**LC** Siglas en inglés para concentración letal, es la concentración de una sustancia que ha sido probada que va a matar.

**LCL** Siglas en inglés para concentración letal baja, concentración más baja de un gas o vapor capaz de matar especies específicas en un periodo de tiempo específico.

**LC<sub>50</sub>** Concentración de un material en aire que matará el 50% de un grupo de animales de laboratorio con una sola exposición (usualmente 1 a 4 horas). La LC<sub>50</sub> se expresa como partes de un material por millón de partes de aire, por volumen (ppm) para gases y vapores, o como microgramos de material por metro cúbico de aire (mg/ m<sup>3</sup>) para polvos y neblinas, así como también para gases y vapores.

**LB** Siglas en inglés para dosis letal es la cantidad de una sustancia que ha sido probada que va a matar.

**LDL** Siglas en inglés para dosis letal baja, dosis más baja administrada de un material capaz de matar especies de laboratorio específicas.

**LD<sub>50</sub>** Una sola dosis de un material que se espera mate 50% de un grupo de animales de laboratorio. La dosis LD<sub>50</sub> normalmente se expresa en miligramos o gramos de un material por kilogramo de peso del cuerpo del animal (mg/kg o g/kg). El material puede administrarse por la boca o aplicarse a la piel.

**LEL o LFL** Siglas en inglés para límite explosivo inferior, o límite inflamable inferior, de un vapor o gas; la concentración más baja (porcentaje menor de una sustancia en el aire) que puede producir una ráfaga (flash) de fuego cuando está presente una fuente de ignición (calor, arco, flama). A concentraciones menores que LEL, la mezcla también "se inclina" a quemarse. Ver también "UEL".

**Lesión (Lesión)** Cualquier daño al tejido.

**Lfm** Siglas en inglés para pie lineal por minuto, una unidad de velocidad del aire.

**Local Exhaust (Escape Local)** Sistema para capturar y extraer contaminantes del aire en el punto donde los contaminantes son producidos (soldadura, esmerilado, lijado, y otros procesos u operaciones). Ver también Escape General (General Exhaust).

**M** Metro es una unidad del sistema métrico para longitud. Un metro equivale aproximadamente 39 pulgadas.

**m<sup>3</sup>** Metro cúbico es una medida métrica de volumen, aproximadamente 35.3 pies cúbicos o 1.3 yardas cúbicas.

**Malaise (Malestar)** Sentimiento de incomodidad general, estrés o dificultad, un sentimiento de irritabilidad.

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

**Mammary** Pertaining to the breast.

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

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

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

**Menorrhagia** Excessive menstruation.

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

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

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

**Meter** A unit of length, equivalent to 39.37 inches.

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

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

**mg/m<sup>3</sup>** Milligrams per cubic meter is a unit for expressing concentrations of dusts, gases, or mists in air.

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

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

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

**Mild** Mild.

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

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

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

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

**MSDS** Material Safety Data Sheet.

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

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

**MW** See molecular weight.

**N<sub>2</sub>** Nitrogen is a colorless, odorless, and tasteless gas that will not burn and will not support combustion. The earth's

atmosphere (air) is about 78 percent nitrogen. At higher concentrations, nitrogen can displace oxygen and become a lethal asphyxiant. See Asphyxiant.

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

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

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

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

**Neo** See neoplasia.

**Neonatal** The first 4 weeks after birth.

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

**Nephrotoxin** A substance that causes injury to the kidneys.

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

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

**ng** nanogram, one-billionth of a gram.

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

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

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

**NO<sub>x</sub>** Oxides of nitrogen which are undesirable air pollutants. NO emissions are regulated by EPA under the Clean Air Act.

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

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

**Malignant (Maligno)** Tendiente a empeorar progresivamente y resultar en muerte.

**Mammary (Mamario)** Pertinente al seno.

**Mechanical Exhaust (Mecanismo de Escape)** Un dispositivo con motor como un ventilador o tubo de ventura para corriente de aire, para extraer los contaminantes del área de trabajo, contenedor o lugar cerrado.

**Mechanical Filter Respirator (Respirador con Filtro Mecánico)** Respirador usado para proteger contra partículas de materia transportadas por el aire como polvos, neblinas, emanaciones de metal y humo. Los respiradores con filtro mecánico no proporcionan protección contra gases, vapores o atmósferas deficientes de oxígeno.

**Melting Point (Punto de Fundición)** Temperatura a la cual una sustancia sólida cambia a un estado líquido.

**Menorrhagia (Menorragia)** Menstruación excesiva.

**Menstruation (Menstruación)** Periódica descarga de sangre de la vagina de un útero sin embarazo.

**Metabolism (Metabolismo)** Procesos químicos y físicos que ocurren entre iones, átomos y moléculas del cuerpo.

**Metastasis (Metástasis)** La transferencia de enfermedad de un órgano o parte a otro no directamente conectado con él.

**Meter (Metro)** Unidad de longitud equivalente a 39.37 pulgadas.

**mg** Miligramo es una unidad métrica de peso que es la milésima parte de un gramo.

**mg/kg** Miligramos de sustancia por kilogramo de peso del cuerpo, es una expresión de dosis toxicológica.

**mg/m<sup>3</sup>** Miligramos por metro cúbico es una unidad para expresar concentraciones de polvos, gases o neblinas en el aire.

