

Hazard Communication Program



*A comprehensive guide to
hazardous chemicals in the
workplace and what you
need to do to comply with
OSHA requirements.*



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chemicals in the workplace and what you need
to do to comply with OSHA requirements.*



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Contents

Chapter 1 - Introduction and Implementation

About this Manual/Disclaimer.....	1
Frequently Asked Questions.....	4
Introduction	11
Introduction: Globally Harmonized System of Classification and Labeling (GHS)	11
The What and Why of the GHS	12
The International Mandate.....	13
OSHA's Hazard Communication Standard and the GHS.....	13
Benefits of the GHS	14
State Obligations Regarding the GHS.....	15
Scope of the GHS.....	15
Labeling: Biggest Difference Between the HCS and the GHS.....	16
Specific Labeling Requirements.....	17
Implementation Procedures.....	19
Compliance Checklist	

Chapter 2 - Sample Hazard Communication Program

Our Hazard Communication Program	21
General Company Policy	21
List of Hazardous Chemicals.....	21
Safety Data Sheets (SDSs).....	21
Labels and Other Forms of Warning	21
Non-Routine Tasks.....	22
Training.....	22
Contractor Employers.....	22
Personnel Policies.....	23
Additional Information	23

Chapter 3 - My Hazard Communication Program

Written Hazard Communication Program.....	25
Objective.....	25
Employee Information and Training.....	26
Safety Data Sheets (SDSs).....	27
Container Labeling.....	28
Hazardous Non-Routine Tasks.....	28
List of Hazardous Substances	29
Hazardous Materials Communication for Contractors.....	30
Personnel Policies.....	30
Additional Information	30
Employee Right to Know Hazardous Communication Plan	31

Chapter 4 - GHS Classification

GHS Classification System Explained	33
GHS Physical Hazards	34
Explosives	34
Flammable Gases.....	34
Flammable Aerosols	34
Oxidizing Gases.....	34
Gases under Pressure.....	34
Flammable Liquids.....	34
Flammable Solids.....	35
Self-Reactive Substances	35
Pyrophoric Liquids	35
Pyrophoric Solids	36
Self-Heating Substances	36
Substances which on Contact with Water Emit Flammable Gases	36
Oxidizing Liquids	36

Contents

Oxidizing Solids	36
Organic Peroxides.....	36
Substances Corrosive to Metal.....	37
GHS Health Hazards	38
Acute Toxicity	38
Skin Corrosion.....	38
Skin Irritation	38
Eye Effects	38
Sensitization	39
Germ Cell Mutagenicity.....	39
Carcinogenicity	39
Reproductive Toxicity.....	39
Specific target organ systemic toxicity (TOST)	39
Aspiration Hazard	40
GHS Environmental Hazards	41
Hazardous to the Aquatic Environment	41
Acute Aquatic Toxicity.....	41
Chronic Aquatic Toxicity	41
Summary and Conclusion	41
 Chapter 5 - Labeling of Chemicals	
Standardized Label	42
Symbols/Pictograms.....	43
Signal Words.....	43
Physical, Health, Environmental Hazard Statements	43
Pictograms.....	44
Precautionary Measures.....	45
Product Identifier (Ingredient Disclosure).....	45
Supplier Identification	45
Supplemental Information	45
GHS Label Format / Layout.....	46
Workplace Containers	46

Chapter 6 - Understanding Safety Data Sheets

Overview.....	47
MSDS Comparison Chart	48
OSHA Requirements	51
Employer Responsibilities.....	51
Contents of an SDS.....	51

Safety Data Sheet Checklist

List of Hazardous Chemicals and Index of SDSs

Chapter 7 - My Safety Data Sheets

GHS Sample Safety Data Sheet	54
Identification	54
Hazards Identification.....	54
Composition / Information on Ingredients	55
First Aid Measures.....	55
Fire Fighting Measures	55
Accidental Release Measures.....	55
Handling and Storage	55
Exposure Controls / Personal Protection	56
Physical and Chemical Properties.....	56
Stability and Reactivity	56
Toxicological Information	56
Ecological Information.....	57
Disposal Considerations	57
Transport Information	57
Regulatory Information	57
Other Information	58

Contents

Chapter 8 - Safety Data Sheet Requests

Sample Letter Requesting an MSDS.....	60
Sample Letter Requesting Additional SDS Information.....	61
Sample Letter To Accompany Purchase Orders.....	62

Chapter 9 - My SDS Request File

Chapter 10 - Sample Training Program

Employer Training Requirements	64
Designing a Training Program.....	65
Voluntary Training Guidelines	67
Training Model	67
Review Commission Implications	67
Training Guidelines.....	68
Determining if Training is Needed	68
Identifying Training Needs.....	68
Identifying Goals and Objectives	69
Developing Learning Activities.....	69
Conducting the Training.....	69
Evaluating Program Effectiveness.....	70
Improving the Program.....	70
Matching Training to Employees	71
Identifying Employees at Risk	71
Training Employees at Risk.....	71

Training Checklist

Chapter 11 - My Training Program

Hazardous Communication Program
Hazard Communication
Chemicals
Chemical Spills
Understanding Safety Data Sheets
How to Read a Label
Pictograms and Signal Words
Hazard Materials Contractor
Hazardous Non-Routine
PPE

Chapter 12 - My Training Records

Safety Meeting/Training Report Forms
Training Acknowledgement Forms

Chapter 13 - Appendix 1 - OSHA Hazard Communication

OSHA Hazard Communication Standard (29 CFR 1910.1200).....	83
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Chapter 14 - Appendix 2 - SDS Glossary

Chapter 15 - Appendix 3 - States with Approved Plans

Chapter 16 - Appendix 4 - OSHA/ State Consultation Project Directory



Chapter 1

Introduction and Implementation Procedures

About this Manual / Disclaimer

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First established in 1983 and then extended to all industries in 1987, the Hazard Communication Standard (29 CFR 1910.1200 (e)(1)) was one of the first standards to require a written program. It was later modified with minor changes and technical amendments to take effect March 11, 1994. In 2012, OSHA again expanded the rule to align it with the international standards under The Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

The new hazard communication standard still requires chemical manufacturers and importers to evaluate the chemicals they produce or import and provide hazard information to employers and workers by putting labels on containers and preparing safety data sheets. However, the old standard allowed chemical manufacturers and importers to convey hazard information on labels and material safety data sheets in whatever format they chose. The modified standard provides a single set of harmonized criteria for classifying chemicals according to their health and physical hazards and specifies hazard communication elements for labeling and safety data sheets.

Benefits: The new standard covers over 43 million workers who produce or handle hazardous chemicals in more than five million workplaces across the country. The modification is expected to prevent over 500 workplace injuries and illnesses and 43 fatalities annually. Once fully implemented it will also:

- Improve the quality and consistency of hazard information in the workplace, making it safer

for workers to do their jobs and easier for employers to stay competitive;

- Enhance worker comprehension of hazards, especially for low and limited-literacy workers, reduce confusion in the workplace, facilitate safety training, and result in safer handling and use of chemicals;
- Provide workers quicker and more efficient access to information on the safety data sheets;
- Result in cost savings to American businesses of more than \$475 million in productivity improvements, fewer safety data sheet and label updates and simpler new hazard communication training; and
- Reduce trade barriers by harmonizing with systems around the world.

Rulemaking background: OSHA published a Notice of Proposed Rulemaking to update the Hazard Communication Standard in September 2009 and held public hearings in March 2010.

Major changes to the Hazard Communication Standard:

- **Hazard classification:** Chemical manufacturers and importers are required to determine the hazards of the chemicals they produce or import. Hazard classification under the new, updated standard provides specific criteria to address health and physical hazards as well as classification of chemical mixtures.
- **Labels:** Chemical manufacturers and importers must provide a label that includes a signal word, pictogram, hazard statement, and precautionary statement for each hazard class and category.
- **Safety Data Sheets:** The new format requires 16 specific sections, ensuring consistency in presentation of important protection information.
- **Information and training:** To facilitate understanding of the new system, the new standard requires that workers be trained by December 1, 2013 on the new label elements and safety data sheet format, in addition to the current training requirements.

What you need to do and when:

- Chemical users: Continue to update safety data sheets when new ones become available, provide training on the new label elements and update hazard communication programs if new hazards are identified.
- Chemical Producers: Review hazard information for all chemicals produced or imported, classify chemicals according to the new classification criteria, and update labels and safety data sheets.

Effective Completion Date	Requirement(s)	Who
December 1, 2013	Train employees on the new label elements and SDS format.	Employers
June 1, 2015*	Comply with all modified provisions of this final rule, except:	Chemical manufacturers, importers, distributors and employers
December 1, 2015	Distributors may ship products labeled by manufacturers under the old system until December 1, 2015.	
June 1, 2016	Update alternative workplace labeling and hazard communication program as necessary, and provide additional employee training for newly identified physical or health hazards.	Employers
Transition Period	Comply with either 29 CFR 1910.1200 (this final standard), or the current standard, or both.	All chemical manufacturers, importers, distributors and employers

* This date coincides with the European Union implementation date for classification of mixtures.

The Hazard Communication Standard (HCS) is one of the most frequently cited general industry OSHA standards. If compliance efforts are not documented in a written program, employers will be subject to fines up to \$7,000 per violation.

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.

Chemicals directly or indirectly affect our lives and are essential to our food, our health, and our lifestyle. The widespread use of chemicals has

resulted in the development of sector-specific regulations (transportation, production, agriculture, trade, and consumer products) and related hazard communication standards. The basic goal of hazard communication is to ensure that employers, employees and the public are provided with adequate, practical, reliable and comprehensible information on the hazards of chemicals, so that they can take effective preventive and protective measures for their health and safety. Having readily available information on the hazardous properties of chemicals, as well as recommended control measures, allows the production, transport, use and disposal of chemicals to be managed safely. Thus, employers who exercise safe management of chemicals through proper hazard communication protect our overall health and the environment.

This manual provides information about OSHA's Hazard Communication Standard and the GHS, important elements in compliance, and required documentation. It also discusses the steps employers must take to implement their own Hazard Communication Compliance Program. A program

as outlined herein can only be effective if taken seriously and followed through. Each organization is unique. The needs of your organization should be examined and implemented into the program in order to make it successful. It is essential that the employer demonstrate at all times their personal concern for their employees and the priority placed on them in your workplace. The policy must be clear. The employer shows its importance through their own actions.

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Frequently Asked Questions

Q. What is the Globally Harmonized System?

A. The Globally Harmonized System (GHS) is an international approach to hazard communication, providing agreed criteria for classification of chemical hazards, and a standardized approach to label elements and safety data sheets. The GHS was negotiated in a multi-year process by hazard communication experts from many different countries, international organizations, and stakeholder groups. It is based on major existing systems around the world, including OSHA's Hazard Communication Standard and the chemical classification and labeling systems of other US agencies.

The result of this negotiation process is the United Nations' document entitled "Globally Harmonized System of Classification and Labeling of Chemicals," commonly referred to as The Purple Book. This document provides harmonized classification criteria for health, physical, and environmental hazards of chemicals. It also includes standardized label elements that are assigned to these hazard classes and categories, and provide the appropriate signal words, pictograms, and hazard and precautionary statements to convey the hazards to users. A standardized order of information for safety data sheets is also provided. These recommendations can be used by regulatory authorities such as OSHA to establish mandatory requirements for hazard communication, but do not constitute a model regulation.

Q. Why did OSHA decide to modify the Hazard Communication Standard to adopt the GHS?

A. OSHA has modified the Hazard Communication Standard (HCS) to adopt the GHS to improve safety and health of workers through more effective communications on chemical hazards. Since it was first promulgated in 1983, the HCS has provided employers and employees extensive information about the chemicals in their workplaces. The original standard is performance-oriented, allowing chemical manufacturers and importers to convey information on labels and material safety data sheets in whatever format they choose. While the available information has been helpful in improving employee safety and health, a more standardized approach to classifying the hazards and conveying the information will be

more effective, and provide further improvements in American workplaces. The GHS provides such a standardized approach, including detailed criteria for determining what hazardous effects a chemical poses, as well as standardized label elements assigned by hazard class and category. This will enhance both employer and worker comprehension of the hazards, which will help to ensure appropriate handling and safe use of workplace chemicals. In addition, the safety data sheet requirements establish an order of information that is standardized. The harmonized format of the safety data sheets will enable employers, workers, health professionals, and emergency responders to access the information more efficiently and effectively, thus increasing their utility.

Adoption of the GHS in the US and around the world will also help to improve information received from other countries—since the US is both a major importer and exporter of chemicals, American workers often see labels and safety data sheets from other countries. The diverse and sometimes conflicting national and international requirements can create confusion among those who seek to use hazard information effectively. For example, labels and safety data sheets may include symbols and hazard statements that are unfamiliar to readers or not well understood. Containers may be labeled with such a large volume of information that important statements are not easily recognized. Given the differences in hazard classification criteria, labels may also be incorrect when used in other countries. If countries around the world adopt the GHS, these problems will be minimized, and chemicals crossing borders will have consistent information, thus improving communication globally.

Q. What is the phase-in period in the revised Hazard Communication Standard?

A. The table below summarizes the phase-in dates required under the revised Hazard Communication Standard (HCS):

Effective Completion Date	Requirement(s)	Who
December 1, 2013	Train employees on the new label elements and SDS format.	Employers
June 1, 2015* December 1, 2015	Comply with all modified provisions of this final rule, except: Distributors may ship products labeled by manufacturers under the old system until December 1, 2015.	Chemical manufacturers, importers, distributors and employers
June 1, 2016	Update alternative workplace labeling and hazard communication program as necessary, and provide additional employee training for newly identified physical or health hazards.	Employers
Transition Period	Comply with either 29 CFR 1910.1200 (this final standard), or the current standard, or both.	All chemical manufacturers, importers, distributors and employers

* This date coincides with the European Union implementation date for classification of mixtures.

During the phase-in period, employers would be required to be in compliance with either the existing HCS or the revised HCS, or both. OSHA recognizes that hazard communication programs will go through a period of time where labels and SDSs under both standards will be present in the workplace. This will be considered acceptable, and employers are not required to maintain two sets of labels and SDSs for compliance purposes.

Q. Why must training be conducted prior to the compliance effective date?

A. OSHA is requiring that employees are trained on the new label elements (e.g., pictograms and signal words) and SDS format by December 2013, while full compliance with the final rule will begin in 2015. While many countries are in various stages of implementing the GHS, OSHA believes that it is possible that American workplaces may begin to receive labels and SDSs that are consistent with the GHS shortly after publication. Thus, making it important to ensure that when employees begin to see the new labels and SDSs in their workplaces, they will be familiar with them, understand how to use them, and access the information effectively.

Q. What are the major changes to the Hazard Communication Standard?

A. The three major areas of change are in hazard

classification, labels, and safety data sheets.

- Hazard classification: The definitions of hazard have been changed to provide specific criteria for classification of health and physical hazards, as well as classification of mixtures. These specific criteria will help to ensure that evaluations of hazardous effects are consistent across manufacturers, and that labels and safety data sheets are more accurate as a result.
- Labels: Chemical manufacturers and importers will be required to provide a label that includes a harmonized signal word, pictogram, and hazard statement for each hazard class and category. Precautionary statements must also be provided.
- Safety Data Sheets: Will now have a specified 16-section format.

The GHS does not include harmonized training provisions, but recognizes that training is essential to an effective hazard communication approach. The revised Hazard Communication Standard (HCS) requires that workers be re-trained within two years of the publication of the final rule to facilitate recognition and understanding of the new labels and safety data sheets.

Q. What Hazard Communication Standard provisions are unchanged in the revised HCS?

A. The revised Hazard Communication Standard (HCS) is a modification to the existing standard. The parts of the standard that did not relate to the GHS (such as the basic framework, scope, and exemptions) remained largely unchanged. There have been some modifications to terminology in order to align the revised HCS with language used in the GHS. For example, the term “hazard determination” has been changed to “hazard classification” and “material safety data sheet” was changed to “safety data sheet.” OSHA stakeholders commented on this approach and found it to be appropriate.

Q. How will chemical hazard evaluation change under the revised Hazard Communication Standard?

A. Under both the current Hazard Communication Standard (HCS) and the revised HCS, an evaluation of chemical hazards must be performed considering the available scientific evidence concerning such hazards. Under the current HCS, the hazard determination provisions have definitions of hazard and the evaluator determines whether or not the data on a chemical meet those definitions. It is a performance-oriented approach that provides parameters for the evaluation, but not specific, detailed criteria. The hazard classification approach in the revised HCS is quite different. The revised HCS has specific criteria for each health and physical hazard, along with detailed instructions for hazard evaluation and determinations as to whether mixtures or substances are covered. It also establishes both hazard classes and hazard categories—for most of the effects; the classes are divided into categories that reflect the relative severity of the effect. The current HCS does not include categories for most of the health hazards covered, so this new approach provides additional information that can be related to the appropriate response to address the hazard. OSHA has included the general provisions for hazard classification in paragraph (d) of the revised rule, and added extensive appendixes (Appendixes A and B) that address the criteria for each health or physical effect.

Q. How will labels change under the revised Hazard Communication Standard?

A. Under the current Hazard Communication Standard (HCS), the label preparer must provide the

identity of the chemical, and the appropriate hazard warnings. This may be done in a variety of ways, and the method to convey the information is left to the preparer. Under the revised HCS, once the hazard classification is completed, the standard specifies what information is to be provided for each hazard class and category. Labels will require the following elements:

- Pictogram: a symbol plus other graphic elements, such as a border, background pattern, or color that is intended to convey specific information about the hazards of a chemical. Each pictogram consists of a different symbol on a white background within a red square frame set on a point (i.e. a red diamond). There are nine pictograms under the GHS. However, only eight pictograms are required under the HCS.
- Signal words: a single word used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label. The signal words used are “danger” and “warning.” “Danger” is used for the more severe hazards, while “warning” is used for less severe hazards.
- Hazard Statement: a statement assigned to a hazard class and category that describes the nature of the hazard(s) of a chemical, including, where appropriate, the degree of hazard.
- Precautionary Statement: a phrase that describes recommended measures to be taken to minimize or prevent adverse effects resulting from exposure to a hazardous chemical, or improper storage or handling of a hazardous chemical.

Q. What pictograms are required in the revised Hazard Communication Standard? What hazard does each identify?

A. There are nine pictograms under the GHS to convey the health, physical and environmental hazards. The final Hazard Communication Standard (HCS) requires eight of these pictograms, the exception being the environmental pictogram, as environmental hazards are not within OSHA’s jurisdiction.

The hazard pictograms and their corresponding hazards are shown below.

HCS Pictograms and Hazards		
Health Hazard  • Carcinogen • Mutagenicity • Reproductive Toxicity • Respiratory Sensitizer • Target Organ Toxicity • Aspiration Toxicity	Flame  • Flammables • Pyrophorics • Self-Heating • Emits Flammable Gas • Self-Reactives • Organic Peroxides	Exclamation Mark  • Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity (harmful) • Narcotic Effects • Respiratory Tract Irritant • Hazardous to Ozone Layer (Non Mandatory)
Gas Cylinder  • Gases Under Pressure	Corrosion  • Skin Corrosion/ burns • Eye Damage • Corrosive to Metals	Exploding Bomb  • Explosives • Self Reactives • Organic Peroxides
Flame over Circle  • Oxidizers	Environment (Non Mandatory)  • Aquatic Toxicity	Skull and Crossbones  • Acute Toxicity (fatal or toxic)

Q. Can I use a black border on pictograms for domestic shipment?

A. Under the revised Hazard Communication Standard (HCS), pictograms must have red borders. OSHA believes that the use of the red frame will increase recognition and comprehensibility. Therefore, the red frame is required regardless of whether the shipment is domestic or international.

Q. Will OSHA allow blank red borders?

A. The revised Hazard Communication Standard (HCS) requires that all red borders printed on the label have a pictogram printed inside it. If OSHA were to allow blank red borders, workers may be confused about what they mean and concerned that some information is missing. OSHA has determined that prohibiting the use of blank red borders on labels is necessary to provide the maximum recognition and impact of warning labels and to ensure that users do

not get desensitized to the warnings placed on labels.

Q. When must label information be updated?

A. In the revised Hazard Communication Standard (HCS), OSHA is lifting the stay on enforcement regarding the provision to update labels when new information on hazards becomes available. 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 six months of becoming aware of the new information, and shall ensure that labels on containers of hazardous chemicals shipped after that time contain the new information. If the chemical is not currently produced or imported, the chemical manufacturer, importer, distributor, or employer shall add the information to the label before the chemical is shipped or introduced into the workplace again.

Q. How will workplace labeling provisions be changing under the revised Hazard Communication Standard?

A. The current standard provides employers with flexibility regarding the type of system to be used in their workplaces and OSHA has retained that flexibility in the revised Hazard Communication Standard (HCS). Employers may choose to label workplace containers either with the same label that would be on shipped containers for the chemical under the revised rule, or with label alternatives that meet the requirements for the standard. Alternative labeling systems such as the National Fire Protection Association (NFPA) 704 Hazard Rating and the Hazardous Material Information System (HMIS) are permitted for workplace containers. However, the information supplied on these labels must be consistent with the revised HCS, e.g., no conflicting hazard warnings or pictograms.

Q. How is the Safety Data Sheet (SDS) changing under the revised Hazard Communication Standard?

A. The information required on the safety data sheet (SDS) will remain essentially the same as that in the current standard. The current Hazard Communication Standard (HCS) indicates what information has to be included on an SDS but does not specify a format for presentation or order of information. The revised HCS requires that the information on the SDS is presented

using consistent headings in a specified sequence.

Paragraph (g) of the final rule indicates the headings of information to be included on the SDS and the order in which they are to be provided. In addition, Appendix D indicates what information is to be included under each heading. The SDS format is the same as the ANSI standard format which is widely used in the U.S. and is already familiar to many employees.

The format of the 16-section SDS should include the following sections:

- Section 1. Identification
- Section 2. Hazard(s) identification
- Section 3. Composition/information on ingredients
- Section 4. First-Aid measures
- Section 5. Fire-fighting measures
- Section 6. Accidental release measures
- Section 7. Handling and storage
- Section 8. Exposure controls/personal protection
- Section 9. Physical and chemical properties
- Section 10. Stability and reactivity
- Section 11. Toxicological information
- Section 12. Ecological information
- Section 13. Disposal considerations
- Section 14. Transport information
- Section 15. Regulatory information
- Section 16. Other information, including date of preparation or last revision

Sections 12-15 may be included in the SDS, but are not required by OSHA.

Q. Will TLVs be required on the Safety Data Sheet (SDS)?

A. OSHA is retaining the requirement to include the American Conference of Government Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) on the safety data sheet (SDS) in the revised Standard. OSHA finds that requiring TLVs on the SDS will provide employers and employees with useful information to help them assess the hazards presented by their workplaces. In addition to TLVs, OSHA permissible exposure limits (PELs), and any other exposure limit used or recommended by the chemical manufacturer,

importer, or employer preparing the safety data sheet are also required.

Q. May the International Agency for Research on Cancer (IARC) and the National Toxicology Program (NTP) lists be used to make carcinogen classifications?

A. In the revised Hazard Communication Standard (HCS), OSHA has provided classifiers with the option of relying on the classification listings of IARC and NTP to make classification decisions regarding carcinogenicity, rather than applying the criteria themselves. OSHA believes that this will make classification easier for classifiers, as well as lead to greater consistency. In addition, OSHA has provided in non-mandatory Appendix F of the revised rule, guidance on hazard classification for carcinogenicity. Part A of Appendix F includes background guidance provided by GHS based on the Preamble of the IARC “Monographs on the Evaluation of Carcinogenic Risks to Humans” (2006). Part B provides IARC classification information. Part C provides background guidance from the National NTP “Report on Carcinogens” (RoC), and Part D is a table that compares GHS carcinogen hazard categories to carcinogen classifications under IARC and NTP, allowing classifiers to be able to use information from IARC and NTP RoC carcinogen classifications to complete their classifications under the GHS, and thus the HCS.

Q. Will the International Agency for Research on Cancer (IARC) and the National Toxicology Program (NTP) classifications be required on the Safety Data Sheet (SDS)?

A. OSHA has retained the requirement to include IARC and NTP classifications on safety data sheets (SDSs). Therefore, if a chemical is listed as a carcinogen by either IARC or NTP, it must be noted on the SDS. Additionally, if OSHA finds a chemical to be a carcinogen, it must be noted on the SDS as well.

Q. How has OSHA addressed hazards covered under the current Hazard Communication Standard that have not been addressed by the GHS?

A. In the Notice of Proposed Rulemaking (NPRM), OSHA proposed to include hazards currently covered under the Hazard Communication Standard (HCS) that have yet to be addressed by the GHS (OSHA provided several examples: simple asphyxiants,

and combustible dust) in a separate category called “Unclassified Hazards”. In response to comments from the regulated community, OSHA has renamed the category to “Hazards Not Otherwise Classified (HNOC)” to minimize confusion. In the final HCS, HNOC hazards will not be required to be disclosed on the label but will be required to be disclosed in section 2 of the Safety Data Sheet (SDS). This reflects how GHS recommends these hazards should be disclosed. Chemical manufacturers and importers are expected to assess these hazards when they are conducting their hazard evaluation of physical and health hazards. A new or separate evaluation is not required. Also in the final standard, in response to comments, OSHA has removed pyrophoric gases, simple asphyxiants, and combustible dust from the HNOC hazard category and has addressed these chemicals individually (see question below for more information on each hazard).

Q. How has OSHA addressed pyrophoric gases, simple asphyxiants, and combustible dust?

A. In the revised Hazard Communication Standard (HCS), OSHA has added pyrophoric gases, simple asphyxiants and combustible dust to the definition of “hazardous chemical”. OSHA has also added definitions to the revised HCS for pyrophoric gases and simple asphyxiants, and provided guidance on how to define combustible dust for the purposes of complying with the HCS.

- **Pyrophoric gases:**

OSHA has retained the definition for pyrophoric gases from the current HCS. Pyrophoric gases must be addressed both on container labels and SDSs. OSHA has provided label elements for pyrophoric gases which include the signal word “danger” and the hazard statement “catches fire spontaneously if exposed to air”.

- **Simple asphyxiants:**

OSHA has revised the definition of simple asphyxiants that was proposed in the Notice of Proposed Rulemaking (NPRM) as a result of comments from the regulated community. In the final HCS, simple asphyxiants must be labeled where appropriate, and be addressed on SDSs. OSHA has provided label elements for simple asphyxiants which include the signal word “warning” and the hazard statement “may displace oxygen and cause rapid suffocation”.

- **Combustible dust:**

OSHA has not provided a definition for combustible dust to the final HCS given ongoing activities in the specific rulemaking, as well as in the United Nations Sub-Committee of Experts on the GHS (UN/SCEGHS). However, guidance is being provided through existing documents, including the Combustible Dust National Emphasis Program Directive CPL 03-00-008, which includes an operative definition, as well as provides information about current responsibilities in this area. In addition, there are a number of voluntary industry consensus standards (particularly those of the NFPA) that address combustible dust.

In the final HCS, combustible dust hazards must be addressed on labels and SDSs. Label elements are provided for combustible dust in the final HCS and include the signal word “warning” and the hazard statement “May form combustible dust concentrations in the air”.

For chemicals in a solid form that do not present a combustible dust hazard, but may form combustible dusts while being processed in normal downstream uses, paragraph (f)(4) of the HCS allows the chemical manufacturer some flexibility in labeling requirements. The manufacturer or importer may transmit the label to the customer at the time of the initial shipment, but the label does not need to be included with subsequent shipments unless it changes. This provides the needed information to the downstream users on the potential hazards in the workplace, while acknowledging that the solid metal or other materials do not present the same hazards that are produced when these materials are processed under normal conditions of use.

Q: How many businesses and workers would be affected by the revised Hazard Communication Standard?

A: OSHA estimates that over 5 million workplaces in the United States would be affected by the revised Hazard Communication Standard (HCS). These are all those workplaces where employees—a total of approximately 43 million of them—could be exposed to hazardous chemicals. Included among

these 5 million workplaces are an estimated 90,000 establishments that create hazardous chemicals; these chemical producers employ almost 3 million workers.

Q: What are the estimated overall costs for industry to comply with the revised Hazard Communication Standard?

A: The revised Hazard Communications Standard's (HCS) total cost, an estimated \$201 million a year on an annualized basis for the entire United States, is the sum of four major cost elements. (1) OSHA estimates that the cost of classifying chemical hazards in accordance with the GHS criteria and revising safety data sheets and labels to meet new format and content requirements would be \$22.5 million a year on an annualized basis. (2) OSHA estimates that training for employees to become familiar with new warning symbols and the revised safety data sheet format under GHS would cost \$95.4 million a year on an annualized basis. (3) OSHA estimated annualized costs of \$59 million a year for management to become familiar with the new GHS system and to engage in other management-related activities as may be necessary for industry's adoption of GHS. (4) OSHA estimated annualized costs of \$24.1 million for printing packaging and labels for hazardous chemicals in color.

Q: What are the estimated benefits attributable to the revised Hazard Communication Standard?

A: OSHA expects that the modifications to the Hazard Communication Standard (HCS) will result in increased safety and health for the affected employees and reduce the numbers of accidents, fatalities, injuries, and illnesses associated with exposures to hazardous chemicals. The GHS revisions to the HCS standard for labeling and safety data sheets would enable employees exposed to workplace chemicals to more quickly obtain and to more easily understand information about the hazards associated with those chemicals. In addition, the revisions to HCS are expected to improve the use of appropriate exposure controls and work practices that can reduce the safety and health risks associated with exposure to hazardous chemicals.

OSHA estimates that the revised HCS will result in the prevention of 43 fatalities and 585 injuries and illnesses (318 non-lost-workday injuries and illnesses, 203 lost-workday injuries and illnesses, and 64 chronic

illnesses) annually. The monetized value of this reduction in occupational risks is an estimated \$250 million a year on an annualized basis.

OSHA estimates that the revised HCS will result in savings of \$475.2 million from productivity improvements for health and safety managers and logistics personnel, \$32.2 million during periodic updating of SDSs and labels, and \$285.3 million from simplified hazard communication training.

OSHA anticipates that, in addition to safety and health benefits, the revised HCS will result in four types of productivity benefits: (1) for chemical manufacturers, because they will need to produce fewer SDSs in future years; (2) for employers, in providing training to new employees as required by the existing OSHA HCS through the improved consistency of the labels and SDSs. (3) for firms engaging in, or considering engaging in, international trade.

Q. I understand that the United Nations revises the GHS every two years. How will OSHA manage and communicate changes to the Hazard Communication Standard?

A. It is expected that the GHS will be a living document and is expected to remain up-to-date and relevant; therefore further changes may be adopted on a two year cycle. Presently most of the recent updates have been clarification of text. However, OSHA anticipates that future updates of the Hazard Communication Standard (HCS) may be necessary and can be done through various rulemaking options, including:

- Technical updates for minor terminology changes,
- Direct Final Rules for text clarification, and
- Notice and Comment rulemaking for more substantive or controversial updates such as additional criteria or changes in health or safety hazard classes or categories.

Introduction

Approximately 43 million workers are potentially exposed to one or more chemical hazards. There are an estimated 650,000 existing chemical products, and hundreds more 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, 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 side by side comparison of HCS 1994 and GHS 2012)

The Hazard Communication Standard (HCS) applies to businesses in manufacturing and industrial fields, but to those that have a low risk of exposure to hazardous materials, such as office or clerical environments where cleaning products are used or environments where trace chemicals in municipal drinking water exist but are not regularly communicated. Section 2 of the U.S. Consumer Product Safety Code (15 U.S.C. 2051 Sec. 2) finds that “(1) an unacceptable number of consumer products which present unreasonable risks of injury are distributed in commerce; (2) complexities of consumer products and the diverse nature and abilities of consumers using them frequently result in an inability of users to anticipate risks and to safeguard themselves adequately; (3) the public should be protected against unreasonable risks of injury associated with consumer products; (4) control by State and local governments of unreasonable risks of injury associated with consumer products is inadequate and may be burdensome to manufacturers.” Although the risk of exposure varies with every business, the best line of defense against illnesses and injuries and potential fines for noncompliance is a written Hazard Communication Program.

Whether a business manufactures chemicals, works with importers of hazardous materials, or simply maintains a clean office environment through the use

of household chemicals, the basic goal of the HCS 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 illnesses and injuries.

In 2012, OSHA modified the HCS to align it with the provisions of the Globally Harmonized System of Classification and Labeling of Chemicals (GHS). The primary benefit of aligning OSHA’s HCS with the international GHS is to increase the quality and consistency of information provided to workers, employers and chemical users by adopting a standardized approach to hazard classification, labels and safety data. OSHA’s adoption of the GHS did not change the framework and scope of the HCS, it simply helped ensure improved quality and more consistency in the classification and labeling of all chemicals.

Introduction: Globally Harmonized System of Classification and Labeling (GHS)

The GHS, or Globally Harmonized System of Classification and Labeling of Chemicals, grew out of a 1992 United Nations environmental conference and was formalized in 2003. As will be explained in more detail in subsequent sections, the GHS aims to harmonize the way nations classify and label their hazardous chemicals. The goal is uniformity across the globe in the methods used to convey chemical hazards through both words and pictures.

Here in the United States, the GHS’s goals have been incorporated into a rewriting of the Occupational Safety and Health Administration’s Hazard Communication Standard (HCS). Since the HCS covers more than 945,000 hazardous chemicals in 7 million U.S. work sites, the revisions have a sweeping effect, most specifically on the Material Safety Data Sheets (MSDS) and warning labels that come with the purchase of most chemicals. These MSDS and labels give workers the “right to know” about chemical hazards they are exposed to, along with instructions for care in handling and for post-accident responses.

The GHS calls for standardized (new) formats and information requirements for the data sheets and for the employment of more universal pictograms to convey important messages in multilingual environments. These revisions most directly affect the manufacturers and distributors of chemical products,

but they also place new requirements on employers for effective workplace policies and retraining of personnel to learn the new standards.

For each class and category of hazard under the GHS that OSHA has adopted, there is a harmonized hazard statement, a signal word, and a pictogram specified. This is referred to as the core information for a chemical. Thus once an employer classifies a chemical, the GHS provides the specific core information to convey to users on that chemical. There are provisions to allow supplementary information as well so the chemical manufacturer is not limited to the specified core information. This should address product liability concerns for U.S. employers and ensure they can include other information they consider to be necessary for that purpose.

The What and Why of the GHS

The GHS is an acronym for The Globally Harmonized System of Classification and Labeling of Chemicals. The GHS is a system for standardizing and harmonizing the classification and labeling of chemicals. It is a logical and comprehensive approach to:

- Defining health, physical and environmental hazards of chemicals;
- Creating classification processes that use available data on chemicals for comparison with the defined hazard criteria; and
- Communicating hazard information, as well as protective measures, on labels and Safety Data Sheets (SDS).

Many countries already have regulatory systems in place for these types of requirements. These systems may be similar in content and approach, but their differences are significant enough to require multiple classifications, labels and safety data sheets for the same product when marketed in different countries, or even in the same country when parts of the life cycle are covered by different regulatory authorities. This leads to inconsistent protection for those potentially exposed to the chemicals, as well as creating extensive regulatory burdens on companies producing chemicals. For example, in the United States (U.S.) there are requirements for classification and Labeling of chemicals for the Consumer Product Safety Commission, the Department of Transportation, the Environmental Protection Agency, and the Occupational Safety and Health

Administration.

The GHS itself is not a regulation or a standard. The GHS Document (referred to as “The Purple Book”) establishes agreed hazard classification and communication provisions with explanatory information on how to apply the system. The elements in the GHS supply a mechanism to meet the basic requirement of any hazard communication system, which is to decide if the chemical product produced and/or supplied is hazardous and to prepare a label and/or Safety Data Sheet as appropriate.

Regulatory authorities in countries adopting the GHS thus take the agreed criteria and provisions, and implement them through their own regulatory process and procedures rather than simply incorporating the text of the GHS into their national requirements. The GHS Document thus provides countries with the regulatory building blocks to develop or modify existing national programs that address classification of hazards and transmittal of information about those hazards and associated protective measures. This helps to ensure the safe use of chemicals as they move through the product life-cycle from “cradle to grave.”

The production and use of chemicals is fundamental to all economies. The global chemical business is more than a \$1.7 trillion per year enterprise. In the U.S., chemicals are more than a \$450 billion business and exports are greater than \$80 billion per year.

Chemicals directly or indirectly affect our lives and are essential to our food, our health, and our lifestyle. The widespread use of chemicals has resulted in the development of sector-specific regulations (transport, production, workplace, agriculture, trade, and consumer products). Having readily available information on the hazardous properties of chemicals, and recommended control measures, allows the production, transport, use and disposal of chemicals to be managed safely. Thus, human health and the environment are protected.

The sound management of chemicals should include systems through which chemical hazards are identified and communicated to all who are potentially exposed. These groups include workers, consumers, emergency responders and the public. It is important to know what chemicals are present and/or used, their hazards to human health and the environment, and the means to control them. A number of classification and Labeling systems,

each addressing specific use patterns and groups of chemicals, exist at the national, regional and international levels. The existing hazard classification and Labeling systems address potential exposure to chemicals in all the types of use settings listed above.

While the existing laws and regulations are similar, they are different enough to require multiple labels for the same product both within the U.S. and in international trade and to require multiple safety data sheets for the same product in international trade. Several U.S. regulatory agencies and various countries have different requirements for hazard definitions as well as for information to be included on labels or material safety data sheets.

The International Mandate

The single most important force that drove the creation of the GHS was the international mandate adopted by the 1992 United Nations Conference on Environment and Development (UNCED), often called the “Earth Summit.” The harmonization of classification and labeling of chemicals was one of six program areas that were endorsed by the United Nations General Assembly to strengthen international efforts concerning the environmentally sound management of chemicals. It was recognized that an internationally harmonized approach to classification and Labeling would provide the foundation for all countries to develop comprehensive national programs to ensure the safe use of chemicals.

In conjunction with its Convention and Recommendation on Safety in the Use of Chemicals at Work, the International Labor Organization (ILO) studied the tasks required to achieve harmonization. The ILO concluded that there were four major existing systems that needed to be harmonized to achieve a global approach.

No international organization covers all aspects of chemical classification and Labeling. A broad scope and extensive expertise and resources were required to develop a system. In order to proceed, several decisions were needed: (a) what systems would be considered “major” and thus the basis for harmonization, and (b) how could the work be divided to get the best expertise for different aspects.

Four existing systems were deemed to be major and the primary basis for the GHS:

- UN Transport Recommendations
- U.S. Requirements for Workplace, Consumer

and Pesticides

- European Union Dangerous Substance and Preparations Directives
- Canadian Requirements for Workplace, Consumers and Pesticides

A Coordinating Group for the Harmonization of Chemical Classification Systems (CG/HCCS) was created under the Inter-organization Program for the Sound Management of Chemicals (IOMC) and they were charged with coordinating and managing development of the system. The GC/HCCS worked on a consensus basis and included representatives from major stakeholders, including national governments, industry and workers. They created a set of guiding principles. The scope and guiding principles created a common framework for the organizations that were charged with developing the different elements of the system. The key guiding principles are:

- Protection will not be reduced
- Will be based on intrinsic properties (hazards) of chemicals
- All types of chemicals will be covered
- All systems will have to be changed
- Involvement of all stakeholders should be ensured
- Comprehensibility must be addressed

OSHA’s Hazard Communication Standard and the GHS

The Hazard Communication Standard (HCS) (29 CFR 1910.1200; 1915.1200; 1917.28; 1918.90; and 1926.59) was first adopted by the Occupational Safety and Health Administration (OSHA) in 1983 for the manufacturing sector (48 FR 53280; Nov. 25, 1983). Later, the Agency expanded the scope of coverage to all industries where employees are potentially exposed to hazardous chemicals. The HCS requires chemical manufacturers and importers to evaluate the hazards of the chemicals they produce or import.

The rule provides definitions of health and physical hazards to use as the criteria for determining hazards in the evaluation process. The information about the hazards and protective measures is then required to be conveyed to downstream employers and employees by putting labels on containers and preparing and distributing safety data sheets. All employers with hazardous chemicals

in their workplaces are required to have a hazard communication program, including container labels, safety data sheets, and employee training. (Note: The HCS uses the term “material safety data sheet,” or MSDS, while the GHS uses safety data sheet, or SDS.)

OSHA has updated its estimates in the standard’s regulatory impact analysis, and found that the HCS now covers more than 7 million workplaces, more than 100 million employees, and some 945,000 hazardous chemicals. Ensuring that hazard and protective measure information is available in workplaces through hazard communication programs helps employers design and implement appropriate controls for chemical exposures, and gives employees the right-to-know the hazards and identities of the chemicals, as well as allowing them to participate actively in the successful control of exposures. Together, these actions of employers and employees reduce the potential for adverse effects to occur. The information transmitted under the HCS requirements provides the foundation upon which a chemical safety and health program can be built in the workplace.

The HCS is performance-oriented; i.e., it establishes requirements for labels and safety data sheets but does not provide the specific language to convey the information or a format in which to provide it. This is the area where the GHS comes into play in the United States.

The primary impact of revising the HCS to adopt the GHS is compliance obligations for producers of hazardous chemicals. The modifications to the HCS involve a review of the classifications of these chemicals, as well as preparation and distribution of new labels and revised safety data sheets. Employers who use chemicals, and exposed employees, benefit from receiving the revised labels and safety data sheets prepared in a consistent format. The information should be easier to comprehend and access in the new approach, allowing it to be used more effectively for the protection of employees. The primary change in workplaces where chemicals are used but not produced will be to integrate the new approach into the workplace hazard communication program, including assuring that both the employers and employees understand the pictograms and other information provided on the chemicals.

Benefits of the GHS

Development of this system required extensive work

by a great number of people, and resources from many countries and organizations. The reason it received such support is that there is a widespread belief that there are significant benefits associated with implementation of a globally harmonized approach to hazard communication. Countries, international organizations, chemical producers and users of chemicals will all benefit.

First and foremost, implementation of the GHS enhances protection of people potentially exposed to chemicals and the environment. While some countries such as ours already have the benefits of protection under existing systems, the majority of countries do not have such comprehensive approaches. Thus, implementation of the GHS provides these countries with the important protections that result from dissemination of information about chemical hazards and protective measures. In our country, the expectation is that adoption of the GHS improves and builds on protections we already have. Refinement of the information provided helps improve comprehensibility and thus make it more likely that the information will result in workplace changes to protect employees. As has already been noted, the majority of affected employers and employees should benefit from adoption of the GHS through receipt of better, more standardized, and consistent information about chemicals in their workplaces.

Second, implementation of such an approach facilitates international trade in chemicals. It reduces the burdens caused by having to comply with differing requirements for the same product, and allows companies that have not had the resources to deal with those burdens to be involved in international trade. This is particularly important for small producers who may be precluded currently from international trade because of the compliance resources required to address the extensive regulatory requirements for classification and labeling of chemicals.

Third, one of the initial reasons this system was pursued internationally involved concerns about animal welfare and the proliferation of requirements for animal testing and evaluation. Where existing systems have different definitions of hazards, it often results in duplicative testing to produce data related to the varying levels of toxicity or cut-offs used to define the hazards in the different systems. Having one agreed definition reduces this duplicative testing. It should be noted that OSHA has no testing

requirements. The HCS is based on collecting and evaluating the best available evidence on the hazards of each chemical.