**Micron (Micrón, Micrómetro)** Unidad de longitud igual a una millonésima de metro; aproximadamente 0.000039 de una pulgada.

**Mist (Neblina)** Gotas pequeñas de líquido suspendidas generadas por condensación de un estado gaseoso a uno líquido; o por rompimiento de un líquido a un estado disperso, como salpicadura, espuma o atomización. La neblina se forma cuando un líquido finamente dividido se suspende en el aire.

**Mixture (Mezcla)** Cualquier combinación de dos o más químicos si la combinación no es por completo o en partes, el resultado de una reacción química.

**Mild, Mild (Moderado)** No severo.

**ml** Mililitro es una unidad métrica de capacidad, equivalente en volumen a 1 centímetro cúbico (cc), o aproximadamente 1/16 de pulgada cúbica. Una milésima de un litro.

**mmHg** Milímetros (mm) de mercurio (Hg) es una unidad de medida para bajas presiones o vacíos parciales.

**Molecular Weight (Peso Molecular)** Peso (masa) de una molécula basada en la suma de pesos atómicos de los átomos que forman la molécula.

**mppcf** Millones de partículas por pie cúbico es una unidad para expresar la concentración de partículas de una sustancia suspendida en el aire. Límites de exposición para polvos minerales (Sílice, grafito, cemento Portland, polvos nauseabundos y otros), anteriormente expresados como mppcf, son ahora más comúnmente expresados como mg/m<sup>3</sup>.

**MSDS** Siglas en inglés para Material Safety Data Sheets, Hojas de Datos de Seguridad del Material.

**MSHA** Siglas en inglés para Mine Safety and Health Administration, del U.S. Department of Labor.

**Mutagen (Mutágeno)** Sustancia o agente capaz de alterar el material genético de una célula viviente.

**MW** Siglas en inglés para Molecular Weight. Ver Peso Molecular.

**N<sub>2</sub>** El nitrógeno es un gas incoloro, inodoro y sin sabor, que no puede quemarse y que no soporta combustión. La atmósfera de la tierra (aire) es aproximadamente 78% nitrógeno. A mayores

concentraciones, el nitrógeno puede desplazar al oxígeno y volverse un asfixiante letal. Ver Asfixiante (Asphyxiant).

**Narcosis** Estado de estupor, inconciencia o impedimento de actividad producido por la influencia de narcóticos u otros químicos.

**Nausea (Náusea)** Tendencia a vomitar, sentimiento de enfermedad en el estómago.

**NCI** Siglas en inglés para el National Cancer Institute, el cual es parte del National Institutes of Health que estudia las causas del cáncer y su prevención, así como su diagnóstico, tratamiento y rehabilitación de pacientes con cáncer.

**NFPA** Siglas en inglés para National Fire Prevention Association, organización internacional que promueve/mejora la protección contra fuego, previene y establece medidas de seguridad contra la pérdida de vida y propiedad por causa del fuego. Mejor conocida en el ámbito industrial por sus National Fire Codes- 16 volúmenes de códigos, normas, prácticas recomendadas y manuales desarrollados (y periódicamente actualizados) por comités técnicos de NFPA. Entre ellos está NFPA 704M, código para mostrar los riesgos de los materiales que se pueden presentar bajo condiciones de fuego o emergencias relacionadas, usando la familiar etiqueta en forma de diamante o una placa con números o símbolos apropiados.

**Neo** Ver neoplasia.

**Neonatal** Las primeras 4 semanas después del nacimiento.

**Neoplasia** Una condición caracterizada por la presencia de un crecimiento nuevo (tumores).

**Nephrotoxin (Neprotóxina)** Una sustancia que causa daño a los riñones.

**Neurotoxin (Neurotoxina)** Material que afecta las células nerviosas y que puede producir anomalías emocionales o en el comportamiento.

**Neutralize (Neutralizar)** Eliminar riesgos potenciales por medio de la desactivación de ácidos fuertes, cáusticos y oxidantes. Por ejemplo, los ácidos derramados pueden ser neutralizados añadiéndoles una cantidad apropiada de sustancia cáustica.

**ng** nanogramo, una billonésima parte de un gramo.

**NIOSH** Siglas en inglés para el National Institute for Occupational Safety and Health, U.S. Public Health Service, U.S. Department of Health and Human Services (DHHA); entre otras actividades, prueba y certifica dispositivos para protección respiratoria y tubos de detección para muestreo de aire, recomienda límites de exposición ocupacional para varias sustancias, y colabora con OSHA y MSHA en investigaciones de seguridad y salud ocupacional.

**Nonflammable (Incombustible)** Que no se incendia fácilmente, o si se incendia, no se quema rápidamente.

**Non-Sparking Tools (Herramientas Anti-Chispa)**

Herramientas fabricadas con berilio-cobre o aluminio-bronce que reducen grandemente la posibilidad de incendiar polvos, gases, o vapores inflamables. Aunque estas herramientas pueden emitir algunas chispas cuando golpean metal, las chispas contienen una baja cantidad de calor y no son propensas a incendiar la mayoría de los líquidos inflamables.

**NO<sub>x</sub>** Óxidos de nitrógeno que son indeseables contaminantes del aire. Las emisiones de NO están reguladas por la EPA bajo el Acta de Aire Limpio (Clean Air Act).

**NPIRS** Siglas en inglés para el National Pesticide Information Retrieval System, el cual es una base de datos automatizada operada por Purdue University y que contiene información sobre los pesticidas registrados en la EPA, incluyendo archivos de referencia de las MSDS.

**NRC** Siglas en inglés para el National Response Center; el cual es un centro de notificación al cual debe de llamarse cuando ocurra un derrame significativo de químicos o aceites, o cualquier otro accidente relacionado con el ambiente. El número gratuito es 1-800-424-8802.

**NTP** National Toxicology Program. The NTP publishes an Annual Report on Carcinogens.

**Odor** A description of the smell of the substance.

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

**Olfactory** Relating to the sense of smell.

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

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

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

**Organogenesis** The formation of organs during development.

**OSHA** Occupational Safety and Health Administration, U.S. Department of Labor.

**Ovary** The female sex gland in which ova are formed.

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

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

**Oxidizer** A chemical other than a blasting agent or explosive that initiates or promotes combustion in other materials, causing fire either by itself or through the release of oxygen or other gases.

**Oxidizing Agent** A chemical or substance that brings about an oxidation reaction. The agent may (1) provide the oxygen to the substance being oxidized (in which case the agent has to be oxygen or contain oxygen), or (2) it may receive electrons being transferred from the substance undergoing oxidation (chlorine is a good oxidizing agent for electron-transfer purposes, even though it contains no oxygen).

**Pathologic** Pertaining to or caused by disease.

**Pathology** Scientific study of alterations produced by disease.

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

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

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

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

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

**PMCC** Pensky-Martens Closed Cup. See Flashpoint.

**Pneumoconiosis** A condition of the lung in which there is permanent deposition of particulate matter and the tissue

reaction to its presence. It may range from relatively harmless forms of iron oxide deposition to destructive forms of silicosis.

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

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

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

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

**ppm** Parts per million is the concentration of a gas or vapor in air--parts 9By volume) of the gas or vapor in a million parts of air; also the concentration of a particulate in a liquid of solid.

**Prenatal** Preceding birth.

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

**Pul** See pulmonary.

**Pulmonary** Relating to, or associated with, the lungs.

**Pulmonary Edema** Fluid in the lungs

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

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

**Reactive** See Unstable.

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

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

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

**NTP** Siglas en inglés para National Toxicology Program. El NTP publica un Reporte Anual sobre Carcinógenos (Annual Report on Carcinogens).

**Olor (Olor)** Una descripción de cómo huele una sustancia.

**Olor Threshold (Límite de Olor)** La concentración más baja del vapor de una sustancia, en aire, que puede olerse.

**Olfactory (Olfativo)** Relativo al sentido del olfato.

**Oral** Usado o introducido dentro del cuerpo a través de la boca.

**Oral Toxicology (Toxicología Oral)** Efectos adversos que resultan de la introducción de una sustancia dentro del cuerpo por medio de la boca. Comúnmente usado para describir los efectos en animales de laboratorio.

**Organic Peroxide (Peróxido Orgánico)** Un compuesto orgánico que contiene la estructura bivalente -O-O y que puede ser considerado un derivado estructural del peróxido de hidrógeno donde uno o dos átomos de hidrógeno han sido reemplazados por un radical orgánico.

**Organogenesis (Organogénesis)** La formación de órganos durante el desarrollo.

**OSHA** Siglas en inglés para Occupational Safety and Health Administration, U.S. Department of Labor. (Administración de la Seguridad y Salud Ocupacional, Departamento del Trabajo de los Estados Unidos)

**Ovary (Ovario)** Glándula del sexo femenino en la cual se forman los óvulos.

**Overexposure (Sobre exposición)** Exposición a un material riesgoso por encima de los límites de exposición permisibles.

**Oxidation (Oxidación)** En un sentido literal, oxidación es una reacción en la cual una sustancia se combina con oxígeno proporcionado por un oxidador o un agente oxidante. Ver Agente Oxidante.

**Oxidizer (Oxidador)** Un químico diferente a un agente explosivo que inicia o promueve la combustión en otros materiales, causando fuego ya sea por sí mismo o por medio de la liberación de oxígeno u otros gases.

**Oxidizing Agent (Agente Oxidante)** Un químico o sustancia que provoca una reacción de oxidación. El agente puede (1) proporcionar el oxígeno a la sustancia siendo oxidada (en ese caso el agente tiene que ser o contener oxígeno), o (2) puede recibir electrones que están siendo transferidos por la sustancia sufriendo la oxidación (el cloro es un buen agente oxidante para fines de transferencia de electrones, aunque no contiene oxígeno).

**Pathologic (Patológico)** Pertinente a o causado por un padecimiento.

**Pathology (Patología)** Ciencia que estudia las alteraciones producidas por un padecimiento.

**PEL** Siglas en inglés para Permissible Exposure Limit; es un límite de exposición ocupacional establecido por la autoridad normativa de OSHA. Puede ser un límite promedio de tiempo-peso (time-weighted average, TWA), o un límite de concentración máxima de exposición.