Information transmittal systems provide the underlying infrastructure for the sound management of chemicals in a country. Those countries that do not have the resources to develop and maintain such a system can use the GHS to build their chemical safety and health programs. Unlike some other safety and health issues, a country's approach to the sound management of chemicals definitely affects other countries. In some cases, bordering countries may experience pollution and other effects of uncontrolled chemical exposures.

In all countries, there is a need to acquire sufficient information to properly handle the chemical when it is imported from other countries. Thus, having a coordinated and harmonized approach to the development and dissemination of information about chemicals is mutually beneficial to both importing and exporting countries.

In the U.S., the four primary regulatory agencies (OSHA, EPA, CPSC, and DOT) that are responsible for GHS implementation were not domestically harmonized in terms of definitions of hazards and other requirements related to classification and labeling of chemicals. Now that all four agencies have adopted the GHS, the U.S. will have the additional benefit of harmonizing the overall U.S. approach to classification and labeling. Since most chemicals are produced in a workplace and shipped elsewhere, every manufacturer deals with at least two of the U.S. systems. As such, every producer is likely to experience some benefits from domestic harmonization, in addition to the benefits that will accrue to producers involved in international trade.

OSHA believes that adoption of the GHS also addresses some of the issues that have been discussed in the U.S. regarding the HCS and its implementation, such as improving labels and SDS comprehensibility through implementation of a standardized approach. The current regulatory system includes a performance-oriented approach to labels and SDSs, allowing the producers to use whatever language or format they choose to provide the necessary information. This often results in a lack of consistency that makes it difficult for some users of chemicals to properly identify the hazards and the protective measures, particularly when purchasing

the same product from multiple suppliers. Having the information provided in the same words and pictograms on labels, as well as having a standardized order of information on SDSs, would help all users identify the critical information necessary to protect employees.

State Obligations Regarding the GHS

In response to the final rule amending the HCS in response to the GHS, the 26 states and U.S. Territories with their own OSHA-approved occupational safety and health plans are required to revise their standards to reflect the new amendment within six months of federal promulgation (29 CFR 1953.5(a)). A revised state hazard communication standard must be applicable to both the private and public (State and local government employees) sectors. Some states may have statutory provisions that would require amendment in order to conform to a revised Federal HCS.

Section 18(c)(2) of the OSH Act requires that state standards applicable to products distributed or used in interstate commerce, if not identical to the federal standard, must be required by compelling local conditions and must not unduly burden interstate commerce, in addition to being "at least as effective" as the federal standard. The amended HCS, like the original standard, would be "applicable to products in the sense that it would permit the distribution and use of hazardous chemicals in commerce only if they are in labeled containers accompanied by safety data sheets" (48 FR 53280, 53323, Nov. 25, 1983). In order to assure that state standards do not pose an undue burden on interstate commerce, and to advance the goals of the GHS, OSHA expects to closely scrutinize resultant state standards to assure not only equal or greater effectiveness, but also that any different or additional requirements do not conflict with, or adversely affect, the effectiveness of the national application of OSHA's standard.

Scope of the GHS

The GHS covers chemicals in various stages of their life cycle, from production to disposal. It is based primarily on the hazards of chemicals. The GHS is designed to allow regulatory authorities to choose provisions that are appropriate to their particular scope of regulation. This is referred to as the "building block approach." The GHS includes all of the building blocks or possible regulatory components

that might be needed for classification and labeling requirements in the workplace as well as for regulation of classification and labeling of pesticides, chemicals in transport, and consumer products. Therefore, regulatory authorities such as OSHA chose the provisions of the GHS that are necessary for the protection of employees, but did not adopt others that address other types of protection. For example, the GHS includes harmonized criteria for classifying chemicals for aquatic toxicity. Since OSHA does not have the regulatory authority to address environmental concerns, OSHA did not adopt the GHS criteria for aquatic toxicity. It is expected that other U.S. agencies that regulate environmental issues will consider adopting this definition. Similarly, the GHS safety data sheet format includes a section that addresses environmental information. OSHA does not require inclusion of environmental information for SDSs used in workplaces.

The building block approach may also be applied in other ways when deciding which parts of the system to adopt. For example, the GHS includes classification criteria, labels, and SDSs. While workplace authorities such as OSHA are likely to adopt all of these elements, it is expected that consumer product authorities will not have SDS requirements, nor will transport authorities. The building block approach may also be applied to the criteria for defining hazards. For example, the acute toxicity criteria are much broader than those currently in the HCS for workplace exposures. This is to allow consumer product authorities the tools they need to address the protection of children who might accidentally be exposed. OSHA would not need to adopt all of the categories of acute toxicity in order to protect employees from the types of exposures they may have.

In addition to the building block approach, the GHS also contains a number of areas that are left to the competent authority to determine how to apply the provision. Where OSHA is the competent authority, i.e., in terms of workplace protections in the U.S., the Agency expects to maintain its current approaches in terms of interpretations and accommodations regarding application. These approaches are based on the rulemaking record, as well as implementation experiences in the U.S., and have been determined to be an appropriate application. For example, the scope and application provisions in the GHS address the interface of the OSHA requirements to requirements

in other agencies that address the same products.

Overall, the scope of the GHS with regard to chemicals covered, as well as types of chemicals and workplaces that are covered, is very similar to the HCS. The HCS has a very broad scope of coverage, ensuring that information is provided on all potential hazards in American workplaces. Adoption of the GHS should maintain this broad coverage of hazards and chemicals. It should be noted that the GHS, like the HCS, does not require any new testing of chemicals. Evaluations of chemical hazards are to be based on the best available evidence.

As has been described above, the HCS consists of requirements for defining health and physical hazards, preparing a written hazard communication program, preparing and distributing labels on containers that are shipped as well as containers in the workplace, preparing and distributing safety data sheets for all hazardous chemicals, and employee training. The GHS addresses classification of health and physical hazards, and preparation and distribution of labels and safety data sheets.

It does not include requirements for a written hazard communication program or for employee training. Training is noted in the GHS as an important adjunct to label and safety data sheet requirements, but the harmonization process did not include such provisions. Countries are thus free to determine what training will be applicable in their own regulatory approach. OSHA believes that training is critical to ensuring the effectiveness of hazard communication, and anticipates maintaining current HCS requirements that training be part of a hazard communication program. OSHA has published additional training materials to ensure understanding of the new approach regarding labels and SDSs in the GHS.

Labeling: Biggest Difference Between the HCS and the GHS

The HCS requirements for labels simply indicate the minimal information required to be on them. At the time the standard was promulgated, OSHA reviewed the current industry consensus standards for labels, and basically focused on requiring information that was not generally present on most labels in use by industry. The additional information included an identity that could be traced to more detailed information, and specific information about both the health and physical hazards. In particular, OSHA did

not consider a label statement indicating possible harm but no specific health effect to be a sufficient hazard communication. Other types of information such as precautionary statements were not included in the requirements.

This performance-oriented approach was strongly supported by the chemical industry at the time the standard was adopted. Taking such an approach allowed existing labels to continue to be used in many situations, thus minimizing the impact on a number of producers.

However, it also has resulted in labels that are not consistent and may not communicate adequately to users. While some producers follow voluntary industry consensus standards, others do not. Many large companies have developed their own libraries of phrases to be used on labels and safety data sheets, and undertaken translation of them into multiple languages. This is a considerable burden for a company to develop and maintain.

Other major existing systems considered in the harmonization process included specific label phrases to convey hazards and other information. Symbols and pictograms were also part of these systems. For purposes of developing an agreed-upon harmonized approach, it was thus necessary to consider including such elements in the GHS.

For each class and category of hazard under the GHS that OSHA has adopted, there is a harmonized hazard statement, a signal word, and a pictogram specified. This is referred to as the core information for a chemical. Once an employer classifies a chemical, the GHS provides the specific core information to convey to users on that chemical. There are provisions to allow supplementary information as well so the chemical manufacturer is not limited to the specified core information. This should address product liability concerns for U.S. employers and ensure they can include other information they consider to be necessary for that purpose.

Precautionary statements are also provided as examples in the GHS. These labeling provisions are the biggest difference between the HCS and the GHS.

There are benefits to this standardized approach. First, employers and employees will be given the same information on a chemical regardless of the supplier. This consistency will improve communication of the hazards. It may also improve communication for those who are not functionally literate, or who are not

literate in the language written on the label. Literacy of both types is a significant concern in American workplaces. Secondly, having the core information developed already, translated into multiple languages, and readily available to whomever wishes to access it, will eliminate the burden of chemical manufacturers and importers developing and maintaining their own such systems. Thus, the specification approach should be beneficial both to the producers and the users of chemicals.

Specific Labeling Requirements

Under the HCS, the SDS is the detailed reference source on the chemical. While labels provide a quick snapshot to remind employers and employees of the hazards of the chemical, the SDS addresses all aspects of hazard information as well as methods for handling and use. The HCS specifies what information must be included on the SDS, but does not specify a format or order of information. Again, this approach was supported by producers to minimize the impact of the standard for those who already developed and disseminated SDSs. Safety data sheets under the HCS are required to include:

- Identification of the chemical or hazardous ingredients of a mixture
- Physical and chemical characteristics
- Health hazards, including signs, symptoms, and medical conditions that could be aggravated by exposure
- The primary routes of entry
- The OSHA permissible exposure limit, ACGIH Threshold Limit Value, and any other recommended exposure limits
- Whether the chemical is considered to be a carcinogen by OSHA, the International Agency for Research on Cancer, or the National Toxicology Program
- Precautions for safe handling and use
- Control measures
- Emergency and first aid procedures
- Date of preparation of the safety data sheet
- Contact information for the responsible party

Users of chemicals have always preferred a standardized approach. Many believe that having the information in the same place on every data sheet

allows them to access it more effectively. OSHA published a request for information regarding ways to improve the information provided under the HCS (55 FR 20580; May 17, 1990), and received around 600 comments in response. The majority of them were in favor of a standardized format or order of information.

As a result of the users' expressed preferences, chemical manufacturers in the U.S. developed a voluntary industry consensus standard that included an order of information for safety data sheets (ANSI Z400.1). This approach was later adopted into international voluntary industry consensus standards as well.

The HCS allows any format to be used, so many producers have been following the consensus standard order of information for some years. In negotiating the GHS, it was decided that this format should be adopted there as well. One change was made, reversing the order of sections 2 and 3 so the hazard information appeared earlier in the sheet than information on chemical composition. Both the national and international industry consensus standards are being changed to be consistent with this approach. The GHS data sheet is to include the following in this order:

- Identification
- Hazard identification
- Composition/information on ingredients
- First aid measures
- Firefighting measures
- Accidental release measures
- Handling and storage
- Exposure controls/personal protection
- Physical and chemical properties
- Stability and reactivity
- Toxicological information
- Ecological information
- Disposal considerations
- Transport information
- Regulatory information
- Other information

Having a standardized order of information should improve comprehensibility, which has been a

continuing issue with regard to safety data sheets. It should also make it easier for chemical producers to comply by providing them with a template to follow. Using the industry consensus standards should also minimize the burden of preparing new safety data sheets since many chemical producers already use the format specified.

Under the auspices of the International Program on Chemical Safety (IPCS), a series of more than 1,300 international chemical safety cards has been developed and translated into 14 languages. These cards are developed and peer reviewed by participating institutions in a number of countries, including the U.S. The National Institute for Occupational Safety and Health (NIOSH) is undertaking this work. The cards are similar to SDSs in terms of the information provided, but they are in a concise format of two pages. The cards are going to be updated to reflect the GHS criteria and hazard information. They may be found on NIOSH's Web page at: <http://www.cdc.gov/niosh/ipcs/nicstart.html>

OSHA also has a link to them on its hazard communication page. These cards are an excellent resource for many of the most common chemicals found in the workplace. When updated to be GHS consistent, they will also be a useful resource for GHS compliance and for implementation of control banding.

As mentioned earlier, there is information required on a GHS SDS that is outside OSHA's jurisdiction to regulate. This includes environmental and transport information. OSHA does not intend to propose requiring it on safety data sheets, but will provide information about the provisions so chemical producers can include it if they wish to be completely consistent with the GHS. OSHA does not preclude such information being on a safety data sheet, but will not review or enforce such provisions.

Implementation Procedures

The following steps will help you comply with the standard and develop your hazard communication program. (See sample program, Chapter 2)

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 SDSs, and any other pertinent information.
- Develop procedures to keep your list current. When new substances are used, add them to your list.

3. Obtain safety data sheets for all chemical substances.

- If you do not have an SDS for a hazardous substance in your workplace, request a copy from the chemical manufacturer, distributor or importer as soon as possible. (See Chapter 8 for a sample letter requesting a SDS.) A SDS must accompany or precede the shipment and must be used to obtain identifying information such as the chemical name and the hazards of a particular substance.
- Review each SDS to be sure that it is complete and clearly written. The SDS 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 Chapter 6 and 7 for a sample SDS and other information.)

- If the SDS is incomplete or unclear, contact the manufacturer or importer to get clarification on the missing information.
- Make sure the SDS 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. (See overview of GHS Classification and Labeling of Chemicals in Chapters 4 and 5)
- 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;
- safety data sheets;
- employee training based on the list of chemicals, SDSs, and labeling information (see Chapter 10 and 11 for tools on employee training); and
- methods for communicating hazards and protective measures to employees and others.

The following sections of this Program will discuss each of these steps in more detail and provide you with sample lists of products, services and other resources.

Compliance Checklist

	Yes	No
1. Listed all of the hazardous chemicals in our workplace.	_____	_____
2. Established a file for information on hazardous chemicals.	_____	_____
3. Obtained an SDS for each hazardous chemical in use.	_____	_____
4. Developed a system to ensure that all incoming hazardous chemicals are labeled.	_____	_____
5. Reviewed each SDS to be sure it is complete.	_____	_____
6. Made sure that SDSs are available where necessary.	_____	_____
7. Implemented procedures whereby containers of hazardous substances are not issued or released until label information is verified.	_____	_____
8. Developed a written hazard communication program.	_____	_____
9. Developed a method to communicate hazards to employees and others.	_____	_____
10. Informed employees of protective measures for hazardous chemicals used in the workplace.	_____	_____
11. Alerted employees to other forms of warning that may be used.	_____	_____
12. Trained employees to recognize and interpret label and/or SDS information, and to take appropriate action in response to chemical hazards.	_____	_____



Chapter 2

Sample Hazard Communication Program

Our Hazard Communication Program

The Hazard Communication Standard requires you to develop a written hazard communication program, as discussed in Chapter 1. The following is a sample hazard communication program that you may use as a guide in developing your program.

General Company Policy

The purpose of this notice is to inform you that our company is complying with the OSHA Hazard Communication Standard, Title 29 Code of Federal Regulations 1910.1200 and the guidelines set forth by the Globally Harmonized System of Classification and Labeling of Chemicals (GHS), by compiling a hazardous chemicals list, using Safety Data Sheets (SDSs), ensuring that containers are labeled, and providing you with training you need to recognize and interpret label and/or SDS, information, and to take appropriate action in response to chemical hazards.

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

The Safety and Health (S&H) Manager, Robert Jones, is the program coordinator, acting as the representative of the plant manager, who has overall responsibility for the program. Mr. Robert Jones will review and update the program, as necessary.

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

Note: This program will be available to all employees for review and a copy will be located in the following area(s):

Location:

1. Safety and Health Manager's Office
2. In all employee handbooks
3. In the Warehouse Resource Center

List of Hazardous Chemicals

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

Safety Data Sheets (SDSs)

SDSs provide you with specific information on the chemicals you use. The Safety and Health Manager will maintain a binder in his/her office with an SDS on every substance listed as a hazardous chemical. The SDS will be a fully completed OSHA Form 174 or equivalent. The Plant Manager, Jeff O'Brien, will ensure that each work site maintains an SDS for hazardous materials in that area. SDSs will be available to you at your work stations during your shifts.

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

Copies of SDSs will be kept in the following areas:

Department	Location
Human Resources	Mr. Jones' Office
Warehouse Resource Center	Warehouse

Labels and Other Forms of Warning

The Safety and Health Manager will ensure that all hazardous chemicals in the plant are properly labeled and updated, as necessary. Labels should list at least the chemical identity, pictograms, signal words, appropriate hazard statements and the name and address of the manufacturer, importer or other responsible party. Mr. Jones will refer to the corresponding SDS to assist you in verifying label information. Containers that are shipped from the

plant will be checked by the supervisor of shipping and receiving to make sure all containers are properly labeled.

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

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

Non-Routine Tasks

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

- ventilation
- respirators
- presence of another employee
- emergency procedures

Training

Everyone who works with or is potentially exposed to hazardous chemicals will receive initial training from the Safety and Health Manager on the following topics:

- Policies and procedures covered by the Hazard Communication Standard and GHS
- Summary and location of the Company's Hazard Communication Program
- How to recognize and interpret label and/or SDS information
- Location of SDSs and how to obtain additional hazard information

- Physical and health hazards of hazardous substances in their work area
- Procedures to protect against hazards (e.g., work procedures, personal protective equipment)
- How to take appropriate action in response to chemical hazards
- Emergency response procedures for hazardous chemical spills

Upon completion of the training program, each employee will sign a form documenting that he/she has received the training. A program that uses both audiovisual materials and classroom type training has been prepared for this purpose. Whenever a new hazard is introduced, additional training will be provided. Regular safety meetings will also be used to review the information presented in the initial training. Foremen and other supervisors will be extensively trained regarding hazards and appropriate protective measures so they will be available to answer questions from employees and provide daily monitoring of safe work practices.

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

Contractor Employers

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

these chemicals.

Personnel Policies

Employees are responsible for following all safe work practices and using proper precautions required by the guidelines in this program. When an employee is not following safety and health rules regarding working with a hazardous substance, disciplinary action will be taken up to and including termination.

Additional Information

All employees, or their designated representatives, can obtain further information on this written program, the Hazard Communication Standard, applicable SDSs and labels, and chemical information lists at the safety and health office, Room SD-10.



Chapter 3

My Hazard Communication Program

Written Hazard Communication Program

Company Name

Date Prepared

Objective:

The purpose of this program is to inform you that our company is complying with the OSHA Hazard Communication Standard, Title 29 Code of Federal Regulations 1910.1200 and the guidelines set forth by the Globally Harmonized System of Classification and Labeling of Chemicals (GHS), by compiling a hazardous chemicals list, using Safety Data Sheets (SDSs), ensuring that containers are labeled, and providing you with training you need to recognize and interpret label and/or SDS, information, and to take appropriate action in response to chemical hazards.

The person with primary responsibility for this program is:

Name

Title

Contact information

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

Note: This program will be available to all employees for review and a copy will be located in the following area(s):

Location:

1. _____
2. _____
3. _____

Employee Information and Training:

Prior to starting a work assignment, everyone who works with or is potentially exposed to hazardous chemicals, will receive initial training conducted by:

Name

Title

Contact information

The training will cover the following topics:

- Policies and procedures covered by the Hazard Communication Standard and GHS
- Summary and location of the Company's Hazard Communication Program
- How to recognize and interpret label and/or SDS information
- Location of SDSs and how to obtain additional hazard information
- Physical and health hazards of hazardous substances in their work area
- Procedures to protect against hazards (e.g., work procedures, personal protective equipment)
- How to take appropriate action in response to chemical hazards
- Emergency response procedures for hazardous chemical spills

It is the responsibility of each department's supervisor to make sure that all affected employees receive thorough training. All employees have a right to information pertaining to hazardous substances in the workplace without discrimination or reprisal.

Upon completion of the training program, each employee will sign a form documenting that he/she has received the training. A program that uses both audiovisual materials and classroom type training has been prepared for this purpose. Whenever a new hazard is introduced, additional training will be provided. Regular safety meetings will also be used to review the information presented in the initial training. Foremen and other supervisors will be extensively trained regarding hazards and appropriate protective measures so they will be available to answer questions from employees and provide daily monitoring of safe work practices.

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

Safety Data Sheets (SDSs):

Safety Data Sheets, or SDSs, provide you with specific information on the chemicals you use. The person with primary responsibility for maintaining Safety Data Sheets is:

Name

Title

Contact information

_____ will maintain a binder in his/her office with an SDS on every substance listed as a hazardous chemical.

_____ will ensure that each work site maintains an SDS for hazardous materials in that area.

_____ is responsible for acquiring and updating SDSs. He/she will review each SDS for thoroughness prior to its usage and contact the chemical manufacturer or vendor if additional information is necessary or if an SDS has not been supplied with an initial shipment. OSHA will be notified if there is no response to a request for any SDS that is not received in a reasonable period of time.

All new procurements for the company must be cleared by _____ to determine any significant safety and health information. He/she will be responsible for ensuring that all affected department supervisors are aware of these new substances and the specific safety procedures for the new substance. The supervisor will be responsible for informing all affected employees who are exposed to these substances. This will include handling procedures, health/safety hazards regarding usage, first aid procedures and personal protective equipment. When alternatives to actual data sheets are used, a description of the system will be provided.

The following system will assure receipt of SDSs:

- A. The purchasing department will require SDS Sheets on all products ordered that are subject to The Hazard Communication Standard.
- B. All department supervisors will be requested to reject any shipments of chemicals without prior approval from the purchasing department.

A master list of SDSs as well as copies of SDSs will be kept in the following areas:

Department	Location
_____	_____
_____	_____
_____	_____

SDSs are available to all employees at all times for their work department or for the company as a whole. If a department does not have an SDS for a chemical used in that work area, the employee must contact their supervisor immediately.

Container Labeling:

Company policy mandates that containers of hazardous substances will not be issued or released until the following label information is verified:

- A. Containers are clearly labeled as to its contents.
- B. Appropriate hazard warnings are noted utilizing GHS Pictograms and signal words.
- C. The name and address of the manufacturer are listed.

_____ is responsible for managing the container labeling program and ensuring that all supervisors are properly trained in labeling procedures including secondary container labeling procedures. He/she will ensure that all hazardous chemicals in the plant are properly labeled and updated, as necessary. Containers that are shipped from the plant will be checked by the supervisor of shipping and receiving to make sure all containers are properly labeled.