**Percent Volatile (Porcentaje Volátil)** Porcentaje volátil por volumen es el porcentaje de un líquido o sólido (por volumen) que se evaporará a una temperatura ambiente de 70 °F (a menos que se especifique alguna otra temperatura). Ejemplos: butano, gasolina y disolvente de pintura (thinner, mineral spirits) son 100% volátiles; sus rangos individuales de evaporación varían, pero con el tiempo, cada uno se evaporará completamente.

**pH** Símbolo que relaciona la concentración del ión de hidrógeno (H<sup>+</sup>) con aquel de una solución estándar conocida. Un pH de 7 es neutral. Los incrementos de 7 a 14 indican mayor alcalinidad. Números menores de 7 hasta 0 indican mayor acidez.

**Physical Hazard (Riesgo Físico)** Significa que existe evidencia científica válida de que un químico es un líquido combustible, un gas comprimido, un explosivo, inflamable, un peróxido orgánico, un oxidador, que se incendia espontáneamente (pyrophoric), inestable (reactivo) o que reacciona con el agua.

**Placenta** Estructura que crece en la pared del útero durante el embarazo, a través de la cual se alimenta el feto.

**PMCC** Siglas en inglés para Pinsky-Martens Closed Cup. Ver Punto de Inflamación.

**Pneumoconiosis (Neumoconiosis)** Condición en el pulmón en la cual existe un depósito permanente de partículas de materia y reacción del tejido a su presencia. Puede variar de relativamente inofensivas formas de depósitos de óxido de hierro hasta formas destructivas de silicosis.

**Poison, Class A (Veneno, Clase A)** Término del DOT para venenos extremadamente peligrosos—gases venenosos o líquidos que, en muy pequeñas cantidades, ya sea como gas o como vapor del líquido, mezclado con el aire, son peligrosos para la vida. Ejemplos: Fosgeno (phosgene, COCl<sub>2</sub>), cianógeno (cyanogen, C<sub>2</sub>N<sub>2</sub>), peróxido de nitrógeno (nitrogen peroxide).  
**Poison, Class B (Veneno, Clase B)** Término del DOT para sustancias líquidas, sólidas, pastosas o semisólidas—diferentes a los venenos o materiales irritantes de la Clase A—que se conocen (o se presumen en base a pruebas en animales) que son tan tóxicos para los humanos que representan un riesgo a la salud durante su transporte.

**Polymerization (Polimerización)** Reacción química en la cual una o más pequeñas moléculas se combinan para formar moléculas más grandes. Una polimerización riesgosa es aquella reacción que ocurre de forma que libera grandes cantidades de energía. Si una polimerización riesgosa puede ocurrir con un cierto material, la MSDS normalmente listará las condiciones que pueden comenzar la reacción y—como el material usualmente contiene un inhibidor de la polimerización—la duración (tiempo) durante el cual dicho inhibidor será efectivo.

**ppb** Partes por billón es la concentración de un gas o vapor en aire—partes (por volumen) de gas o vapor en un billón de partes de aire. Normalmente se usa para expresar concentraciones extremadamente bajas de gases o vapores usualmente no tóxicos; también es la concentración de una particular sustancia en un líquido o sólido.

**ppm** Partes por millón es la concentración de un gas o vapor en aire—partes (por volumen) de un gas o vapor en un millón de partes de aire; también la concentración de una partícula en un líquido o sólido.

**Prenatal** Anterior al nacimiento.

**psi** Siglas en inglés para libras por pulgada cuadrada (para fines de las MSDS), es la presión que un material ejerce en las paredes de un recipiente o tanque cerrado. Para exactitud técnica, la presión debe de ser expresada como psig (siglas en inglés para libras por pulgada cuadrada calibrada) o psia (libras por pulgada cuadrada absoluta; es decir, presión medida más la presión atmosférica al nivel del mar, o psig más aproximadamente 14.7 libras por pulgada cuadrada). Ver también mmHg.

**Pul** Ver pulmonario.

**Pulmonary (Pulmonario)** Relativo a, o asociado con, los pulmones.

**Pulmonary Edema (Edema Pulmonar)** Líquido en los pulmones.

**Pyrophoric (Pirofórico)** Químico que puede incendiarse espontáneamente en aire a temperatura de 13° F (54.4°C) o menor.

**Reaction (Reacción)** Transformación o cambio químico. La interacción de dos o más sustancias para formar nuevas sustancias.

**Reactive (Reactivo)** Ver Inestable.

**Reactivity (Reactividad)** Reacción química con liberación de energía. Efectos indeseables—como acumulación de presión, incremento de temperatura, formación de subproductos nocivos, tóxicos o corrosivos—puede ocurrir debido a la reactividad de la sustancia al calentamiento, quemadura, contacto directo con otros materiales, u otras condiciones en uso o en almacenamiento.

**Reducing Agent (Agente Reductor)** En una reacción reductora (la cual siempre ocurre simultáneamente con una reacción de oxidación) el agente reductor es el químico o sustancia que (1) se combina con oxígeno, o (2) pierde electrones en la reacción. Ver Oxidación.

**REL** Siglas en inglés para el Límite de Exposición Recomendado de NIOSH, es la concentración más alta permitida transportada en el aire que no se espera que lesione a los trabajadores. Puede ser expresada como un límite superior (ceiling limit) o como un promedio ponderado en el tiempo (time-weighted average, TWA).



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

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

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

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

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

**Sarcoma** A tumor that is often malignant.

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

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

**SETA** Setaflash Closed Tester. See Flashpoint.

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

**Skn** Skin.

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

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

**Skin Sensitizer** See Sensitizer.

**Skin Toxicity** See Dermal Toxicity.

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

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

**SOx** Oxides of sulfur.

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

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

**Specific Gravity** The weight of a material compared to the weight of an equal volume of water is an expression of the density (or heaviness) of a material. Insoluble materials with specific gravity of less and 1.0 will float in (or on) water. Insoluble materials with specific gravity greater than 1.0 will

sink in water. Most (but not all) flammable liquids have specific gravity less than 1.0 and, if not soluble, will float on water--an important consideration for fire suppression.

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

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

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

**Squamous** Scaly or platelike.

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

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

**Stenosis** Narrowing of a body passage or opening.

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

**Subcutaneous** Beneath the layers of the skin.

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

**Sys** System or systemic.

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

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

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

**Target Organ Effects** The following is a target organ categorization of effects that may occur, including examples of signs and symptoms and chemicals that have been found to cause such effects. These examples are presented to illustrate the range and diversity of effects and hazards found in the workplace, and the broad scope employers must consider in this area, but they are not intended to be all inclusive.

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(a) Hepatotoxins	Chemicals that produce liver damage.
Signs and Symptoms	Jaundice; liver enlargement.
Chemicals	Carbon tetrachloride; nitrosamines.
(b) Nephrotoxins	Chemicals that produce kidney damage.
Signs and Symptoms	Edema; proteinuria.
Chemicals	Halogenate hydrocarbons; uranium.

**Reproductive Toxin (Toxina Reproductiva)** Sustancias que afectan el sistema reproductor femenino o masculino y que puede impedir la habilidad de tener hijos.

**Respiratory Protection (Protección Respiratoria)** Dispositivos que protegerán el sistema respiratorio de la persona que los usa de una sobre exposición por inhalación de contaminantes trasportados en el aire. La protección respiratoria se usa cuando un trabajador debe de trabajar en un área donde él o ella podrían estar expuestos a concentraciones en exceso al límite de exposición permitido.

**Respiratory System (Sistema Respiratorio)** El sistema de respiración incluye los pulmones y los pasajes de aire (traquea, laringe, boca y nariz) hacia fuera del cuerpo, más los nervios asociados y suministro circulatorio.

**Routes of Entry (Rutas de Entrada)** Medios por los cuales un material puede tener acceso al cuerpo, por ejemplo, inhalación, ingestión y contacto con la piel.

**RCRA** Siglas en inglés para Resource Conservation and Recovery Act, la cual es una legislación orientada a controlar la generación, tratamiento, almacenamiento, transporte y desecho de basura riesgosa (hazardous wastes). Es administrada por la EPA.

**Sarcoma** Tumor frecuentemente maligno.

**Self-Contained Breathing Apparatus, SCBA (Respiradores Autocontenidos o Autónomos)** Dispositivo para protección respiratoria que consiste de un suministro o un medio de aire respirable, oxígeno, o material generador de oxígeno, transportado (cargado) por el usuario.

**Sensitizer (Sensibilizador)** Un químico que causa que una proporción considerable de personas o animales expuestos desarrollen una reacción alérgica en tejido normal después de repetidas exposiciones al químico.

**SETA** Siglas en inglés para Setafash Closed Tester. Ver Punto de Inflamación (Flashpoint).

**Silicosis** Padecimiento de los pulmones (fibrosis) causado por la inhalación de polvo de sílice.

**Skn** Abreviación en inglés para Piel.  
**“Skin” (“Piel”)** Anotación (algunas veces usada con datos de exposición del PEL o TLV), que indica que la sustancia referida puede ser absorbida por la piel, membranas mucosas y los ojos—ya sea transportada por el aire o por contacto directo—y que esta exposición adicional debe de ser considerada parte de la exposición total para evitar exceder el PEL o TLV para dicha sustancia.

**Skin Absorption (Absorción Cutánea)** Habilidad de algunos químicos riesgosos de pasar directamente por la piel y entrar al torrente sanguíneo.

**Skin Sensitizer (Sensibilizador Cutáneo)** Ver Sensibilizador.

**Skin Toxicity (Toxicidad Cutánea)** Ver Toxicidad Dermal.

**Solubility in Water (Solubilidad en Agua)** Término que expresa el porcentaje de un material (por peso) que se disolverá en agua a temperatura ambiente. La información sobre solubilidad puede ser útil en la determinación de métodos de limpieza después de un derrame y en la determinación de agentes y métodos extinguidores para un material.

**Solvent (Solvente)** Una sustancia, usualmente un líquido, en el cual otras sustancias se disuelven. El solvente más común es el agua.

**SOx** Óxidos de sulfuro.

**Especies (Especies)** En las MSDS, especies se refiere a los animales de laboratorio—usualmente ratas, ratones o conejos—usados para obtener los datos reportados de pruebas de toxicidad.