The container policy listed herein will also apply to the secondary usage of containers. If a secondary container is used, it must be labeled as listed on the original container. It is each department supervisor's responsibility to ensure this process is followed.

The following is a list of responsible supervisors and their respective departments:

Name	Department
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

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

Hazardous Non-routine Tasks:

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

Examples of non-routine tasks performed by employees of this company:

Tasks	Hazardous Substance

List of Hazardous Substances:

Specific information on each hazardous substance(s) in regards to carcinogenicity, volatility, skin or eye irritation, inhalation risks, hazardous decomposition by-products, hazardous polymerization, emergency and first aid procedures and protective equipment may be obtained by reviewing the Safety Data Sheets (SDS) for the specific substance being used.

Listed below are all known hazardous substances present. This includes the work areas in which they are used:

Hazardous Substance	Work Area or Process
<i>Example:</i>	
<i>3100 Series Ultraviolet Ink</i>	<i>Printing</i>
<i>Isopropyl Alcohol</i>	<i>Maintenance</i>

This list is up to date as of: _____ . New substances after this date will be listed on an additional sheet titled "List Of Hazardous Chemicals."

Hazardous Materials Communication for Contractors:

To ensure that outside contractors of our company comply to our Hazardous Communication Program, _____ will review the following procedures with the contractor:

- A. Inform all contractors of any hazardous substance that they may be exposed to in the normal course of their work on the premises. This will be done by supplying them with our list of Hazardous Substances.
- B. The labeling system in use
- C. Location of SDSs that are available for their review upon request
- D. Precautions and safety procedures that the contractor must follow to lessen the possibility of exposure
- E. Use of required personal safety equipment
- F. First aid practices when necessary

The responsible supervisor will monitor the contractor to ensure that proper procedures are used during the contractor's presence at our facility.

Each contractor bringing chemicals on-site must provide the supervisor with the appropriate hazard information on these substances, including the labels used and the precautionary measures to be taken in working with these chemicals.

Personnel Policies:

Employees are responsible for following all safe work practices and using proper precautions required by the guidelines in this program. When an employee is not following safety and health rules regarding working with a hazardous substance, disciplinary action will be taken up to and including termination.

Additional Information:

All employees, or their designated representatives, can obtain further information on this written program, the Hazard Communication Standard, applicable SDSs and labels, and chemical information lists by contacting:

Name

Title

Contact information

Location

Employee Right to Know Hazardous Communication Plan

Dear Employee:

The following information is supplied to you as part of our Hazardous Communication Program. All employees must adhere to the policies outlined in our formal Hazardous Communication Program. It is your responsibility to ensure that you receive training prior to working with any hazardous substance that is used in any job task that you perform. Please inform your supervisor immediately if you have not been properly trained on the use of any hazardous substance prior to beginning work with the substance and/or job task. The following procedure will be used to train you on our Program:

Employees must attend a Health and Safety orientation meeting conducted by _____, prior to starting a work assignment in a department that has hazardous substances. This responsibility may be assigned to the department's supervisor. This meeting will be for the purpose of hazardous materials training and procedures. The training will include the following:

- A. An overview of the requirements contained in the Hazardous Communication Regulation and Globally Harmonized System of Classification and Labeling of Chemicals (GHS), including their rights to information without discrimination or reprisal.
- B. Information about any operations in their work area where hazardous substances are present and/or used. A Hazardous Substance List and the work areas and/or processes where these substances are used will be made available to all employees.
- C. Summary and location of the Company's written Hazardous Communication Program. The Program will be kept in each separate department and will be available to any employee upon request.
- D. Methods and observation techniques used to determine the presence or release of Hazardous Substances in the Work Area. All Chemicals/ Hazardous Substances used in the Plant are restricted to certain areas and will be closely monitored by the supervisor of that area or department.
- E. Information about physical and health effects

of the hazardous substances. These substances may be harmful and could be FATAL if ingested. Repeated and prolonged breathing of vapors or contact with the skin could be harmful and cause irritation. The vapors may also be combustible if the area is not properly ventilated. To receive additional information regarding a substance, please request the SDS for that substance.

- F. Information about the steps the company has taken to lessen or prevent exposure to these substances through usage of engineering controls, work practices and the usage of personal protective equipment. Strict control over the use of these substances is conducted by the supervisor of the department where the substance is used. They are kept in an area accessible only to authorized personnel who have been properly trained in their usage. It is mandatory that the employees using these substances wear the proper personal protective equipment provided by the company.
- G. Training in the reading of labels and reviewing of SDSs to obtain appropriate hazard information. Our employees will be trained on the procedures of how to obtain hazard information in their initial employee orientation on safety and health when first hired. Continuing education in these areas will be provided to employees during all company safety meetings.
- H. Teaching of emergency first aid procedures and the cleaning up of hazardous chemical spills to all employees at time of hire and continuing during the course of their employment with our company. The responsible supervisor of the employee will be properly trained in these first aid procedures. The supervisor will be responsible in the administration and direction of these procedures for their respective employees.

It is of utmost importance that all employees understand the policies outlined herein.

Whenever new production processes are introduced in the workplace involving Hazardous Substances or when substances are introduced by any other

means, the responsible supervisors will retrain their employees regarding these substances and processes. This will include the hazards, proper usage, required personal protection equipment and first aid procedures.

All employees must follow the procedures outlined in this program. Failure to follow any company policy regarding the safe use of a hazardous substance may lead to disciplinary action up to and including immediate termination.



Chapter 4

GHS Classification

GHS Classification System Explained

Any hazard communication system or standard starts with the identification of substances that are potentially hazardous and then sorts them into the type of substance they are and into the type of hazard they represent. The Globally Harmonized System of Classification and Labeling of Chemicals (GHS) calls this process “classification.” To earn a “hazard” classification under the GHS, a substance must contain intrinsic hazardous properties that can be measured against existing relevant data to be deemed hazardous and then assigned a degree of inherent danger.

Hazard Classification

The term “hazard classification” is used to indicate that only the intrinsic hazardous properties of substances and mixtures are considered and involves the following 3 steps:

- a) Identification of relevant data regarding the hazards of a substance or mixture;
- b) Subsequent review of those data to ascertain the hazards associated with the substance or mixture; and
- c) A decision on whether the substance or mixture will be classified as a hazardous substance or mixture and the degree of hazard, where appropriate, by comparison of the data with agreed hazard classification criteria.

The GHS recognizes three types of hazards—physical, health, and environment. Each type of hazard is then broken down into hazard classes, as indicated below:

PHYSICAL HAZARDS

1. Explosives
2. Flammable gases
3. Flammable aerosols
4. Oxidizing gases
5. Gases under pressure
6. Flammable liquids

7. Flammable solids
8. Self-reactive substances and mixtures
9. Substances and mixtures that, in contact with water, emit flammable gases
10. Oxidizing liquids
11. Oxidizing solids
12. Organic peroxides
13. Corrosive to metals

HEALTH HAZARDS

1. Acute toxicity
2. Skin corrosion/irritation
3. Serious eye damage/eye irritation
4. Respiratory or skin sensitization
5. Germ cell mutagenicity
6. Carcinogenicity
7. Reproductive toxicity
8. Specific target organ systemic toxicity (TOST) – Single Exposure
9. Specific target organ systemic toxicity (TOST)—Repeated Exposure
10. Aspiration hazard

ENVIRONMENTAL HAZARDS

1. Hazardous to the aquatic environment
2. Acute aquatic toxicity
3. Chronic aquatic toxicity

GHS Physical Hazards

In developing GHS criteria for physical hazards, it was necessary to define physical states. In the GHS:

- a gas is a substance or mixture which at 50°C has a vapor pressure greater than 300 kPa; or is completely gaseous at 20°C and a standard pressure of 101.3 kPa.
- a liquid is a substance or mixture that is not a gas and which has a melting point or initial melting point of 20°C or less at standard pressure of 101.3 kPa.
- a solid is a substance or mixture that does not meet the definitions of a liquid or a gas.

In short, the GHS recognizes gases, liquids and solids are potential physical hazards. Let's examine each of the 13 physical hazards in some detail using GHS definitions and explanations:

Explosives: An explosive substance (or mixture) is a solid or liquid which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings. Pyrotechnic substances are included even when they do not evolve gases. A pyrotechnic substance (or mixture) is designed to produce an effect by heat, light, sound, gas or smoke or a combination of these as the result of non-detonative, self-sustaining, exothermic chemical reactions.

Substances, mixtures and articles are assigned to one of six divisions, 1.1 to 1.6, depending on the type of hazard they present.

Explosives	
Division	Characteristics
1.1	Mass explosion hazard
1.2	Projection hazard
1.3	Fire hazard or minor projection hazard
1.4	No significant hazard
1.5	Very insensitive substances with mass explosion hazard
1.6	Extremely insensitive articles with no mass explosion hazard

Flammable Gases: Flammable gas means a gas having

a flammable range in air at 20°C and a standard pressure of 101.3 kPa.

Flammable Aerosols: Aerosols are any gas compressed, liquefied or dissolved under pressure within a non-refillable container made of metal, glass or plastic, with or without a liquid, paste or powder. The container is fitted with a release device allowing the contents to be ejected as solid or liquid particles in suspension in a gas, as a foam, paste or powder or in a liquid or gaseous state.

Oxidizing Gases: Oxidizing gas means any gas which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does. Substances and mixtures of this hazard class are assigned to a single hazard category on the basis that, generally by providing oxygen, they cause or contribute to the combustion of other material more than air does. Currently, several workplace hazard communication systems cover oxidizers (solids, liquids, gases) as a class of chemicals.

Gases under Pressure: Gases under pressure are gases that are contained in a receptacle at a pressure not less than 280 Pa at 20°C or as a refrigerated liquid. This endpoint covers four types of gases or gaseous mixtures to address the effects of sudden release of pressure or freezing which may lead to serious damage to people, property, or the environment independent of other hazards the gases may pose.

Gases under Pressure	
Group	Criteria
Compressed gas	Entirely gaseous at -50°C
Liquefied gas	Partially liquid at temperatures > -50°C
Refrigerated liquefied gas	Partially liquid because of its low temperature
Dissolved gas	Dissolved in a liquid phase solvent

Flammable Liquids: Flammable liquid means a liquid having a flash point of not more than 93°C. Substances and mixtures of this hazard class are assigned to one of four hazard categories on the basis of the flash point and boiling point.

Flammable Liquids	
Category	Criteria
1	Flash point < 23°C and initial boiling point ≤ 35°C (95°F)
2	Flash point < 23°C and initial boiling point > 35°C (95°F)
3	Flash point ≥ 23°C and ≤ 60°C (140°F)
4	Flash point ≥ 60°C (140°F) and ≤ 93°C (200°F)

Flash Point is determined by closed cup methods as provided in the GHS document, Chapter 2.5, paragraph 11.

Flammable Solids: Flammable solids are solids that are readily combustible, or may cause or contribute to fire through friction. Readily combustible solids are powdered, granular, or pasty substances which are dangerous if they can be easily ignited by brief contact with an ignition source, such as a burning match, and if the flame spreads rapidly. Substances and mixtures of this hazard class are assigned to one of two hazard categories:

Flammable Solids	
Category	Criteria
1	Metal Powders: burning time ≤ 5 minutes Others: wetted zone does not stop fire & burning time < 45 seconds or burning > 2.2 mm/second
2	Metal Powders: burning time > 5 and ≤ 10 minutes Others: wetted zone stop fire for at least 4 minutes & burning time < 45 seconds or burning rate > 2.2mm/second

Self-Reactive Substances: Self-reactive substances are thermally unstable liquids or solids liable to undergo a strongly exothermic thermal decomposition even without participation of oxygen (air). This definition excludes materials classified under the GHS as explosive, organic peroxides or as oxidizing. These materials may have similar properties, but such hazards are addressed in their specific endpoints. There are exceptions to the self-reactive classification for material: (i) with heat of decomposition <300 J/g or (ii) with self-accelerating decomposition temperature (SADT) > 75°C for a 50 kg package.

Substances and mixtures of this hazard class are assigned to one of the seven 'Types', A to G. Currently, only the transport sector uses seven categories for self-reactive substances.

Self-Reactive Substances	
Type	Criteria
A	Can detonate or deflagrate rapidly, as packaged.
B	Possess explosive properties and which, as packaged, neither detonates nor deflagrates, but is liable to undergo a thermal explosion in that package.
C	Possess explosive properties when the substance or mixture as package cannot detonate or deflagrate rapidly or undergo a thermal explosion.
D	Detonates partially, does not deflagrate rapidly and shows no violent effect when heated under confinement; or Does not detonate at all, deflagrates slowly and shows no violent effect when heated under confinement; or Does not detonate or deflagrate at all and shows a medium effect when heated under confinement.
E	Neither detonates nor deflagrates at all and shows low or no effect when heated under confinement.
F	Neither detonates in the cavitated bubble state nor deflagrates at all and shows only a low or no effect when heated under confinement as well as low or no explosive power.
G	Neither detonates in the cavitated state nor deflagrates at all and shows non effect when heated under confinement nor any explosive power, provided that it is thermally stable (self-accelerating decomposition temperature is 60°C to 75°C for a 50 kg package), and, for liquid mixtures, a diluent having a boiling point not less than 150°C is used for desensitization.

Pyrophoric Liquids: A pyrophoric liquid is a liquid which, even in small quantities, is liable to ignite within five minutes after coming into contact with air.

Pyrophoric Solids: A pyrophoric solid is a solid which, even in small quantities, is liable to ignite within five minutes after coming into contact with air.

Self-Heating Substances: A self-heating substance is a solid or liquid, other than a pyrophoric substance, which, by reaction with air and without energy supply, is liable to self-heat. This endpoint differs from a pyrophoric substance in that it will ignite only when in large amounts (kilograms) and after long periods of time (hours or days).

Substances which, on Contact with Water, Emit Flammable Gases: Substances that, in contact with water, emit flammable gases are solids or liquids which, by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities. Substances and mixtures of this hazard class are assigned to one of three hazard categories on the basis of test results which measure gas evolution and speed of evolution.

Substances which on Contact with Water Emit Flammable Gases	
Category	Criteria
1	≥ 10 L/kg/1 minute
2	≥ 20 L/kg/ 1 hour + < 10 L/kg/1 min
3	≥ 1 L/kg/1 hour + < 20 L/kg/1 hour
Not classified	< 1 L/kg/1 hour

Oxidizing Liquids: An oxidizing liquid is a liquid which, while in itself not necessarily combustible, may, generally by yielding oxygen, cause or contribute to the combustion of other material. Substances and mixtures of this hazard class are assigned to one of three hazard categories on the basis of test results which measure ignition or pressure rise time compared to defined mixtures.

Oxidizing Solids: An oxidizing solid is a solid which, while in itself not necessarily combustible, may, generally by yielding oxygen, cause or contribute to the combustion of other material. Substances and mixtures of this hazard class are assigned to one of three hazard categories on the basis of test results which measure mean burning time and re compared to defined mixtures. Currently, several workplace hazard communication systems cover oxidizers (solids, liquids, gases) as a class of chemicals.

Organic Peroxides: An organic peroxide is an organic liquid or solid which contains the bivalent -O-O- structure and may be considered a derivative of hydrogen peroxide, where one or both of the hydrogen atoms have been replaced by organic radicals. The term also includes organic peroxide formulations (mixtures).

Substances and mixtures of this hazard class are assigned to one of seven 'Types', A to G. Currently, only the transport sector uses seven categories for organic peroxides.

Organic Peroxides	
Type	Criteria
A	Can detonate or deflagrate rapidly, as packaged.
B	Possess explosive properties and which, as packaged, neither detonates nor deflagrates rapidly, but is liable to undergo a thermal explosion in that package.
C	Possess explosive properties when the substance or mixture as packaged cannot detonate or deflagrate rapidly or undergo a thermal explosion.
D	Detonates partially, does not deflagrate rapidly and shows no violent effect when heated under confinement; or Does not detonate at all, deflagrates slowly and shows no violent effect when heated under confinement; or Does not detonate or deflagrate at all and shows a medium effect when heated under confinement.
E	Neither detonates nor deflagrates at all and shows low or no effect when heated under confinement.
F	Neither detonates in the caviated bubble state nor deflagrates at all and shows only a low or no effect when heated under confinements as well as low or non explosive power.

Organic Peroxides	
G	Neither detonates in the caviated state nor deflagrates at all and shows no effect when heated under confinement nor any explosive power, provided that it is thermally stable (self-accelerating decomposition temperature is 60°C to 75°C for a 50 kg package), and, for liquid mixtures, a diluent having a boiling point not less than 150°C is used for desensitization.

Substances Corrosive to Metal: A substance or a mixture that by chemical action will materially damage, or even destroy, metals is termed “corrosive to metal. The GHS criteria are a corrosion rate on steel or aluminum surfaces exceeding 6.25 mm per year at a test temperature of 55°C.

The concern in this case is the protection of metal equipment or installations in case of leakage (e.g., plane, ship, tank), not material compatibility between the container/tank and the product. This hazard is not currently covered in all systems.

GHS Health Hazards

The GHS health and environmental hazard criteria represent a harmonized approach for existing classification systems. The steps to develop the GHS criteria included:

- A thorough analysis of existing classification systems, including the scientific basis for a system and its criteria, its rationale and an explanation of the mode of use;
- A proposal for harmonized criteria for each category. For some categories the harmonized approach was easy to develop because the existing systems had similar approaches. In cases where the approach was different, a compromise consensus proposal was developed.

- Health and environmental criteria were established for substances and mixtures.

The following paragraphs are a brief overview of the GHS health and environmental endpoints:

Acute Toxicity: Five GHS categories have been included in the GHS Acute Toxicity scheme from which the appropriate elements relevant to transport, consumer, worker and environment protection can be selected. Substances are assigned to one of the five toxicity categories on the basis of LD50 (oral, dermal) or LC50 (inhalation). The LC50 values are based on 4-hour tests in animals. The GHS provides guidance on converting 1-hour inhalation test results to a 4-hour equivalent.

Acute Toxicity					
Acute toxicity	Cat. 1	Cat. 2	Cat. 3	Cat. 4	Category 5
Oral (mg/kg)	≤ 5	> 5 ≤ 50	> 50 ≤ 300	> 300 ≤ 2000	Criteria: Anticipated oral LD50 between 2000 and 5000 mg/kg; Indication of significant effect in humans;* Indication of significant effect in humans;* Any mortality at class 4;* Significant clinical signs at class 4;* Indications from other studies.* *If assignment to more hazardous class is not warranted.
Dermal (mg/kg)	≤ 50	> 50 ≤ 200	< 200 ≤ 1000	> 1000 ≤ 2000	
Gases (ppm)	≤ 100	> 100 ≤ 500	> 500 ≤ 2500	> 2500 ≤ 5000	
Vapors	≤ 0.5	> 0.5 ≤ 2.0	> 2.0 ≤ 10	> 10 ≤ 20	
Dust & mists (mg/l)	≤ 0.05	> 0.05 ≤ 0.5	> 0.5 ≤ 1.0	> 1.0 ≤ 5	

Skin Corrosion: Skin corrosion means the production of irreversible damage to the skin following the application of a test substance for up to 4 hours. Substances and mixtures in this hazard class are assigned to a single harmonized corrosion category. For Competent Authorities, such as transport packing groups, needing more than one designation for corrosivity, up to three subcategories are provided within the corrosive category.

Skin Irritation: Skin irritation means the production of reversible damage to the skin following the application of a test substance for up to 4 hours. Substances and mixtures in this hazard class are assigned to a single irritant category. For those authorities, such as pesticide regulators, wanting

more than one designation for skin irritation, an additional mild irritant category is provided.

Eye Effects: Indicates damage to the eye that can be broken down into:

Serious eye damage means the production of tissue damage in the eye, or serious physical decay of vision, following application of a test substance to the front surface of the eye, which is not fully reversible within 21 days of application. Substances and mixtures in this hazard class are assigned to a single harmonized category.

Eye irritation means changes in the eye following the application of a test substance to the front surface of the eye, which are fully reversible

within 21 days of application. Substances and mixtures in this hazard class are assigned to a single harmonized hazard category. For authorities, such as pesticide regulators, wanting more than one designation for eye irritation, one of two subcategories can be selected, depending on whether the effects are reversible in 21 or 7 days.

Sensitization: Respiratory sensitizer means a substance that induces hypersensitivity of the airways following inhalation of the substance. Substances and mixtures in this hazard class are assigned to one hazard category.

Skin sensitizer means a substance that will induce an allergic response following skin contact. The definition for “skin sensitizer” is equivalent to “contact sensitizer.” Substances and mixtures in this hazard class are assigned to one hazard category. Consideration should be given to classifying substances which cause immunological contact urticaria (an allergic disorder) as contact sensitizers.

Germ Cell Mutagenicity: Mutagen means an agent giving rise to an increased occurrence of mutations in populations of cells and/or organisms. Substances and mixtures in this hazard class are assigned to one of two hazard categories, Category 1 is Known/Presumed and Category 2 is Suspected/Possible.

Carcinogenicity: Carcinogen means a chemical substance or a mixture of chemical substances that induce cancer or increase its incidence. Substances and mixtures in this hazard class are assigned to one of two hazard categories, Known or Presumed Carcinogen and Suspected Carcinogen.

Carcinogenicity		
Category 1 Known or Presumed Carcinogen		Category 2 Suspected Carcinogen
Subcategory 1A Known Human Carcinogen Based on human evidence	Subcategory 1B Presumed Human Carcinogen demonstrated animal carcinogenicity	Limited evidence of human or animal carcinogenicity

Reproductive Toxicity: Reproductive toxicity includes adverse effects on sexual function and fertility in adult males and females, as well as developmental

toxicity in offspring. Substances and mixtures with reproductive and/or developmental effects are assigned to one of two hazard categories, ‘known or presumed’ and ‘suspected’. Category 1 has two subcategories for reproductive and developmental effects: Materials that cause concern for the health of breastfed children have a separate category and effects on or via lactation.