**Specific Chemical Identity (Identidad Química Específica)** El nombre químico, Chemical Abstracts Service (CAS) Registry Number, o cualquier otra asignación química precisa de una sustancia.

**Specific Gravity (Gravedad Específica)** El peso de un material comparado con el peso de un volumen igual de agua es una

expresión de densidad (o pesadez) de un material. Materiales insolubles con gravedad específica de 1.0 o menor flotarán en el agua. Materiales insolubles con gravedad específica mayor de 1.0 se hundirán en el agua. La mayoría (pero no todos) los líquidos inflamables tienen una gravedad específica menor de 1.0 y, si no son solubles, flotarán en el agua—una consideración importante para la supresión de fuego.

**Spill or Leak Procedures (Procedimientos para Derrames o Fugas)** Los métodos, equipo y precauciones que deben de ser usados para controlar o limpiar una fuga o derrame.

**Splash-Proof Goggles (Gafas a Prueba de Salpicaduras)** Protección para los ojos fabricada con un material no corrosivo que se ajusta cómodamente a la cara y que tiene puertos de ventilación indirecta.

**Spontaneously Combustible (Espontáneamente Combustible)** Un material que se incendia como resultado de la retención de calor proveniente del proceso, o que se oxidará para generar calor e incendiarse, o que absorbe humedad para generar calor e incendiarse.

**Squamous (Escamoso)** Con escamas o similar a un plato (de forma plana y lisa).

**Stability (Estabilidad)** La habilidad de un material de permanecer sin cambios. Para propósitos de las MSDS, un material es estable si permanece en la misma forma bajo esperadas y razonables condiciones de almacenamiento y uso. Condiciones que pueden causar inestabilidad (cambios peligrosos) son conocidas; por ejemplo, temperaturas arriba de 150 °F; desequilibrio por descenso.

**STEL** Siglas en inglés para Short-Term Exposure Limit, Límite de Exposición a Corto Tiempo (Terminología de la ACGIH). Ver TLV.

**Stenosis (Estenosis)** Estrechez o angostura de un pasaje (o apertura) del cuerpo.

**Steroid (Esteroid)** Una molécula compleja entre las cuales están las hormonas sexuales femeninas y masculinas.

**Subcutaneous (Subcutáneo)** Por debajo de las capas de la piel.

**Supplied-Air Respirator (Respiradores con Suplemento de Aire)** Respiradores con línea de aire del aparato de respiración autocontenido.

**Sys** Inglés abreviado para Sistema o Sistemático.

**Systemic Poison (Veneno Sistemático)** Veneno que se dispersa a través del cuerpo, afectando todos los sistemas y órganos corporales. Sus efectos adversos no se localizan en un solo lugar o área.

**Systemic Toxicity (Toxicidad Sistemática)** Efectos adversos causados por una sustancia que afecta el cuerpo en general más que de una forma local.

**Synonym (Sinónimo)** Otro nombre o nombres por el cual un material es conocido. Alcohol metílico, por ejemplo, se conoce también como metanol o alcohol de madera.

**Target Organ Effects (Efectos en Órganos Específicos)** La siguiente es una categorización de efectos en órganos específicos que pueden ocurrir, incluyendo ejemplos de signos y síntomas, y químicos que han sido encontrados como causantes de esos efectos. Estos ejemplos se presentan para ilustrar el rango y diversidad de efectos y riesgos encontrados en el lugar de trabajo, y el amplio alcance que los empleadores deben de considerar en esta área, pero no se intenta incluir todos.

(a) Hepatotoxinas	Químicos que producen daño al hígado.
Signos y Síntomas	Ictericia; agrandamiento del hígado.
Químicos	Tetracloruro de carbono, nitrosaminas.
(b) Nephrotoxinas	Químicos que producen daño en el riñón.
Signos y Síntomas	Edema; proteinuria.
Químicos	Hidrocarburos halogenados; uranio.

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

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

**TCC** Tag (Tagliabue) Closed Cup. See Flashpoint.

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

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

**Temp** Temperature.

**Ter** See Teratogen.

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

**Tfx** Toxic effect(s).

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

**TLV-TWA:** The allowable Time-Weighted Average concentration for a normal 8-hour workday or 80-hour workweek.

**TLV-STEL:** The Short-Term Exposure Limit, or maximum concentration for a continuous 15-minute exposure period (maximum of four such periods per day, with at least 60 minutes between exposure periods, and provided the daily TLV-TWA is not exceeded).

**TLV-C:** The ceiling exposure limit--the concentration that should not be exceeded even instantaneously.

**TOC** Tag Open Cup. See Flashpoint.

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

**Toxic** A chemical falling within any of the following categories:

(a) A chemical that has a median lethal dose (LD<sub>50</sub>) 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<sub>50</sub>) 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<sub>50</sub>) in air of more than 200 parts per million but not more than 2,000 parts per million by volume of gas or vapor, or more than two milligrams per liter but not more than 20 milligrams per liter of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within 1 hours) to albino rats weighing between 200 and 300 grams each.