Reproductive Toxicity			
Category 1		Category 2 Suspected	Additional Category
Known or presumed to cause effects on human reproduction or on development		Human or animal evidence possibly with other information	Effects on or via lactation
Category 1A Known Based on human evidence	Category 1B Presumed Based on experimental animals		

Specific target organ systemic toxicity (TOST) – Single Exposure & Repeated Exposure: The GHS distinguishes between single and repeat exposure for Target Organ Effects. Some existing systems distinguish between single and repeat exposure for these effects and some do not. All significant health effects, not otherwise specifically included in the GHS, that can impair function, both reversible and irreversible, immediate and/or delayed are included in the non-lethal target organ/systemic toxicity class (TOST). Narcotic effects and respiratory tract irritation are considered to be target organ systemic effects following a single exposure.

Substances and mixtures of the single exposure target organ toxicity hazard class are assigned to one of three hazard categories:

TOST: Single Exposure		
Category 1 Significant toxicity in humans - Reliable, good quality human case studies or epidemiological studies Presumed significant toxicity in humans - Animal studies with significant and/or severe toxic effects relevant to humans at generally low exposure (guidance)	Category 2 Presumed to be harmful to human health - Animal studies with significant toxic effects relevant to humans at generally moderate exposure (guidance) - Human evidence in exceptional cases	Category 3 Transient target organ effects - Narcotic effects - Respiratory tract irritation

Substances and mixtures of the repeated exposure target organ toxicity hazard class are assigned to one of two hazard categories:

TOST: Repeated Exposure	
Category 1 Significant toxicity in humans - Reliable, good quality human case studies or epidemiological studies Presumed significant toxicity in humans - Animal studies with significant and/or severe toxic effects relevant to humans at generally low exposure (guidance)	Category 2 Presumed to be harmful to human health - Animal studies with significant toxic effects relevant to humans at generally moderate exposure (guidance) - Human evidence in exceptional cases

Aspiration Hazard: Aspiration toxicity includes severe acute effects such as chemical pneumonia, varying degrees of pulmonary injury or death following aspiration. Aspiration is the entry of a liquid or solid directly through the oral or nasal cavity, or indirectly from vomiting, into the trachea and lower respiratory system. Some hydrocarbons (petroleum distillates) and certain chlorinated hydrocarbons have been shown to pose an aspiration hazard in humans. Primary alcohols and ketones have been shown to pose an aspiration hazard only in animal studies.

Substances and mixtures of this hazard class are assigned to one of two hazard categories this hazard class on the basis of viscosity: Category 1 which is

“Known (regarded) human” or Category 2 which is “Presumed human.”

GHS Environmental Hazards

Hazardous to the Aquatic Environment: The harmonized criteria are considered suitable for packaged goods in both supply and use in multi-modal transport schemes. Elements of it may be used for bulk land transport and bulk marine transport under MARPOL (International Convention for the Prevention of Pollution from Ships) insofar as this uses aquatic toxicity. Two Guidance Documents (Annexes 8 and 9 of the GHS Document) cover issues such as data interpretation and the application of the criteria to special substances. Considering the complexity of this endpoint and the breadth of the application, the Guidance Annexes are important in the application of the harmonized criteria.

Acute Aquatic Toxicity: Acute aquatic toxicity means the intrinsic property of a material to cause injury to an aquatic organism in a short-term exposure. Substances and mixtures of this hazard class are assigned to one of three toxicity categories on the basis of acute toxicity data: LC50 (fish) or EC50 (crustacea) or ErC50 (for algae or other aquatic plants). In some regulatory systems these acute toxicity categories may be subdivided or extended for certain sectors.

Chronic Aquatic Toxicity: Chronic aquatic toxicity means the potential or actual properties of a material to cause adverse effects to aquatic organisms during exposures that are determined in relation to the lifecycle of the organism. Substances and mixtures in this hazard class are assigned to one of four toxicity categories on the basis of acute data and environmental fate data: LC50 (fish) or EC50 (crustacea) or ErC50 (for algae or other aquatic plants) and degradation/bioaccumulation.

Summary and Conclusion

The GHS establishes classification criteria for physical, health and environmental hazards, along with associated hazard communication elements, notably pictograms, signal words, and hazard statements for use on labels. It is based on harmonizing major existing systems for classifying and labeling of chemicals in transport and in the workplace, in pesticides, and in consumer products. A key guiding principle of the GHS harmonization effort was that harmonization should be accomplished without lowering the level of protection afforded by existing systems. It was also acknowledged that changes in

all systems would be required to achieve a single, globally harmonized system.

The basic goal of hazard communication is to ensure that employers, employees and the public are provided with adequate, practical, reliable and comprehensible information on the hazards of chemicals, so that they can take effective preventive and protective measures for their health and safety. Thus, implementation of effective hazard communication provides benefits for governments, companies, workers, and members of the public.



Chapter 5

Labeling of Chemicals

Standardized Label

One of the areas of hazard communication that is vastly improved with the incorporation of the GHS is product labeling. Traditionally, label elements and regulations have varied from country to country and from business to business. One of the goals of the GHS was to develop standardized label elements so that no matter where the chemicals were manufactured or shipped, the end user would be able to heed the appropriate label warnings and information.

Some GHS label elements have been standardized (identical with no variation) and are directly related to the endpoints and hazard level. Other label elements are harmonized with common definitions and/or principles.

The standardized label elements included in the GHS are:

- **Pictogram:** a symbol plus other graphic elements, such as a border, background pattern, or color that is intended to convey specific information about the hazards of a chemical. Each pictogram consists of a different symbol on a white background within a red square frame set on a point (i.e. a red diamond). There are nine pictograms under the GHS. However, only eight pictograms are required under the HCS.
- **Signal words:** a single word used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label. The signal words used are “danger” and “warning.” “Danger” is used for the more severe hazards, while “warning” is used for less severe hazards.
- **Hazard Statement:** a statement assigned to a hazard class and category that describes the nature of the hazard(s) of a chemical, including, where appropriate, the degree of hazard.
- **Precautionary Statement:** a phrase that describes recommended measures to be taken to minimize or prevent adverse effects resulting from exposure to a hazardous chemical, or improper storage or handling of a hazardous chemical.

The symbols, signal words, and hazard statements have all been standardized and assigned to specific hazard categories and classes, as appropriate. These

standardized elements are not subject to variation, and should appear on the GHS label as indicated in the GHS for each hazard category/class in the system. The use of symbols, signal words or hazard statements other than those that have been assigned to each of the GHS hazards would be contrary to harmonization.

Symbols/Pictograms

	Product Name or Identifier (Identify Hazardous Ingredients, where appropriate)
	Signal Word
	Physical, Health, Environmental Hazard Statements
	Supplemental Information
 	Precautionary Measures & Pictograms
	First Aid Statements
	Name and Address of Company, Telephone Number

The GHS symbols have been incorporated into pictograms for use on the GHS label. Pictograms include the harmonized hazard symbols plus other graphic elements, such as borders, background patterns or colors which are intended to convey specific information.

Signal Words

A signal word means a word used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label. The signal words used in the GHS are “Danger” and “Warning”. “Danger” is used for the more severe hazard categories (i.e. in the main for hazard categories 1 and 2), while “Warning” is used for the less severe.

Example: Danger!

Physical, Health, Environmental Hazard Statements

A hazard statement means a phrase assigned to a hazard class and category that describes the nature of the hazards of a hazardous product, including, where appropriate, the degree of hazard. A statement for each GHS hazard should be included on the label

for products possessing more than one hazard. See table on the next page entitled “GHS Pictograms and Hazard Classes” for examples.

The GHS classifies hazard statements into 3 categories:

Physical Hazard

- Explosives
- Flammable Gases
- Flammable Aerosols
- Oxidizing Gases
- Gases Under Pressure
- Flammable Liquids
- Flammable Solids
- Self-Reactive Substances
- Pyrophoric Liquids
- Pyrophoric Solids
- Self-Heating Substances
- Substances which, in contact with water, emit flammable gases

- Oxidizing Liquids
- Oxidizing Solids
- Organic Peroxides
- Corrosive to Metals

Health Hazard

- Acute Toxicity
- Skin Corrosion/Irritation
- Serious Eye Damage/Eye Irritation
- Respiratory or Skin Sensitization
- Germ Cell Mutagenicity
- Carcinogenicity
- Reproductive Toxicology

- Target Organ Systemic Toxicity - Single Exposure
- Target Organ Systemic Toxicity - Repeated Exposure
- Aspiration Toxicity

Environmental Hazard

- Hazardous to the Aquatic Environment
- Acute aquatic toxicity
- Chronic aquatic toxicity
- Bioaccumulation potential
- Rapid degradability

Example: Toxic If Swallowed, Flammable Liquid and Vapor

Pictograms

A precautionary statement means a phrase (and/or pictogram) that describes recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a hazardous product, or improper storage or handling of a hazardous product.

Health Hazard



- Carcinogen
- Mutagenicity
- Reproductive Toxicity
- Respiratory Sensitizer
- Target Organ Toxicity
- Aspiration Toxicity

Flame



- Flammables
- Pyrophorics
- Self-Heating
- Emits Flammable Gas
- Self-Reactives
- Organic Peroxides

Exclamation Mark



- Irritant (skin and eye)
- Skin Sensitizer
- Acute Toxicity (harmful)
- Narcotic Effects
- Respiratory Tract Irritant
- Hazardous to Ozone Layer (Non Mandatory)

Gas Cylinder



- Gases Under Pressure

Corrosion



- Skin Corrosion/ burns
- Eye Damage
- Corrosive to Metals

Exploding Bomb



- Explosives
- Self Reactives
- Organic Peroxides

Flame over Circle



- Oxidizers

Environment
(Non Mandatory)



- Aquatic Toxicity

Skull and Crossbones



- Acute Toxicity (fatal or toxic)

Additional Label Elements may include:

Precautionary Measures

Precautionary information supplements the hazard information by briefly providing measures to be taken to minimize or prevent adverse effects from physical, health or environmental hazards. First aid is included in precautionary information. The GHS label should include appropriate precautionary information. Precautionary statements generally fall into four types: prevention, response in cases of accidental spillage or exposure, storage, and disposal. The precautionary statements have been linked to each GHS hazard statement and type of hazard.

Example: **Do not eat, drink or use tobacco when using this product. Wash hands thoroughly after handling. Keep container tightly closed. Keep away from heat/sparks/open flame. - No smoking. Wear protective gloves and eye/face protection. Ground container and receiving equipment. Use explosion-proof electrical equipment. Take precautionary measures against static discharge. Use only non-sparking tools. Store in cool/well-ventilated place.**

Example of first aid statement: **IF SWALLOWED: Immediately call a POISON CONTROL CENTER or doctor/physician. Rinse mouth.**

Product Identifier (Ingredient Disclosure)

A product identifier should be used on a GHS label and it should match the product identifier used on the SDS. Where a substance or mixture is covered by the UN Model Regulations on the Transport of Dangerous Goods, the UN proper shipping name should also be used on the package.

The GHS label for a substance should include the chemical identity of the substance. For mixtures/alloys, the label should include the chemical identities of all ingredients that contribute to acute toxicity, skin corrosion or serious eye damage, germ cell mutagenicity, carcinogenicity, reproductive toxicity, skin or respiratory sensitization, or Target Organ Systemic Toxicity (TOST), when these hazards appear on the label. Where a product is supplied exclusively for workplace use, the Competent Authority may give suppliers discretion to include chemical identities on the SDS, in lieu of including them on labels. The Competent Authority rules for confidential business information (CBI) take priority over the rules for product identification.

Supplier Identification

The name, address and telephone number of the manufacturer or supplier of the product should be provided on the label.

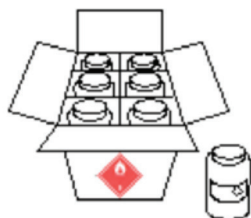
Supplemental Information

Supplemental label information is non-harmonized information on the container of a hazardous product that is not required or specified under the GHS. Supplemental information may be used to provide further detail that does not contradict or cast doubt on the validity of the standardized hazard information. It also may be used to provide information about hazards not yet incorporated into the GHS.

GHS Label Format / Layout

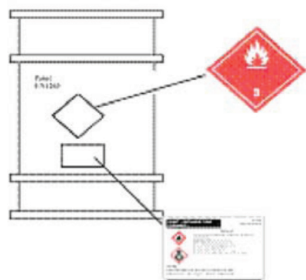
The GHS hazard pictograms, signal word and hazard statements should be located together on the label. The actual label format or layout is not specified in the GHS. National authorities may choose to specify where information should appear on the label or allow supplier discretion.

There has been discussion about the size of GHS pictograms and that a GHS pictogram might be confused with a transport pictogram or “diamond.” Transport pictograms are different in appearance than the GHS pictograms. Annex 7 of the Purple Book explains how the GHS pictograms are expected to be proportional to the size of the label text, so that generally the GHS pictograms would be smaller than the transport pictograms.



Combination Packaging (Outer box with inner bottles)

Several arrangements for GHS labels are also provided in Annex 7 of the Purple Book. The figure above shows an arrangement for a combination packaging with an outer shipping box and inner bottles. The shipping box has a transportation pictogram. The inner bottles have a GHS label with a GHS pictogram.



Combination Packaging (Outer box with inner bottles)

For a container such as a 55 gallon drum, the

transport required markings and pictograms may be combined with the GHS label elements or presented separately. In the figure above, a label arrangement for a single packaging such as a 55 gallon drum is shown. Pictograms and markings required by the transport regulations as well as GHS label and non-duplicative GHS pictogram are shown on the drum.

Workplace Containers

Products falling within the scope of the GHS will carry the GHS label at the point where they are supplied to the workplace, and that label should be maintained on the supplied container in the workplace. The GHS label or label elements can also be used for workplace containers (e.g., storage tanks). However, the Competent Authority (OSHA) can allow employers to use alternative means of giving workers the same information in a different written or displayed format when such a format is more appropriate to the workplace and communicates the information as effectively as the GHS label. For example, label information could be displayed in the work area, rather than on the individual containers. Some examples of workplace situations where chemicals may be transferred from supplier containers include: containers for laboratory testing, storage vessels, piping or process reaction systems or temporary containers where the chemical will be used by one worker within a short timeframe.



Chapter 6

Understanding Safety Data Sheets

Overview

The (Material*) Safety Data Sheet (SDS) 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 SDS 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.

*Before the incorporation of the GHS, OSHA's term for these bulletins was Material Safety Data Sheets or MSDSs.

MSDS Comparison		
MSDS Sections	GHS SDS ¹	OSHA MSDS ²
1. Product and company identification	• Product identifier used on the label; • Other means of identification; • Recommended use of the chemical and restrictions on use; • Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party; • Emergency phone number.	• Product identity same as on label. • Name address and telephone number of the manufacturer, distributor, employer or other responsible party.
2. Hazards identification	• Classification of the chemical in accordance with paragraph (d) of §1910.1200; • Signal word, hazard statement(s), symbol(s) and precautionary statement(s) in accordance with paragraph (f) of §1910.1200. (Hazard symbols may be provided as graphical reproductions in black and white or the name of the symbol, e.g., flame, skull and crossbones); • Describe any hazards not otherwise classified that have been identified during the classification process; • Where an ingredient with unknown acute toxicity is used in a mixture at a concentration $\geq 1\%$ and the mixture is not classified based on testing of the mixture as a whole, a statement that X% of the mixture consists of ingredient(s) of unknown acute toxicity is required.	• Health hazards including acute and chronic effects, listing target organs or systems. • Signs & symptoms of exposure. • Conditions generally recognized as aggravated by exposure. • Primary routes of exposure. • If listed as a carcinogen by OSHA, IARC, NTP. • Physical hazards, including the potential for fire, explosion, and reactivity.

MSDS Comparison		
MSDS Sections	GHS SDS ¹	OSHA MSDS ²
3. Composition/ information on ingredients	Except as provided for in paragraph (i) of §1910.1200 on trade secrets: For Substances • Chemical name; • Common name and synonyms; • CAS number and other unique identifiers; • Impurities and stabilizing additives which are themselves classified and which contribute to the classification of the substance. For Mixtures In addition to the information required for substances: • The chemical name and concentration (exact percentage) or concentration ranges of all ingredients which are classified as health hazards in accordance with paragraph (d) of §1910.1200 and (1) Are present above their cut-off/concentration limits; or (2) Present a health risk below the cut-off/concentration limits. • The concentration (exact percentage) shall be specified unless a trade secret claim is made in accordance with paragraph (i) of §1910.1200, when there is batch-to-batch variability in the production of a mixture, or for a group of substantially similar mixtures (See A.0.5.1.2) with similar chemical composition. In these cases, concentration ranges may be used. For All Chemicals Where a Trade Secret is Claimed Where a trade secret is claimed in accordance with paragraph (i) of §1910.1200, a statement that the specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret is required.	• Chemical and common name of ingredients contributing to known hazards. • For untested mixtures, the chemical & common name of ingredients at 1% or more that present a health hazard and those that present a physical hazard in the mixture. • Ingredients at 0.1% or greater, if carcinogens.
4. First-aid measures	• Description of necessary measures, subdivided according to the different routes of exposure, i.e., inhalation, skin and eye contact, and ingestion; • Most important symptoms/effects, acute and delayed. • Indication of immediate medical attention and special treatment needed, if necessary.	• Emergency & first aid procedures.
5. Firefighting measures	• Suitable (and unsuitable) extinguishing media. • Specific hazards arising from the chemical (e.g., nature of any hazardous combustion products). • Special protective equipment and precautions for fire-fighters.	• Generally applicable control measures. • Flammable property information such as flashpoint. • Physical hazards including the potential for fire, explosion, and reactivity.

MSDS Comparison		
MSDS Sections	GHS SDS ¹	OSHA MSDS ²
6. Accidental release measures	- Personal precautions, protective equipment, and emergency procedures. - Methods and materials for containment and cleaning up.	Procedures for clean up of spills and leaks.
7. Handling and storage	- Precautions for safe handling. - Conditions for safe storage, including any incompatibilities.	Precautions for safe handling & use, including appropriate hygienic practices.
8. Exposure controls/personal protection	- OSHA permissible exposure limit (PEL), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV), and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the safety data sheet, where available. - Appropriate engineering controls. - Individual protection measures, such as personal protective equipment.	- General applicable control measures - Appropriate engineering controls and work practices. - Protective measures during maintenance & repair. - Personal protective equipment. - Permissible exposure levels, threshold limit values, listed by OSHA, ACGIH, or established company limits.
9. Physical and chemical properties	- Appearance (physical state, color, etc.); - Odor; - Odor threshold; - pH; - Melting point/freezing point; - Initial boiling point and boiling range; - Flash point; - Evaporation rate; - Flammability (solid, gas); - Upper/lower flammability or explosive limits; - Vapor pressure; - Vapor density; - Relative density; - Solubility(ies); - Partition coefficient: n-octanol/water; - Auto-ignition temperature; - Decomposition temperature; - Viscosity.	- Characteristics of hazardous chemicals such as vapor pressure & density. - Physical hazards including the potential for fire, explosion, and reactivity.

MSDS Comparison		
MSDS Sections	GHS SDS ¹	OSHA MSDS ²
10. Stability and reactivity	• Reactivity; • Chemical stability; • Possibility of hazardous reactions; • Conditions to avoid (e.g., static discharge, shock, or vibration); • Incompatible materials; • Hazardous decomposition products.	• Organic peroxides, pyrophoric, unstable # (reactive), or water-reactive hazards. • Physical hazards, including reactivity and hazardous polymerization.
11. Toxicological information	Description of the various toxicological (health) effects and the available data used to identify those effects, including: • Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact); • Symptoms related to the physical, chemical and toxicological characteristics; • Delayed and immediate effects and also chronic effects from short- and long-term exposure; • Numerical measures of toxicity (such as acute toxicity estimates). • Whether the hazardous chemical is listed in the National Toxicology Program (NTP) Report on Carcinogens (latest edition) or has been found to be a potential carcinogen in the International Agency for	• See also Section 2 [health hazards Including acute and chronic effects, listing target organs or systems. • Signs & symptoms of exposure. • Primary routes of exposure. • If listed as a carcinogen by OSHA, IARC, NTP].
12. Ecological information	• Ecotoxicity (aquatic and terrestrial, where available); • Persistence and degradability; • Bioaccumulative potential; • Mobility in soil; • Other adverse effects (such as hazardous to the ozone layer).	• No present requirements.
13. Disposal considerations	Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging.	• No present requirements. • See section 7.
14. Transport information	• UN number; • UN proper shipping name; • Transport hazard class(es); • Packing group, if applicable; • Environmental hazards (e.g., Marine pollutant (Yes/No)); • Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code); • Special precautions which a user needs to be aware of, or needs to comply with, in connection with transport or conveyance either within or outside their premises.	• No present requirements.
15. Regulatory information	Safety, health and environmental regulations specific for the product in question.	• No present requirements.
16. Other information	The date of preparation of the SDS or the last change to it.	• Date of preparation of MSDS or date of last change.

1. Globally Harmonized System of Classification and Labeling of Chemicals (GHS), United Nations, 2012.
2. U.S. DOL, OSHA, 29 CFR 1910.1200, HAZCOM.

OSHA Requirements

Employers must maintain a complete and accurate SDS 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 SDS within three months and provide it to their customers with the next shipment of the chemical. If there are multiple suppliers of the same chemical, there is no need to retain multiple SDSs for that chemical.

While SDSs 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 SDS 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 SDS is incomplete or unclear, the employer should contact the manufacturer or importer to get clarification or obtain missing information. (See Chapter 8 for sample letters requesting an SDS, or additional information.)

When an employer is unable to obtain an SDS from a supplier or manufacturer, he/she should submit a written complaint, with complete background information, to the nearest OSHA area office. OSHA will then call and send a certified letter to the supplier or manufacturer to obtain the necessary 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.

Employer Responsibilities

Employers must prepare a list of all hazardous chemicals in the workplace. When the list is complete, it should be checked against the collected SDSs that the employer has been sent to ensure that there is an SDS for every hazardous chemical (see the Safety Data Sheet Checklist at the end of this chapter). Once all the SDSs have been verified, employers must ensure that each employee has a basic knowledge of how to find information on an SDS and how to properly make

use of that information.

The employer is required to maintain in the workplace copies of the required material safety data sheets for each hazardous chemical, and must 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.)

Where employees must travel between workplaces during a work shift, 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 must ensure that employees can immediately obtain the required information in an emergency.

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 must 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).

Contents of an SDS

OSHA specifies the information to be included on the SDS, but does not prescribe the precise format. The SDS must be in English and include at least the following 16 headings in the order given below:

1. Identification

- Product identifier used on the label;
- Other means of identification;
- Recommended use of the chemical and restrictions on use;
- Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party;
- Emergency phone number.

2. Hazard(s) identification

- Classification of the chemical in accordance with paragraph (d) of §1910.1200;
- Signal word, hazard statement(s), symbol(s) and

precautionary statement(s) in accordance with paragraph (f) of §1910.1200. (Hazard symbols may be provided as graphical reproductions in black and white or the name of the symbol, e.g., flame, skull and crossbones);

- Describe any hazards not otherwise classified that have been identified during the classification process;
- Where an ingredient with unknown acute toxicity is used in a mixture at a concentration $\geq 1\%$ and the mixture is not classified based on testing of the mixture as a whole, a statement that X% of the mixture consists of ingredient(s) of unknown acute toxicity is required.

3. Composition/information on ingredients

Except as provided for in paragraph (i) of §1910.1200 on trade secrets:

For Substances

- Chemical name;
- Common name and synonyms;
- CAS number and other unique identifiers;
- Impurities and stabilizing additives which are themselves classified and which contribute to the classification of the substance.

For Mixtures

In addition to the information required for substances:

- The chemical name and concentration (exact percentage) or concentration ranges of all ingredients which are classified as health hazards in accordance with paragraph (d) of §1910.1200 and
 - (1) Are present above their cut-off/concentration limits; or
 - (2) Present a health risk below the cut-off/concentration limits.
- The concentration (exact percentage) shall be specified unless a trade secret claim is made in accordance with paragraph (i) of §1910.1200, when there is batch-to-batch variability in the production of a mixture, or for a group of substantially similar mixtures (See A.0.5.1.2) with similar chemical composition. In these cases, concentration ranges may be used.

For All Chemicals Where a Trade Secret is Claimed

Where a trade secret is claimed in accordance with paragraph (i) of §1910.1200, a statement that the specific chemical identity and/or exact percentage (concentration) of composition has

been withheld as a trade secret is required.

4. First-aid measures

- Description of necessary measures, subdivided according to the different routes of exposure, i.e., inhalation, skin and eye contact, and ingestion;
- Most important symptoms/effects, acute and delayed.
- Indication of immediate medical attention and special treatment needed, if necessary.

5. Fire-fighting measures

- Suitable (and unsuitable) extinguishing media.
- Specific hazards arising from the chemical (e.g., nature of any hazardous combustion products).
- Special protective equipment and precautions for fire-fighters.

6. Accidental release measures

- Personal precautions, protective equipment, and emergency procedures.
- Methods and materials for containment and cleaning up.

7. Handling and storage

- Precautions for safe handling.
- Conditions for safe storage, including any incompatibilities.

8. Exposure controls/personal protection

- OSHA permissible exposure limit (PEL), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV), and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the safety data sheet, where available.
- Appropriate engineering controls.
- Individual protection measures, such as personal protective equipment.

9. Physical and chemical properties

- Appearance (physical state, color, etc.);
- Odor;
- Odor threshold;

- pH;
- Melting point/freezing point;
- Initial boiling point and boiling range;
- Flash point;
- Evaporation rate;
- Flammability (solid, gas);
- Upper/lower flammability or explosive limits;
- Vapor pressure;
- Vapor density;
- Relative density;
- Solubility(ies);
- Partition coefficient: n-octanol/water;
- Auto-ignition temperature;
- Decomposition temperature;
 - Viscosity.

10. Stability and reactivity

- Reactivity;
- Chemical stability;
- Possibility of hazardous reactions;
- Conditions to avoid (e.g., static discharge, shock, or vibration);
- Incompatible materials;
 - Hazardous decomposition products..

11. Toxicological information

Description of the various toxicological (health) effects and the available data used to identify those effects, including:

- Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact);
- Symptoms related to the physical, chemical and toxicological characteristics;
- Delayed and immediate effects and also chronic effects from short- and long-term exposure;
- Numerical measures of toxicity (such as acute toxicity estimates).
- Whether the hazardous chemical is listed in the National Toxicology Program (NTP) 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 edition), or by OSHA.

12. Ecological information

- Ecotoxicity (aquatic and terrestrial, where available);
- Persistence and degradability;

- Bioaccumulative potential;
- Mobility in soil;
- Other adverse effects (such as hazardous to the ozone layer).

13. Disposal considerations

Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging.

14. Transport information

- UN number;
- UN proper shipping name;
- Transport hazard class(es);
- Packing group, if applicable;
- Environmental hazards (e.g., Marine pollutant (Yes/No));
- Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code);
 - Special precautions which a user needs to be aware of, or needs to comply with, in connection with transport or conveyance either within or outside their premises.

15. Regulatory information

Safety, health and environmental regulations specific for the product in question.

16. Other information.

The date of preparation of the SDS or the last change to it.

Safety Data Sheet Checklist

You must ensure that each SDS contains the following information:

- _____ 1. Identification of the product
- _____ 2. Hazard(s) identification
- _____ 3. Composition/information on ingredients
- _____ 4. First-aid measures
- _____ 5. Fire-fighting measures
- _____ 6. Accidental release measures (spill clean up and precautions)
- _____ 7. Handling and storage
- _____ 8. Exposure controls/personal protection
- _____ 9. Physical and chemical properties
- _____ 10. Stability and reactivity
- _____ 11. Toxicological information
- _____ 12. Ecological information
- _____ 13. Disposal considerations
- _____ 14. Transport information
- _____ 15. Regulatory information
- _____ 16. Other information

List of Hazardous Chemicals and Index of SDS's

Hazardous Chemicals	Operation/Area Used (Optional)	SDS's on File

List of Hazardous Chemicals and Index of SDS's

Hazardous Chemicals	Operation/Area Used (Optional)	SDS's on File

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Hazardous Chemicals	Operation/Area Used (Optional)	SDS's on File

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List of Hazardous Chemicals and Index of SDS's

Hazardous Chemicals	Operation/Area Used (Optional)	SDS's on File



Chapter 7

My Safety Data Sheets

GHS Sample Safety Data Sheet

Employers may utilize this section of the manual to keep copies of their Safety Data Sheets for each hazardous chemical that is present in the workplace. The following is an example of an OSHA/GHS compliant Safety Data Sheet. It should be used as a guide, but information will vary depending on the chemical. (See Chapter 6 for an overview of SDSs and what information is required to be compliant.)

GHS Sample Safety Data Sheet

1. Identification

Product Name: Chemical Stuff

Synonyms: Methyltoxy Solution

CAS Number: 000-00-0

Product Use: Organic Synthesis

Manufacturer/Supplier: My Company

Address: My Street, Mytown, TX 00000

General Information: 713-000-0000

Transportation Emergency Number: CHEMTREC: 800-424-9300

2. Hazards Identification

GHS Classification		
Health	Environmental	Physical
Acute Toxicity - Category 2 (inhalation), Category 3 (oral/dermal) Eye Corrosion - Category 1 Skin Corrosion - Category 1 Skin Sensitization - Category 1 Mutagenicity - Category 2 Carcinogenicity - Category 1B Reproductive/Developmental - Category 2 Target Organ Toxicity (Repeated) - Category 2	Aquatic Toxicity - Acute 2	Flammable Liquid - Category 2

GHS Label:

Symbols: flame, skull and crossbones, corrosion, health hazard	
Hazard Statements DANGER! Highly Flammable Liquid and Vapor. Fatal if inhaled. Causes severe skin burns and eye damage. May cause allergic skin reaction. Toxic if swallowed and in contact with skin May cause cancer. Suspected of damaging the unborn child. Suspected of causing genetic defects. May cause damage to cardiovascular, respiratory, nervous, and gastrointestinal systems and liver and blood through prolonged or repeated exposure. Toxic to aquatic life.	Precautionary Statements Do not eat, drink or use tobacco when using this product. Do not breathe mist/vapors. Keep container tightly closed. Keep away from heat/sparks/open flame. - No smoking. Wear respiratory protection, protective gloves and eye/face protection. Use only in a well-ventilated area. Take precautionary measures against static discharge. Use only non-sparking tools. Store container tightly closed in cool/well-ventilated place. Wash thoroughly after handling.

3. Composition / Information on Ingredients

Component	CAS Number	Weight %
Methyltoxy	000-00-0	80

(See Section 8 for Exposure Limits)

4. First Aid Measures

Eye: Eye irritation. Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Get immediate medical attention.

Skin: Itching or burning of the skin. Immediately flush the skin with plenty of water while removing contaminated clothing and shoes. Get immediate medical attention. Wash contaminated clothing before reuse.

Inhalation: Nasal irritation, headache, dizziness, nausea, vomiting, heart palpitations, breathing difficulty, cyanosis, tremors, weakness, red flushing of face, irritability. Remove exposed person from source of exposure to fresh air. If not breathing, clear airway and start cardiopulmonary resuscitation (CPR). Avoid mouth-to-mouth resuscitation.

Ingestion: Get immediate medical attention. Do not induce vomiting unless directed by medical personnel.

5. Fire Fighting Measures

Suitable Extinguishing Media: Use dry chemical, foam, or carbon dioxide to extinguish fire. Water may be ineffective but should be used to cool fire-exposed containers, structures and to protect personnel. Use water to dilute spills and to flush them away from sources of ignition.

Fire Fighting Procedures: Do not flush down sewers or other drainage systems. Exposed firefighters must wear NIOSH-approved positive pressure self-contained breathing apparatus with full-face mask and full protective clothing.

Unusual Fire and Explosion Hazards: Dangerous when exposed to heat or flame. Will form flammable or explosive mixtures with air at room temperature. Vapor or gas may spread to distant ignition sources and flash back. Vapors or gas may accumulate in low areas. Runoff to sewer may cause fire or explosion hazard. Containers may explode in heat of fire. Vapors may concentrate in confined areas. Liquid will float and may reignite on the surface of water.

Combustion Products: Irritating or toxic substances may be emitted upon thermal decomposition. Thermal decomposition products may include oxides of carbon and nitrogen.

6. Accidental Release Measures

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. (Also see Section 8).

Vapor protective clothing should be worn for spills and leaks. Shut off ignition sources; no flares, smoking or flames in hazard area. Small spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal. Large spills: Dike far ahead of liquid spill for later disposal.

Do not flush to sewer or waterways. Prevent release to the environment if possible. Refer to Section 15 for spill/release reporting information.

7. Handling and Storage

Handling

Do not get in eyes, on skin or on clothing. Do not breathe vapors or mists. Keep container closed. Use only with adequate ventilation. Use good personal hygiene practices. Wash hands before eating, drinking, smoking. Remove contaminated clothing and clean before re-use. Destroy contaminated belts and shoes and other items that cannot be decontaminated.

Keep away from heat and flame. Keep operating temperatures below ignition temperatures at all times. Use non-sparking tools.

Storage

Store in tightly closed containers in cool, dry, well-ventilated area away from heat, sources of ignition and incompatibles. Ground lines and equipment used during transfer to reduce the possibility of static spark-initiated fire or explosion. Store at ambient or lower temperature. Store out of direct sunlight. Keep containers tightly closed and upright when not in use. Protect against physical damage.

Empty containers may contain toxic, flammable and explosive residue or vapors. Do not cut, grind, drill, or weld on or near containers unless precautions are taken against these hazards.

8. Exposure Controls / Personal Protection

Exposure Limits

Component, Methyltoxy - TWA: 3 ppm (skin) - **STEL:** C 15 ppm (15 min.)

Engineering Controls: Local exhaust ventilation may be necessary to control air contaminants to their exposure limits. The use of local ventilation is recommended to control emissions near the source. Provide mechanical ventilation for confined spaces. Use explosion-proof ventilation equipment.

Personal Protective Equipment (PPE)

Eye Protection: Wear chemical safety goggles and face shield. Have eye-wash stations available where eye contact can occur.

Skin Protection: Avoid skin contact. Wear gloves impervious to conditions of use. Additional protection may be necessary to prevent skin contact including use of apron, face shield, boots or full body protection. A safety shower should be located in the work area. Recommended protective materials include: Butyl rubber and for limited contact Teflon.

Respiratory Protection: If exposure limits are exceeded, NIOSH approved respiratory protection should be worn. A NIOSH approved respirator for organic vapors is generally acceptable for concentrations up to 10 times the PEL. For higher concentrations, unknown concentrations and for oxygen deficient atmospheres, use a NIOSH approved air-supplied respirator. Engineering controls are the preferred means for controlling chemical exposures. Respiratory protection may be needed for non-routine or emergency situations. Respiratory protection must be provided in accordance with OSHA 29 CFR 1910.134.

9. Physical and Chemical Properties

Flashpoint: 20C (35oF)

Autoignition Temperature: 480oC (896oF)

Boiling Point: 77oC (170.6oF) @ 760 mm Hg

Melting Point: -82oC

Vapor Pressure: 100.0 mm Hg @ 23oC

Vapor Density(Air=1): 1.7; air = 1

% Solubility in Water: 10 @ 20°C

Pour Point: NA

Molecular Formula: Mixture

Odor/Appearance: Clear, colorless liquid with mild, pungent odor.

Lower Flammability Limit: >3.00%

Upper Flammability Limit: <15.00%

Specific Gravity: 0.82g/ml @ 20oC

% Volatile: 100

Evaporation Rate (Water=1): 5(Butyl Acetate =1)

Viscosity: 0.3 cP @ 25oC

Octanol/Water Partition Coefficient: log Kow: 0.5

pH: 7, 8% aqueous solution

Molecular Weight: Mixture

10. Stability and Reactivity

Stability/Incompatibility: Incompatible with ammonia, amines, bromine, strong bases and strong acids.

Hazardous Reactions/Decomposition Products: Thermal decomposition products may include oxides of carbon and nitrogen.

11. Toxicological Information

Signs and Symptoms of Overexposure: Eye and nasal irritation, headache, dizziness, nausea, vomiting, heart palpitations, difficulty breathing, cyanosis, tremors, weakness, itching or burning of the skin.

Acute Effects:

Eye Contact: may cause severe conjunctival irritation and corneal damage.

Skin Contact: may cause reddening, blistering or burns with permanent damage. Harmful if absorbed through the skin. May cause allergic skin reaction.

Inhalation: may cause severe irritation with possible lung damage (pulmonary edema).

Ingestion: may cause severe gastrointestinal burns.

Target Organ Effects: May cause gastrointestinal (oral), respiratory tract, nervous system and blood effects based on experimental animal data. May cause cardiovascular system and liver effects.

Chronic Effects: based on experimental animal data, may cause changes to genetic material; adverse effects on the developing fetus or on reproduction at doses that were toxic to the mother. Methyltoxy is classified by IARC as group 2B and by NTP as reasonably anticipated to be a human carcinogen. OSHA regulates Methyltoxy as a potential carcinogen.

Medical Conditions Aggravated by Exposure: preexisting diseases of the respiratory tract, nervous system, cardiovascular system, liver or gastrointestinal tract.

Acute Toxicity Values

Oral LD⁵⁰ (Rat) = 100 mg/kg

Dermal LD⁵⁰ (Rabbit) = 225-300 mg/kg

Inhalation LC⁵⁰ (Rat) = 200 ppm/4 hr., 1100 ppm vapor/1 hr

12. Ecological Information

LC⁵⁰ (Fathead Minnows) = 9 mg/L/96 hr.

EC⁵⁰ (Daphnia) = 8.6 mg/L/48 hr.

Bioaccumulation is not expected to be significant. This product is readily biodegradable.

13. Disposal Considerations

As sold, this product, when discarded or disposed of, is a hazardous waste according to Federal regulations (40 CFR 261). It is listed as Hazardous Waste Number Z000, listed due to its toxicity. The transportation, storage, treatment and disposal of this waste material must be conducted in compliance with 40 CFR 262, 263, 264, 268 and 270. Disposal can occur only in properly permitted facilities. Refer to state and local requirements for any additional requirements, as these may be different from Federal laws and regulations. Chemical additions, processing or otherwise altering this material may make waste management information presented in the MSDS incomplete, inaccurate or otherwise inappropriate.

14. Transport Information

U.S. Department of Transportation (DOT)

Proper Shipping Name: Methyltoxy

Hazard Class: 3, 6.1

UN/NA Number: UN0000

Packing Group: PG 2

Labels Required: Flammable Liquid and Toxic

International Maritime Organization (IMDG)

Proper Shipping Name: Methyltoxy

Hazard Class: 3 Subsidiary 6.1

UN/NA Number: UN0000

Packing Group: PG 2

Labels Required: Flammable Liquid and Toxic

15. Regulatory Information

U.S. Federal Regulations

Comprehensive Environmental Response and Liability Act of 1980 (CERCLA):

The reportable quantity (RQ) for this material is 1000 pounds. If appropriate, immediately report to the National Response Center (800/424-8802) as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies.

Toxic Substances Control Act (TSCA): All components of this product are included on the TSCA inventory.

Clean Water Act (CWA): Methyltoxy is a hazardous substance under the Clean Water Act. Consult Federal, State and local regulations for specific requirements.

Clean Air Act (CAA): Methyltoxy is a hazardous substance under the Clean Air Act. Consult Federal, State and local regulations for specific requirements.

Superfund Amendments and Reauthorization Act (SARA) Title III Information:

SARA Section 311/312 (40 CFR 370) Hazard Categories:

Immediate Hazard: X

Delayed Hazard: X

Fire Hazard: X

Pressure Hazard:

Reactivity Hazard:

This product contains the following toxic chemical(s) subject to reporting requirements of SARA Section 313 (40 CFR 372)

Component	CAS Number	Maximum %
Methyltoxy	000-00-0	80

State Regulations

California: This product contains the following chemicals(s) known to the State of California to cause cancer, birth defects or reproductive harm:

Component	CAS Number	Maximum %
Methyltoxy	000-00-0	80

International Regulations

Canadian Environmental Protection Act: All of the components of this product are included on the Canadian Domestic Substances list (DSL).

Canadian Workplace Hazardous Materials Information System (WHMIS):

Class B-2 Flammable Liquid

Class D-1-B Toxic

Class D-2-A Carcinogen

Class D-2-B Chronic Toxin

Class E Corrosive

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

European Inventory of Existing Chemicals (EINECS):

All of the components of this product are included on EINECS.

EU Classification: F Highly Flammable; T Toxic; N Dangerous to the Environment

EU Risk (R) and Safety (S) Phrases:

R11: Highly flammable.

R23/24/25: Toxic by inhalation, in contact with skin and if swallowed.

R37/38: Irritating to respiratory system and skin.

R41: Risk of serious damage to eyes.

R43: May cause sensitization by skin contact.

R45: May cause cancer.

R51/53: Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

S53: Avoid exposure - obtain special instructions before use.

S16: Keep away from sources of ignition - No Smoking.

S45: In case of accident or if you feel unwell, seek

medical advice immediately (show the label where possible).

S9: Keep container in a well-ventilated place.

S36/37: Wear suitable protective clothing and gloves.

S57: Use appropriate container to avoid environmental contamination.

16. Other Information

National Fire Protection Association (NFPA) Ratings:

This information is intended solely for the use of individuals trained in the NFPA system.

Health: 3

Flammability: 3

Reactivity: 0

Revision Indicator: New MSDS

Disclaimer: The information contained herein is accurate to the best of our knowledge. My Company makes no warranty of any kind, express or implied, concerning the safe use of this material in your process or in combination with other substances.



Chapter 8

Safety Data Sheet Requests

The following sample letters may be used when corresponding with a vendor to request an SDS or to request additional SDS information. If the vendor fails to send the requested information by the date indicated in the letter, then the employer should submit a written complaint, with complete background information, to the nearest OSHA area office. (See Chapter 6 for an overview of SDSs and employer responsibilities.)

Sample Letter Requesting an MSDS

Blitz Manufacturing Company
1923 Oak Grove Lane
Springfield, Massachusetts 02110

Dear Sir or Madam:

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

We, therefore, request a copy of the SDS for your product listed as Stock Number _____. We did not receive an SDS with the initial shipment of the Blitz Solvent 90 we received from you on October 1st. We also request any additional information, supplemental SDSs, 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 SDS and any other relevant information should be sent to us within 10, 20, 30 days (select appropriate time). Delays in receiving the SDS information may prevent the 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 SDS 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 SDSs 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) 555-9460.

Sincerely,

George Rogers, President
XYZ Company

Sample Letter Requesting Additional SDS 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 chemicals produced by ACE Chemical Company. The SDSs forwarded to us appear to be deficient as follows:

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

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

Sincerely,

Robert Stevens
Purchasing Agent
XYZ Company

Sample Letter To Accompany Purchase Orders

This is a notice to vendors addressing the need for SDSs and container labeling. This letter should be attached to purchase orders for all chemicals or other hazardous substances.

This is a notice to vendors addressing the need for SDSs and container labeling. This letter should be attached to purchase orders for all chemicals or other hazardous substances.