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

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

**Trade Name** The trademark name or commercial trade name for a material or product.

**Transplacental** An agent that causes physical defects in the developing embryo.

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

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

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

**ug** Microgram, one-millionth of a gram.

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

(c) Neurotoxinas efectos tóxicos en el sistema nervioso. Signos y Síntomas Químicos	Químicos que producen sus principales efectos tóxicos en el sistema nervioso. Narcosis; cambios en el comportamiento; disminución en las funciones motoras. Mercurio, bisulfito de carbono.
(d) Agentes que actúan en sistema hematopoyético de la sangre Signos y Síntomas Químicos	Disminución en la función de la hemoglobina, priva al cuerpo de oxígeno. Cianosis; pérdida de conciencia Monóxido de carbono; cianuros
(e) Agentes que dañan el pulmón Signos y Síntomas Químicos	Químicos que irritan o dañan el tejido pulmonar. Tos, pesadez en el pecho, falta de aliento. Sílice; asbestos.
(f) Toxinas reproductoras  Signos y Síntomas Químicos	Químicos que afectan negativamente las capacidades reproductoras incluyendo daño cromosomal (mutaciones) y efectos en el feto (teratogénesis). Defectos de nacimiento; esterilidad Plomo; DBCP.
(g) Riesgos cutáneos Signos y Síntomas Químicos	Químicos que afectan la capa dermal del cuerpo. Adelgazamiento de la piel; salpullidos; irritación. Cetonas; compuestos con cloro.
(h) Riesgos para los Ojos Signos y Síntomas Químicos	Químicos que afectan el ojo o la capacidad visual. Conjuntivitis; daño a la córnea. Solventes orgánicos; ácidos.

#### Target Organ Toxins (Toxinas en Órganos Específicos)

Una sustancia tóxica que ataca un órgano específico del cuerpo. Por ejemplo, sobre exposición al tetracloruro de carbono puede causar daño al hígado.

**TCC** Siglas en inglés para Tag (Tagliabue) Closed Cup. Ver Punto de Inflamación.

**TCL** Siglas en inglés para Toxic concentration low, la concentración más baja de un gas o vapor capaz de producir un efecto tóxico definido en una especie de laboratorio específica, en un tiempo específico.

**TDL** Siglas en inglés para Toxic dose low, la mínima dosis administrada de un material capaz de producir un efecto tóxico definido en una especie de laboratorio específica.

**Temp** Abreviatura para Temperatura.

**Ter** Ver Teratógeno.

**Teratogen (Teratógeno)** Una sustancia o agente al cual si una mujer embarazada es expuesta, puede resultar en malformaciones en el feto.

**Tfx** Siglas en inglés para Toxic effects (Efectos tóxicos).

**TLV** Siglas en inglés para Threshold Limit Value, término usado por la ACGIH para expresar la concentración de material transportada en el aire a la cual casi todas las personas pueden ser expuestas día a día sin sufrir efectos adversos. La ACGIH expresa TLVs en tres formas:

TLV-TWA: Siglas en inglés para Time-Weighted Average Concentration, concentración promedio tiempo-peso permitida para un día de trabajo normal de 8 hrs o una semana de trabajo de 40 hrs.

TLV-STEL: Siglas en inglés para Short –Term Exposure Limit, concentración máxima para un periodo de exposición continua de 15 min (máximo cuatro periodos por día, con al menos 60 minutos entre periodos de exposición, y previendo que el TLV-TWA diario no sea excedido).

TLV-C: Siglas en inglés para Ceiling Exposure Limit, concentración que no debe de ser excedida ni por un instante.

**TOC** Siglas en inglés para Tag Open Cup. Ver Punto de Inflamación.

**Torr** Una unidad de presión, igual a 1/760 atmósfera.

**Toxic (Tóxico)** Un químico que cae dentro de cualquiera de las siguientes categorías:

(a) Un químico que tiene una dosis letal media (LD<sub>50</sub>) mayor de 50 miligramos por kilogramo pero no más de 500 miligramos por kilogramo de peso corporal cuando es administrado oralmente a ratas albinas que pesan entre 200 y 300 gramos cada una.

(b) Un químico que tiene una dosis letal media (LD<sub>50</sub>) mayor de 200 miligramos por kilogramo pero no más de 1,000 miligramos por kilogramo de peso corporal cuando se administra por contacto continuo por 24 horas (o menos si ocurre muerte dentro de 24 horas) con la piel desnuda de ratas albinas pesando entre dos y tres kilogramos cada una.

(c) Un químico que tiene una concentración letal media (LC<sub>50</sub>) en aire de más de 200 partes por millón pero no más de 2,000 partes por millón por volumen de gas o vapor, o más de dos miligramos por litro pero no más de 20 miligramos por litro de niebla, emanación o polvo, cuando se administra por inhalación continua por una hora (o menos si ocurre muerte dentro de 1 hora) a ratas albinas pesando entre 200 y 300 gramos cada una.

**Toxic Substance (Sustancia Tóxica)** Cualquier sustancia que pueda causar lesiones agudas o crónicas en el cuerpo humano, o que se sospecha que pueda ser capaz de causar enfermedades o lesiones bajo ciertas condiciones.

**Toxicity (Toxicidad)** La suma de efectos adversos que resultan de la exposición a un material, generalmente por la boca, piel o tracto respiratorio.