Date:

Clean Products Company
864 Main Street
Nashville, TN 37201

Dear Mrs. Smith:

Attached to this letter is a purchase order for the products from your company which we plan to utilize in our facility. Our receiving personnel have been instructed to accept only containers which have been properly labeled and identified. Improperly labeled containers will result in refusal of the shipment. Please make sure that any shipments sent to our facility are compliant with the label requirements outlined by OSHA and The Globally Harmonized System of Classification and Labeling of Chemicals (GHS) including pictograms, signal words and hazard statements.

In addition, we require (Material) Safety Data Sheets (SDS) prior to receipt of our initial order and/or when an SDS has been revised. If your policy differs from this procedure, please notify us as soon as possible. To assist us, we would appreciate if you would record the responsible party information on the shipping papers.

If you have any questions, please do not hesitate to contact me. Thank you for your cooperation. I look forward to working with you in the future.

Sincerely,

Robert Stevens
Purchasing Agent
XYZ Company



Chapter 9

My SDS Request File

Employers may utilize this section of the manual to keep copies of their Safety Data Sheet requests. Keeping copies of the letters you send will act as proof of your attempt to obtain the required information. (See Chapter 6 for an overview of SDSs and employer responsibilities.)



Chapter 10

Sample Training Program

Employer Training Requirements

Under the Hazard Communication Standard, 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. Likewise, the GHS states in Chapter 1.4, Section 1.4.9, the importance of training all target audiences to recognize and interpret label and/or SDS information, and to take appropriate action in response to chemical hazards. Training requirements should be appropriate for and commensurate with the nature of the work or exposure. Key target audiences include workers, emergency responders and also those responsible for developing labels and SDSs. To varying degrees, the training needs of additional target audiences have to be addressed. These should include training for persons involved in transport and strategies required for educating consumers in interpreting label information on products that they use.

Everyone who works with or is potentially exposed to hazardous chemicals should receive initial training on the following topics:

- Policies and procedures covered by the Hazard Communication Standard and GHS
- Summary and location of the Company's Hazard Communication Program
- How to recognize and interpret label and/or SDS information
- Location of SDSs and how to obtain additional hazard information
- Physical and health hazards of hazardous substances in their work area
- Procedures to protect against hazards (e.g., work procedures, personal protective equipment)
- How to take appropriate action in response to chemical hazards
- Emergency response procedures for hazardous chemical spills

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 SDSs for that

particular workplace or work area. Upon completion of the training program, employers should require each employee to sign a form documenting that he/she has received the training.

Whenever a new hazard is introduced or work procedures change in a way that alters an employee's exposure to a hazardous substance, additional training must be provided. It is also recommended that employers conduct regular safety meetings to review the information presented in the initial training. Foremen and other supervisors should be extensively trained regarding hazards and appropriate protective measures so they will be available to answer questions from employees and provide daily monitoring of safe work practices.

Designing a Training Program

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 an effective training program. Using the sample and the guidelines, together with establishment-specific label and SDS 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 ways 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 as: Any chemical that is a physical or health hazard.
- “Physical hazard” is defined as a chemical that is scientifically proven to be 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 any substance 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 program 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 Safety Data Sheet (SDS) for each chemical and that the list references the corresponding SDS for each chemical.
- Make the list readily available to your employees (or to other employers at your worksite).
- Make sure employees understand the information regarding the chemicals listed in the workplace.

Instruct Employees on How to Use and Interpret SDSs

- Make sure you have an SDS for each hazardous chemical product you package, handle, or transfer. (See Chapter 6)
- Check each SDS you receive to ensure that it contains all the information required by the standard.
- Obtain SDSs or information where necessary (i.e., when an SDS is not received from manufacturer, importer or supplier, or when an SDS is incomplete. (See Chapter 8 for sample letter requesting SDS information.)

Instruct Employees on Labeling Requirements

- Check each container entering the workplace for appropriate labeling (e.g., identity of chemicals, hazard warnings; name and address of manufacturer/ importer/responsible party).
- Explain the importance of reading labels and 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.

- Explain the required elements of a label under GHS and how to read Pictograms.
- Explain that signal words indicate the relative degree of severity of a hazard. The signal words used in the GHS are “Danger” for the more severe hazards, and “Warning” for the less severe 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 or when the chemicals will be used immediately by the employee transferring the chemicals.)
- In lieu of labels, process sheets, batch tickets, standard operating procedures, or other written materials may be used on stationary process equipment if they contain the same information as a label and are readily available to employees in the work area or station.
- Cross-reference chemical identifiers on labels to SDSs and the lists of hazardous chemicals.
- Be aware of other hazardous chemicals that may have specific labeling requirements under other standards (e.g., asbestos, lead, etc.).

Review Existing Methods of Controlling Workplace Exposures

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

Review Your Current Procedures for Handling Chemicals and Compare with Recommended Practices Identified on SDSs and Labels

Keep 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 how to apply 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.

Voluntary Training Program

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

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

The guidelines are designed to help employers to (1) determine whether a worksite problem can be solved by training; (2) determine what training, if any, is needed; (3) identify goals and objectives for the training; (4) design learning activities; (5) conduct training; (6) determine the effectiveness of the training; and (7) revise the training program based on feedback from employees, supervisors, and others.

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

Training Model

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

A training program designed in accordance with these guidelines can be used to supplement and enhance the employer’s other education and training activities. The guidelines afford employers significant flexibility in the selection of content and training program

design. OSHA encourages a personalized approach to the informational and instructional programs at individual worksites, thereby enabling employers to provide the training that is most needed and applicable to local working conditions.

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

Review Commission Implications

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

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

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

Training Guidelines

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

- A. Determining if training is needed
- B. Identifying training needs
- C. Identifying goals and objectives
- D. Developing learning activities
- E. Conducting the training
- F. Evaluating program effectiveness
- G. Improving the program

This model is useful for any size business. It eliminates the need for a professional trainer or expensive training materials. Using this model, employers or supervisors can develop and administer safety and health training programs that address problems specific to their businesses, while fulfilling the learning needs of their employees, and strengthening their safety and health program.

A. Determining if Training is Needed

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

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

Problems that can be addressed effectively by training include those that arise from lack of knowledge of a work process, unfamiliarity with equipment, or incorrect execution of a task. Training is less effective (but can still be used) for problems arising from an employee's lack of motivation or lack of attention to the job. Training is most effective when designed in relation to the goals of the employer's total safety and health program.

B. Identifying Training Needs

If the problem can be solved by training, then the

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

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

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

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

The employees themselves can provide valuable information on the training they need. Safety

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

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

C. Identifying Goals and Objectives

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

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

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

D. Developing Learning Activities

Once employers have stated precisely what the objectives for the training program are, then learning activities can be identified and described. Learning activities enable employees to demonstrate that

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

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

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

E. Conducting the Training

With the completion of the steps outlined above, the employer is ready to begin conducting the training. To the extent possible, the training should be presented so that its organization and meaning are clear to the employees. To do so, employers or supervisors should (1) provide overviews of the material to be learned; (2) relate, wherever possible, the new information or

skills to the employees' goals, interests, or experience; and (3) reinforce what the employees learned by summarizing the program's objectives and the key points of information covered. These steps will assist employers in presenting the training in a clear manner.

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

In order to be motivated to pay attention and learn the material that the employer or supervisor is presenting, employers must convince the employees of the importance and relevance of the material. Among the ways of developing motivation are (1) explaining the goals and objectives of instruction; (2) relating the training to the interests, skills, and experiences of the employees; (3) outlining the main points to be presented during the training session(s); and (4) pointing out the benefits of training (e.g., the employee will be better informed, more skilled, and thus more valuable both on the job and on the labor market; or the employee will, if he or she applies the skills and knowledge learned, be able to work at reduced risk).

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

F. Evaluating Program Effectiveness

To make sure that the training program is accomplishing its goals, an evaluation of the training can be valuable. Training should have, as one of its critical components, a method of measuring the effectiveness of the training. A plan for evaluating the training session(s) should be developed when the course objectives and content are developed. It should not be delayed until the

training has been completed. Evaluation will help employers or supervisors determine the amount of learning achieved and whether an employee's performance has improved on the job. Among the methods of evaluating training are (1) Student opinion. Questionnaires or informal discussions with employees can help employers determine the relevance and appropriateness of the training program; (2) Supervisors' observations. Supervisors are in good positions to observe an employee's performance both before and after the training and note improvements or changes; and (3) Workplace improvements. The ultimate success of a training program may be changes throughout the workplace that result in reduced injury or accident rates.

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

G. Improving the Program

If, after evaluation, it is clear that the training did not give the employees the level of knowledge and skill that was expected, then it may be necessary to revise the training program or provide periodic retraining. At this point, asking questions of employees and of those who conducted the training may be of some help. Among the questions that could be asked are (1) Were portions of the content already known and, therefore, unnecessary? (2) What material was confusing or distracting? (3) Was anything missing from the program? (4) What did the employees learn, and what did they fail to learn?

It may be necessary to repeat steps in the training process, that is, to return to the first steps and retrace one's way through the training process. As the program is evaluated, the employer should ask (1) If a job analysis was conducted, was it accurate? (2) Was any critical feature of the job overlooked? (3) Were the important gaps in knowledge and skill included? (4) Was material already known by the employees intentionally omitted? (5) Were the instructional objectives presented clearly and concretely? (6) Did the objectives state the level of acceptable performance that was expected of employees? (7) Did the learning activity simulate the actual job? (8) Was the learning activity appropriate for the kinds of knowledge and skills required on the job? (9) When the training was presented, was the organization

of the material and its meanings made clear? (10) Were the employees motivated to learn? (11) Were the employees allowed to participate actively in the training process? (12) Was the employer's evaluation of the program thorough?

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

Matching Training to Employees

Employees must know as much as possible about the safety and health hazards to which they are exposed. All relevant information and instruction for employees should be provided by employers who decide which employees are in the greatest need of information and instruction. Employees who are at greatest risk due to the nature of their work have priority for information and training.

A. Identifying Employees at Risk

Within industries which are hazardous in general, there are employees who operate at greater risk than others. In some cases, the degree of risk for an occupation is influenced by the conditions under which it is performed, such as noise, heat or cold, or safety or health hazards in the surrounding area. In these situations, employees should be trained not only on how to perform their job safely, but also on how to operate within a hazardous environment.

To identify employee populations at high levels of risk, examine the incidence of accidents and injuries, both within the company and within the industry. If employees in certain occupational categories are experiencing higher accident and injury rates than other employees, training may be one way to reduce those rates. In addition, thorough accident investigation can identify not only specific employees who could benefit from training but also identify company-wide training needs.

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

1. The age of the employee (younger employees have higher incidence rates).
2. The length of time on the job (new employees have higher incidence rates).
3. The size of the firm (in general terms, medium-size firms have higher incidence rates than smaller

or larger firms).

4. The type of work performed (incidence and severity rates vary significantly by Standard Industrial Classification, or SIC Code).
5. The use of hazardous substances (by SIC Code).

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

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

B. Training Employees at Risk

Determining the content of training for employee populations at higher levels of risk is similar to determining what any employee needs to know, but more emphasis is placed on the requirements of the job and the possibility of injury. One useful tool for determining training content from job requirements is the Job Hazard Analysis described earlier. This procedure examines each step of a job, identifies existing or potential hazards, and determines the best way to perform the job in order to reduce or eliminate the hazards. Its key elements are (1) job description; (2) job location; (3) key steps (preferably in the order in which they are performed); (4) tools, machines and materials used; (5) actual and potential safety and health hazards associated with these key job steps; and (6) safe and healthful practices, apparel, and equipment required for each key job step.

Safety Data Sheets (SDS) can also provide information for training employees in the safe use of materials. These data sheets, developed by chemical manufacturers and importers, are supplied with manufacturing or construction materials and describe the ingredients of a product, its hazards, protective equipment to be used, safe handling procedures, and emergency first-aid responses. The information contained in these sheets can help employers identify employees in need of training (i.e., workers handling substances described in the sheets) and

train employees in safe use of the substances. Safety Data Sheets are generally available from suppliers, manufacturers of the substance, large employers who use the substance on a regular basis, or they can be developed by employers or trade associations. SDS are particularly useful for those employers who are developing training on chemical use as required by OSHA's Hazard Communication Standard.

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

Training Checklist

	Complete	Incomplete
1. Established a thorough training program.	_____	_____
2. Identified employees who need training.	_____	_____
3. Developed a training program that ensures 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. Informed employees how to detect the presence or release of hazardous chemicals in the workplace.	_____	_____
11. Trained employees in the use of proper work practices, personal protective equipment and clothing, and other controls to reduce or eliminate their exposure to the chemicals in their work areas.	_____	_____
12. Trained employees in emergency and first-aid procedures and signs of overexposure.	_____	_____
13. Listed all the hazardous chemicals in our workplace.	_____	_____
14. Employees know when and how to update our hazardous chemical list.	_____	_____
15. Obtained or developed a safety data sheet for each hazardous chemical in the workplace.	_____	_____
16. Explained how to use an SDS.	_____	_____
17. Informed employees of the list of hazardous chemicals and SDSs 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 warnings signs for containers that hold hazardous chemicals.	_____	_____
21. Developed a way to identify and inform employees of new hazardous chemicals before they are introduced into a work area.	_____	_____
22. Established a way to inform employees of new hazards associated with the chemicals they already use.	_____	_____
23. Developed a way to evaluate the effectiveness of the training program and to keep track of who has received training.	_____	_____



Chapter 11

My Training Program

Employee Right-to-Know Hazardous Communication Plan

This information is supplied to you as part of our Hazardous Communication Program. All employees must adhere to the policies outlined in our formal Hazardous Communication Program. It is your responsibility to ensure that you receive training prior to working with any hazardous substance that is used in any job task that you perform. Please inform your supervisor immediately if you have not been properly trained on the use of any hazardous substance prior to beginning work with any substance and/or job task.



1. Employee Information and Training

All employees must attend a Health and Safety orientation meeting conducted by _____, prior to starting a work assignment in a department that has exposure to a hazardous substance(s). This responsibility may be assigned to the department supervisor. This meeting will be for the purpose of hazardous materials training and procedures and will include the following:

- A. An overview of the requirements contained in the Hazardous Communication Regulation, including employee rights to information without discrimination or reprisal.
- B. Information about any operations in the work area where hazardous substances are present and/or used. A Hazardous Substance List and the work areas and/or processes where these substances are used will be made available to all employees.
- C. Location and availability of the written Hazardous Materials Communication Program. The Program will be kept in each separate department and will be available to any employee upon request.
- D. Methods and observation techniques used to determine the presence or release of Hazardous Substances in the Work Area. All Chemicals/Hazardous Substances used in the Plant are restricted to certain areas and/or departments. This will be closely monitored by the supervisor of that area or department.
- E. Information about physical and health effects of the hazardous substances that are present at the worksite. These substances may be harmful and could be FATAL if ingested. Repeated and prolonged breathing of vapors or contact with the skin could be harmful and cause irritation. The vapors may also be combustible if the area is not properly ventilated. To receive additional information regarding a substance, please request the Safety Data Sheet (SDS) for that substance.
- F. Information about the steps the Company has taken to lessen or prevent exposure to these

substances through use of engineering controls, work practices and the use of personal protective equipment. Strict control over the use of these substances is conducted by the supervisor of the department where the substance is used. They are kept in an area accessible only to authorized personnel who have been properly trained in their usage. It is mandatory that the employees using these substances wear the proper gloves, aprons, eye protection and respirators provided by the Company.

- G. Training in the reading of labels and reviewing of SDS's to obtain appropriate hazard information. Our employees will be trained on the procedures of how to obtain hazard information in their initial employee orientation on safety and health. Continued education in these areas will be provided to employees during all company safety meetings. This may be done by the Plant Manager, a supervisor or outside consultant.
- H. Teaching of emergency first aid procedures to all employees at time of hire and continued during the course of their employment with our Company. The responsible supervisor of the employee will be properly trained in these first aid procedures. The supervisor will be responsible in the administration and direction of these procedures for their respective employees.

Whenever new production processes are introduced in the workplace involving hazardous substances or these substances are introduced by any other means, the responsible supervisors will retrain their employees regarding these substances and processes. This will include the hazards, proper usage, required personal protection equipment and first aid procedures.

All employees must follow the procedures outlined in this program. Failure to follow any company policy regarding the safe use of a hazardous substance may lead to disciplinary action up to and including immediate termination.

Hazard Communication

OSHA's Hazard Communication Standard covers all workers exposed to hazardous chemicals in all industrial sectors. This standard is based on a simple concept - that employees have both a need and a right to know the hazards and the 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.

Communicating hazards is accomplished through Safety Data Sheets (SDS), container labeling and warning signs. By learning about the hazards found in the workplace as well as safe and proper use of hazardous chemicals, employees can reduce the number of illnesses and injuries caused by chemicals.



Safety Data Sheets

The Safety Data Sheet 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 SDS 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.

Employers are required to ensure that every employee has a basic knowledge of how to find information on SDSs and how to use that information. They must also make sure that complete and accurate SDS's are available to employees during each workshift and that information is provided for each hazardous chemical.

Before working with any kind of chemical or hazardous substance, always make sure that you have read the SDS to be aware of safety precautions and what to do in case of an emergency. They are readily accessible during each work shift to employees when they are in their work area.

Container Labeling

Company policy mandates that containers of hazardous substances will not be issued or released until the following label information is verified:

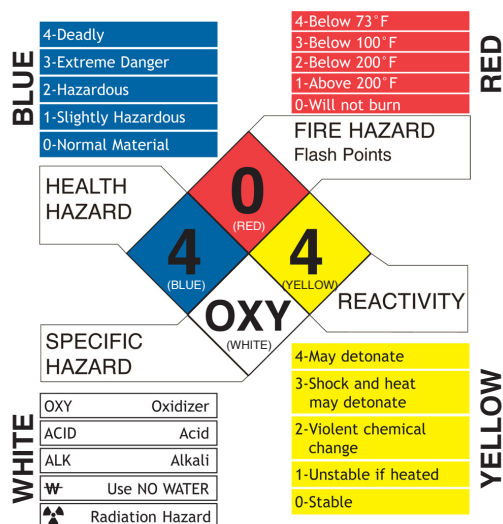
- Containers are clearly labeled as to its contents.
- Appropriate hazard warnings are noted.

- The name and address of the manufacturer are listed.

This also applies to the secondary usage of containers. If a secondary container is used, it must be labeled as listed on the original container.

Haz-Mat Diamond

The National Fire Protection Association (NFPA) system uses a diamond-shaped diagram of symbols and numbers to indicate the degree of hazard associated with a particular chemical or material. These diamond shaped symbols are placed on containers of chemicals or materials to identify the degree of hazard associated with the chemical or material. The diagram identifies three color-coded categories of hazard for each material. Each category is divided in levels of hazard potential with increasing numbers indicating increasing hazards. The abbreviated degrees of hazard in each of these categories are given as follows:



Chemicals in the Workplace

All chemicals can cause harm. When only a very large amount of the chemical can cause damage, the chemical is considered to be relatively non-toxic. When a small amount can be harmful, the chemical is considered toxic.

Toxic materials can take the form of solids, liquids, gases, vapors, dusts, fumes, fibers and mists. How a substance gets into the body and what damage it causes depends on the form or the physical properties of the substance.

Chemical exposure may cause or contribute to many serious health conditions such as heart ailments, central nervous system problems, 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.

Never work with a chemical until you are familiar with all of the hazards of the chemical and its use precautions, including what to do in the event of a spill.



Exposure

Just a little bit of some chemicals entering your body could harm you. Exposure to chemicals normally occurs through inhalation, skin or eye contact, and ingestion.

Inhalation - The most common type of exposure occurs when you breathe a substance into the lungs.

Skin Contact - The skin is a protective barrier that helps keep foreign chemicals out of the body. However, some chemicals can easily pass through the skin and enter the bloodstream. If the skin is cut or cracked, chemicals can penetrate through the skin more easily.

Eye Contact - Some chemicals may burn or irritate the eye.

Ingestion - The least common source of exposure in the workplace is swallowing chemicals. Chemicals can be ingested if they are left on hands, clothing or beard, or accidentally contaminate food, drinks or cigarettes.

SDSs

A Safety Data Sheet (SDS) is a detailed information sheet 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. There is an SDS available for employee review for every substance containing chemicals that is used in the workplace.

SDSs can be found at this worksite in the following location: _____

Emergency Procedures

The cleanup of a chemical spill should only be done by trained and properly equipped personnel. If the spill is minor, follow company procedures for cleaning up the spill. If the spill is extensive or you do not know the hazards and precautions that need to be taken, do the following:

- Activate nearest fire alarm.
- **Do not** attempt to clean up spill.
- Attend to any injured or contaminated persons and remove them from exposure.
- Seek medical attention, if necessary.
- Alert people in the facility to evacuate to a safe distance.
- Turn off ignition and heat sources and isolate incompatibles or reactive chemical substances, if this can be accomplished safely.
- Close doors and windows to the affected area.

If a chemical has spilled on your body or splashed in your eye, immediately rinse the affected area with running water for 15 minutes and seek medical attention. Report the incident to your supervisor.

PPE

Personal protective equipment (PPE) is to be used as a line of defense against exposure to chemical elements and should be used in conjunction with engineering and environmental controls. PPE includes chemically resistant gloves, eyewear, footwear, coveralls and respiratory protection.

It is important to know the properties of the chemicals you are working with and the appropriate PPE to protect against possible hazards.

Cleaning up Spills

Employees should never work with a chemical until they are familiar with all of the hazards of the chemical and its precautions, including what to do in the event of a spill. The cleanup of a chemical spill should only be done by trained and properly equipped personnel. Specific procedures for spill cleanup will vary depending on the location of the spill (elevator, corridor, chemical storeroom, work area), the amount and physical properties of the spilled material (volatile liquid, solid or toxic gas), and the degree and type of material toxicity.