**Trade Name (Nombre Comercial)** Nombre de marca o nombre comercial para un material o producto.

**Transplacental** Un agente que causa defectos físicos en el desarrollo del embrión.

**TSCA** Siglas en inglés para Toxic Substances Control Act (Federal Environmental Legislation, administrada por la EPA) regulación de la manufactura, manejo y uso de materiales clasificados como "sustancias tóxicas".

**TWA** Siglas en inglés para Time-Weighted Average Exposure, concentración transportada por el aire de un material al cual una persona es expuesta, promediada sobre el total de tiempo de exposición- generalmente el día completo de trabajo (8 a 12 horas). También ver TLV.

**UEL o UFL** Siglas en inglés para Upper Explosive Limit, límite superior explosivo o límite superior de inflamabilidad de un vapor o gas; la concentración más alta (porcentaje más alto de una sustancia en el aire) que producirá una ráfaga de fuego cuando una fuente de ignición (calor, arco o flama) esté presente. A concentraciones más altas, la mezcla es muy "rica" para quemarse. Ver también LEEL.

**ug** Microgramo, una millonésima de un gramo.

**Unstable (Inestable)** Que tiende a la descomposición u otro cambio químico no deseado, durante su manejo normal o almacenamiento.

**USDA** U.S. Department of Agriculture.

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

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

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

1. Vapor pressure of a substance at 100°F will always be higher than the vapor pressure of the substance at 68°F (20°C).
2. Vapor pressures reported on MSDS's in mmHg are usually very low pressures; 760 mmHg is equivalent to 14.7 pounds per square inch.
3. The lower the boiling point of a substance, the higher its vapor pressure.

**Ventilation** See General Exhaust, Local Exhaust, and Mechanical Exhaust.

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

**Viscosity** The tendency of a fluid to resist internal flow without regard to its density.

**Volatility** A measure of how quickly a substance forms a vapor at ordinary temperatures.

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

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

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

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

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

**USDA** Departamento de Agricultura de los Estados Unidos.

**Vapor** La forma gaseosa de una sustancia sólida o líquida cuando se está evaporando.

**Vapor Density (Densidad de Vapor)** El peso de un vapor o gas comparado con el peso de un volumen equivalente de aire es una expresión de la densidad del vapor o gas. Materiales más ligeros que el aire tiene una densidad de vapor menor que 1.0 (ejemplos: acetileno, metano, hidrógeno). Materiales más pesados que el aire (ejemplos: propano, hidrógeno, sulfito, etano, butano, cloruro, dióxido de sulfuro) tienen densidades de vapor mayores de 1.0. Todos los vapores y gases se mezclarán con aire, pero los materiales más ligeros tenderán a elevarse y disiparse (a menos que estén confinados). Los vapores y gases más pesados son más probables de concentrarse en lugares bajos—a lo largo o debajo del piso, en sumideros, drenajes y en hoyos, zanjas y cunetas—donde pueden crear fuego o riesgos para la salud.

**Vapor Pressure (Presión de Vapor)** La presión ejercida por un vapor saturado arriba de su propio líquido dentro de un recipiente cerrado. Cuando se realizan pruebas de control de calidad en productos, la temperatura de prueba es usualmente de 100°F y la presión de vapor se expresa como libras por pulgada cuadrada (psig o psia), pero las presiones de vapor reportadas en las MSDS son en milímetros de mercurio (mmHg) a 68°F (20°C), a menos que se aclare lo contrario. Es importante recordar tres factores:

1. La presión de vapor de una sustancia a 100°F será siempre mayor que la presión de vapor de la sustancia a 68°F (20°C).
2. Las presiones de vapor reportadas en las MSDS en mmHg son generalmente muy bajas presiones; 760 mmHg es equivalente a 14.7 libras por pulgada cuadrada.
3. Entre más bajo el punto de ebullición de una sustancia, más alta su presión de vapor.

**Ventilation (Ventilación)** Ver Escape General, Escape Local y Escape Mecánico.

**Vermiculite (Vermiculita)** Una mica expandida (silicato hidratado de magnesio-aluminio-hierro) usada como absorbente para el control y limpieza de derrames.

**Viscosity (Viscosidad)** La tendencia de un fluido a resistir flujo interno sin importar su densidad.

**Volatility (Volatilidad)** Una medida de la rapidez de una sustancia para formar un vapor a temperaturas ordinarias.

**Water Disposal Methods (Métodos de Desecho de Agua)** Métodos de deshecho apropiados para material contaminado, líquidos o sólidos recuperados, y sus recipientes.

**Water-Reactive (Reactivo con el Agua)** Un químico que reacciona con agua para liberar un gas que inflamable o que presenta un riesgo para la salud.

**Work Area (Área de Trabajo)** Un cuarto o espacio definido en el lugar de trabajo donde se usan o producen químicos riesgosos, y donde hay trabajadores presentes.

**Workplace (Lugar de Trabajo)** Un establecimiento en un lugar geográfico conteniendo una o más áreas de trabajo.

**Zinc Fume Fever (Fiebre de Emanaciones de Zinc)** Una condición provocada por la inhalación de emanaciones de óxido de zinc que se caracteriza por síntomas semejantes a la gripe (flu) con un sabor metálico en la boca, tos, debilidad, fatiga, dolor muscular y náusea, seguida por fiebre y escalofríos. La aparición de los síntomas ocurre cuatro a doce horas después de la exposición.