The types, quantities and conditions of use of hazardous materials in buildings can vary significantly. For these reasons, safe spill response procedures require planning. **Users of hazardous materials should know the location of the following in the event of a spill:**

- The nearest spill response kit.
- The nearest safety shower.
- The nearest eye wash.
- The nearest fire alarm pull box.
- SDS(s) for materials used in the work area.
- The nearest safe evacuation route.

Employees may clean up small spills of hazardous materials provided that all the of the following conditions are met:

- The hazards of the material(s) are known and appropriate precautions can be taken to prevent personal exposure.
- There is no potential of a release to the environment.
- There are no personal injuries as a result of the spill.
- The clean up procedures are known the proper equipment is available.
- The spill can be cleaned up safely by two people in one hour or less.

Minor Chemical Spill:

- Alert people in the immediate area of spill.
- Wear the appropriate protective equipment, including safety goggles, chemical resistant gloves, long-sleeve clothing and resistant footwear.
- Avoid breathing vapors from the spill.
- Increase ventilation in the area of the spill.
- Confine the spill to the smallest area possible.
- Do not walk through the spilled chemical.
- Turn off ignition and heat sources and isolate incompatibles or reactive chemical substances, if this can be accomplished safely.
- Cover or block sinks or floor drains to prevent spilled materials from reaching the outdoors.
- Use an appropriate kit to neutralize and/or absorb the spill.

- Collect neutralized and/or absorbed materials, place in an appropriate container and label it as hazardous waste.
- After a spill is thoroughly cleaned or neutralized, clean spill area with water.

Major Chemical Spill:

- Activate nearest fire alarm.
- **Do not** attempt to clean up spill.
- Attend to any injured or contaminated persons and remove them from exposure.
- Seek medical attention, if necessary.
- Alert people in the facility to evacuate to a safe distance.
- Turn off ignition and heat sources and isolate incompatibles or reactive chemical substances, if this can be accomplished safely.
- Close doors and windows to the affected area.
- Post “Do Not Enter” signs or barrier tape at all entrances to the affected area.
- Provide emergency personnel with as much information as possible about the incident including SDS(s) if available.

Chemical Spill on Body:

- Immediately rinse the affected area with running water from faucet or safety shower continuously for at least 15 minutes.
- Remove all contaminated clothing.
- Make sure chemical has not accumulated in shoes.
- Review SDS(s) for hazards or possible delayed reactions.
- Seek medical attention.
- Report the incident to your supervisor immediately.

Hazardous Material Splashed in Eye:

- Immediately rinse eyeball and inner surface of eyelid with running water from a faucet or eyewash continuously for 15 minutes.
- Review SDS(s) for hazards.
- Seek medical attention.
- Report the incident to your supervisor immediately.

Understanding Safety Data Sheets (SDS's)

The (Material) Safety Data Sheet (SDS) 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 SDS 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.*

**Before the incorporation of the GHS, OSHA's term for these bulletins was Material Safety Data Sheets or MSDS's.*

Employers must maintain a complete and accurate SDS for each hazardous chemical that is used in the facility.



Contents of an SDS

OSHA specifies the information to be included on the SDS, but does not prescribe the precise format. The SDS must be in English and include at least the following 16 headings in the order given below:

1. Identification

GHS product identifier including recommended use and restrictions, supplier's contact information and emergency phone number.

2. Hazard(s) identification

GHS classification of the substance/mixture as well as GHS label elements including precautionary statements and any other hazards that may exist.

3. Composition/information on ingredients

Information on the substance/mixture including chemical identity, impurities and stabilizing additives, and, in the case of mixtures, concentration of ingredients.

4. First-aid measures

Description of necessary first-aid according to routes of exposure, most important symptoms/effects, and indication of immediate medical attention and special treatment.

5. Fire-fighting measures

Details about suitable extinguishing media, hazards specific to the chemical (such as combustion), protective equipment and precautions for firefighters.

6. Accidental release measures

Includes personal precautions, protective equipment, emergency procedures, environmental precautions as well as methods and materials for containment and cleaning up.

7. Handling and storage

Description of precautions for safe handling and conditions for safe storage, including any incompatibilities.

8. Exposure controls/personal protection

Control parameters including appropriate engineering controls and individual protection measures.

9. Physical and chemical properties

Description of chemical appearance (physical state, color etc), odor and physical features (e.g. PH, Melting point/freezing point, Initial boiling point/range, Flash point).

10. Stability and reactivity

Information regarding chemical stability, possible hazardous reactions, incompatible materials, hazardous decomposition products and conditions to avoid (e.g. static discharge, shock or vibration).

11. Toxicological information

Concise, complete and comprehensible description of the various health effects and the available data used to identify those effects (e.g. likely routes of exposure, symptoms, delayed and immediate effects from exposure and numerical measures of toxicity).

12. Ecological information

Information about the ecotoxicity, persistence and degradability, bioaccumulative potential, mobility in soil and other adverse effects.

13. Disposal considerations

Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging.

14. Transport information

Includes information such as UN number, proper shipping name, transport hazard class(es), packing group, whether chemical is a marine pollutant, and any territory specific special precautions.

15. Regulatory information

Safety, health and environmental regulations specific for the product in question.

16. Other information

Other information including information on preparation and revision of the SDS.

A master list of SDS as well as copies of SDS's will be kept in the following areas:

Department	Location
_____	_____
_____	_____
_____	_____

SDS's are available to all employees at all times for their work department or for the company as a whole. If a department does not have an SDS for a chemical used in that work area, the employee must contact their supervisor immediately.

How to Read a Hazardous Substance Label

The standardized label elements included in the GHS are:

- **Symbols (hazard pictograms):** Convey health, physical and environmental hazard information, assigned to a GHS hazard class and category.
- **Signal Words:** “Danger” or “Warning” are used to emphasize hazards and indicate the relative level of severity of the hazard, assigned to a GHS hazard class and category.
- **Hazard Statements:** Standard phrases assigned to a hazard class and category that describe the nature of the hazard.

The symbols, signal words, and hazard statements have all been standardized and assigned to specific hazard categories and classes, as appropriate. These standardized elements are not subject to variation, and should appear on the GHS label as indicated in the GHS for each hazard category/class in the system.



	Product Name or Identifier (Identify Hazardous Ingredients, where appropriate)
	Signal Word
	Physical, Health, Environmental Hazard Statements
	Supplemental Information
 	Precautionary Measures & Pictograms
	First Aid Statements
	Name and Address of Company, Telephone Number

Company policy mandates that containers of hazardous substances will not be issued or released until the following label information is verified:

- A. Containers are clearly labeled as to its contents.
- B. Appropriate hazard warnings are noted utilizing GHS Pictograms and signal words.
- C. The name and address of the manufacturer are listed.

_____ is responsible for managing the container labeling program and ensuring that all supervisors are properly trained in labeling procedures including secondary container labeling procedures. He/she will ensure that all hazardous chemicals in the plant are properly labeled and updated, as necessary. Containers that are shipped from the plant will be checked by the supervisor of shipping and receiving to make sure all containers are properly labeled.

Understanding Pictograms and Signal Words

Pictograms

A precautionary statement means a phrase (and/or pictogram) that describes recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a hazardous product, or improper storage or handling of a hazardous product.



Health Hazard



- Carcinogen
- Mutagenicity
- Reproductive Toxicity
- Respiratory Sensitizer
- Target Organ Toxicity
- Aspiration Toxicity

Flame



- Flammables
- Pyrophorics
- Self-Heating
- Emits Flammable Gas
- Self-Reactives
- Organic Peroxides

Exclamation Mark



- Irritant (skin and eye)
- Skin Sensitizer
- Acute Toxicity (harmful)
- Narcotic Effects
- Respiratory Tract Irritant
- Hazardous to Ozone Layer (Non Mandatory)

Gas Cylinder



- Gases Under Pressure

Corrosion



- Skin Corrosion/ burns
- Eye Damage
- Corrosive to Metals

Exploding Bomb



- Explosives
- Self Reactives
- Organic Peroxides

Flame over Circle



- Oxidizers

Environment
(Non Mandatory)



- Aquatic Toxicity

Skull and Crossbones



- Acute Toxicity (fatal or toxic)

Signal Words

The signal word indicates the relative degree of severity of a hazard. The signal words used in the GHS are:

“Danger” for the more severe hazards, and
“Warning” for the less severe hazards.

Some lower level hazard categories do not use signal words. Only one signal word corresponding to the class of the most severe hazard should be used on a label.

Hazardous Materials Communication for Contractors

To ensure that outside contractors of our company comply to our Hazardous

Communication Program, _____

will review the following procedures with the contractor:



-
- A. Inform all contractors of any hazardous substance that they may be exposed to in the normal course of their work on the premises. This will be done by supplying them with our list of Hazardous Substances.
 - B. The labeling system in use.
 - C. Location of SDS's that are available for their review upon request.
 - D. Precautions and safety procedures that the contractor must follow to lessen the possibility of exposure.
 - E. Use of required personal safety equipment.
 - F. First aid practices when necessary.

The responsible supervisor will monitor the contractor to ensure that proper procedures are used during the contractor's presence at our facility.

Each contractor bringing chemicals on-site must provide the supervisor with the appropriate hazard information on these substances, including the labels used and the precautionary measures to be taken in working with these chemicals.

Hazardous Non-routine Tasks

Our employees are sometimes required to perform non-routine tasks. Prior to starting this type of task, each affected employee will be given information by their supervisor about the hazards to which they may be exposed during such activity.



Our employees are sometimes required to perform non-routine tasks. Prior to starting this type of task, each affected employee will be given information by their supervisor about the hazards to which they may be exposed during such activity.

This information will include the following:

- A. Specific hazards to which employee may be exposed.

- B. Proper precautions to take to reduce or avoid exposure.
- C. Measures that the Company has taken to lessen the hazards including, ventilation, respirators, the required presence of another employee during the activity, and emergency procedures, including first aid.

Examples of non-routine tasks performed by employees of this company:

[illegible]

Personal Protective Equipment (PPE)

OSHA requires employers to protect employees from potentially hazardous conditions in the workplace. PPE is any clothing or equipment that is designed to protect any part of the body from workplace hazards that can be absorbed, inhaled, or physically touched.

The Company will pay for the PPE that is necessary for the employee to perform their job safely in accordance with OSHA regulations. Exceptions include ordinary safety-toed footwear, ordinary prescription safety eyewear, logging boots and everyday clothing and weather-related gear. Employees can still be required to pay for these types of PPE, if (with the exception of logging boots) they are permitted to wear it away from work.

The Company will pay for replacement PPE used to comply with OSHA standards. However, when an employee has lost or intentionally damaged PPE, the employee is required to pay for its replacement.

If employees choose to use PPE they own, employers will not need to reimburse the employees for the PPE. However, employers cannot require employees to provide their own PPE and the employee's use of PPE they already own must be completely voluntary. Even when an employee provides their own PPE, the employer must ensure that the equipment is adequate to protect the employee from hazards at the workplace.



Employees must:

- Properly wear PPE
- Attend training sessions on PPE
- Care for, clean and maintain PPE
- Inform a supervisor of the need to repair or replace PPE

Types of PPE

Head - Hard hats can protect employees from head impact, penetration injuries, and electrical injuries such as those caused by falling or flying objects, fixed objects, or contact with electrical conductors. Also, OSHA regulations require that employees cover and protect long hair to prevent it from getting caught in machine parts such as belts and chains.

Hand - Employees exposed to harmful substances through skin absorption, severe cuts or lacerations, severe abrasions, chemical burns, thermal burns, and harmful temperature extremes will benefit from hand protection such as gloves.

Foot and Leg - In addition to foot guards and safety shoes, leggings (e.g., leather, aluminized rayon, or other appropriate material) can help prevent injuries by protecting employees from hazards such as falling or rolling objects, sharp objects, wet and slippery surfaces, molten metals, hot surfaces, and electrical hazards.

Eye and Face - Besides spectacles and goggles, PPE such as special helmets or shields, spectacles with side shields, and faceshields can protect employees from the hazards of flying fragments, large chips, hot

sparks, optical radiation, splashes from molten metals, as well as objects, particles, sand, dirt, mists, dusts, and glare.

Hearing Loss - Wearing earplugs or earmuffs can help prevent damage to hearing. Exposure to high noise levels can cause irreversible hearing loss or impairment as well as physical and psychological stress. Earplugs made from foam, waxed cotton, or fiberglass wool are self-forming and usually fit well. A professional should fit employees individually for molded or preformed earplugs. Clean earplugs regularly, and replace those that cannot be cleaned.

Whole Body - In some cases, workers must shield most or all of their bodies against hazards in the workplace, such as exposure to heat and radiation as well as hot metals, scalding liquids, body fluids, hazardous materials or waste, and other hazards. In addition to fire-retardant wool and fire retardant cotton, materials used in whole-body PPE include rubber, leather, synthetics, and plastic.

Respiratory - When engineering controls are not feasible, workers must use appropriate respirators to protect against adverse health effects caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors. Respirators generally cover the nose and mouth or the entire face or head and help prevent illness and injury. A proper fit is essential, however, for respirators to be effective. All employees required to wear respirators must first undergo medical evaluation.



Chapter 12

My Training Records

Safety Meeting/Training Report

Today's Meeting Date _____ Time/Shift _____

Company Name _____

Address _____ Phone _____

City _____ State _____ Zip Code _____

Topic: _____ Video Shown: ☐ Yes ☐ No

Comments: _____

Supervisor _____

Management Representative _____

Employees Attending Meeting

Employee Name	Dept.

Employee Name	Dept.

New procedures discussed _____

Number of Accidents Past Period _____ Number of Accidents This Period _____

Retain this form for 3 years

Safety Meeting/Training Report

Today's Meeting Date _____ Time/Shift _____

Company Name _____

Address _____ Phone _____

City _____ State _____ Zip Code _____

Topic: _____ Video Shown: ☐ Yes ☐ No

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Topic: _____ Video Shown: ☐ Yes ☐ No

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Company Name _____

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Topic: _____ Video Shown: ☐ Yes ☐ No

Comments: _____

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Company Name _____

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Topic: _____ Video Shown: ☐ Yes ☐ No

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Company Name _____

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Today's Meeting Date _____ Time/Shift _____

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Address _____ Phone _____

City _____ State _____ Zip Code _____

Topic: _____ Video Shown: ☐ Yes ☐ No

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Supervisor _____

Management Representative _____

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Employee Name	Dept.

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Supervisor _____

Management Representative _____

Employees Attending Meeting

Employee Name	Dept.

Employee Name	Dept.

New procedures discussed _____

Number of Accidents Past Period _____ Number of Accidents This Period _____

Retain this form for 3 years

Employee Acknowledgement Form

I state that I have attended a safety meeting addressing _____, and
Safety Meeting Topic
have read and received a copy of the _____ Hazard
Company Name
Communication Program.

I further state that I understand these rules and acknowledge that compliance with the Hazard Communication Program is a condition of employment. If I violate the safety rules or fail to report an injury to my supervisor immediately, I understand that I am subject to termination, in accordance with company policy.

Employee Signature

Date

Instructor Signature

Date

cc: Supervisor

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Chapter 13

Appendix 1— OSHA Hazard Communication

Side-by-Side Comparison of OSHA’s Existing Hazard Communication Standard (HCS 1994) vs. the Revised Hazard Communication Standard (HCS 2012)

This document provides a comparison of the changes from the existing Hazard Communication Standard (the current Hazard Communication Standard, 1910.1200, as published in the Code of Federal Regulations (CFR) on March 11, 1994; herein referred to as HCS 1994) and the final rule revising the Hazard Communication Standard to be consistent with the United Nations Globally Harmonized System of Classification and Labelling of Chemicals (herein referred to as the HCS 2012).

The HCS 1994 is a performance-oriented standard that provides guidance for defining hazards and for performing hazard determinations. However, the current standard does not specify an approach or format to follow. The Globally Harmonized System of Classification and Labelling of Chemicals (GHS) has certain aspects that are performance-oriented, but the key provisions are a uniformity-oriented approach for the classification and presentation, through labeling and safety data sheets, of hazard information.

The HCS 2012 is written as a modification to the existing standard, and those parts of the standard that do not relate to the GHS, or are already consistent with it remain unchanged. Additionally, some minor changes to terminology have been made in order to align this rule with language used in the GHS. For example, the term “hazard determination” has been changed to “hazard classification” and “material safety data sheet” has been changed to “safety data sheet.”

The following side-by-side comparison shows the changes made to the HCS 1994 as stricken text in the left-hand column. Additions or changes made to the existing HCS (1994) to create the revised HCS (aligning the HCS with the GHS, and effective 2012) are shown as underlined text in the right-hand column.

Purpose.

The Hazard Communication Standard (HCS) 1994 includes a paragraph that describes the purpose of the HCS, and addresses preemption of state and local laws. The Hazard Communication Standard (HCS 2012) includes essentially the same paragraph as the HCS 1994. The primary modification to this paragraph is to state affirmatively that part of the purpose is to harmonize with international requirements. OSHA also clarified the standard's preemptive affect on State laws. Other than terminology, no additional substantive changes have been made in this paragraph of the HCS.	
HCS 1994	HCS 2012
(a) Purpose. (a)(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. (a)(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.	(a) Purpose. (a)(1) The purpose of this section is to ensure that the hazards of all chemicals produced or imported are <u>classified</u>, and that information concerning the <u>classified</u> hazards is transmitted to employers and employees. <u>The requirements of this section are intended to be consistent with the provisions of the United Nations Globally Harmonized System of Classification and Labeling of Chemicals (GHS), Revision 3.</u> The 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, safety data sheets and employee training. (a)(2) This occupational safety and health standard is intended to address comprehensively the issue of <u>classifying</u> the potential hazards of chemicals, and communicating information concerning hazards and appropriate protective measures to employees, and to preempt any <u>legislative or regulatory enactments</u> of a state, or political subdivision of a state, pertaining to this subject. <u>Classifying</u> 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 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 any requirement relating to the issue addressed by this Federal standard, except pursuant to a Federally-approved state plan.

Scope and Application.

In this paragraph, OSHA has removed reference to Appendix E, which previously provided employers with guidance information regarding the determination of their compliance obligations. Rather than include this information in the Appendix, OSHA will provide separate guidance documents to employers. Additionally, this paragraph in the HCS 2012 will continue to address the many practical accommodations OSHA has made regarding application of the HCS to different types of workplaces, as well as deal with the interface of the HCS to other Federal laws that address similar areas. No changes in these rules are necessary to incorporate the GHS; therefore, only terminology changes have been made in this paragraph of the HCS.

HCS 1994	HCS 2012
(b) Scope and application. (b)(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.) (b)(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. (b)(3) This section applies to laboratories only as follows: (b)(3)(i) Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced; (b)(3)(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; (b)(3)(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, (b)(3)(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.	(b) Scope and application. (b)(1) This section requires chemical manufacturers or importers to <u>classify</u> 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, 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.) (b)(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. (b)(3) This section applies to laboratories only as follows: (b)(3)(ii) Employers shall maintain any 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; (b)(3)(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, (b)(3)(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) of this section, and that a safety data sheet is provided to distributors and other employers in accordance with paragraphs (g)(6) and (g)(7) of this section.

Scope and Application. (Continued)

In this paragraph, OSHA has removed reference to Appendix E, which previously provided employers with guidance information regarding the determination of their compliance obligations. Rather than include this information in the Appendix, OSHA will provide separate guidance documents to employers. Additionally, this paragraph in the HCS 2012 will continue to address the many practical accommodations OSHA has made regarding application of the HCS to different types of workplaces, as well as deal with the interface of the HCS to other Federal laws that address similar areas. No changes in these rules are necessary to incorporate the GHS; therefore, only terminology changes have been made in this paragraph of the HCS.	
HCS 1994	HCS 2012
(b)(4) In work operations where employees only handle chemicals in sealed containers which are not opened under normal conditions of use (such as are found in marine cargo handling, warehousing, or retail sales), this section applies to these operations only as follows: (b)(4)(i) Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced; (b)(4)(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, (b)(4)(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. (b)(5) This section does not require labeling of the following chemicals: (b)(5)(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; (b)(5)(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;	(b)(4) In work operations where employees only handle chemicals in sealed containers which are not opened under normal conditions of use (such as are found in marine cargo handling, warehousing, or retail sales), this section applies to these operations only as follows: (b)(4)(i) Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced; (b)(4)(ii) Employers shall maintain copies of any safety data sheets that are received with incoming shipments of the sealed containers of hazardous chemicals, shall obtain a safety data sheet as soon as possible for sealed containers of hazardous chemicals received without a safety data sheet if an employee requests the safety data sheet, and shall ensure that the safety data sheets are readily accessible during each work shift to employees when they are in their work area(s); and, (b)(4)(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. (b)(5) This section does not require labeling of the following chemicals: (b)(5)(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; (b)(5)(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;

Scope and Application. (Continued)

In this paragraph, OSHA has removed reference to Appendix E, which previously provided employers with guidance information regarding the determination of their compliance obligations. Rather than include this information in the Appendix, OSHA will provide separate guidance documents to employers. Additionally, this paragraph in the HCS 2012 will continue to address the many practical accommodations OSHA has made regarding application of the HCS to different types of workplaces, as well as deal with the interface of the HCS to other Federal laws that address similar areas. No changes in these rules are necessary to incorporate the GHS; therefore, only terminology changes have been made in this paragraph of the HCS.	
HCS 1994	HCS 2012
(b)(5)(iii) Any food, food additive, color additive, drug, cosmetic, or medical or veterinary device or product, including materials intended for use as ingredients in such products (e.g. flavors and fragrances), as such terms are defined in the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 et seq.) or the Virus-Serum-Toxin Act of 1913 (21 U.S.C. 151 et seq.), and regulations issued under those Acts, when they are subject to the labeling requirements under those Acts by either the Food and Drug Administration or the Department of Agriculture; (b)(5)(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; (b)(5)(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, (b)(5)(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. (b)(6) This section does not apply to: (b)(6)(i) Any hazardous waste as such term is defined by the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6901 et seq.), when subject to regulations issued under that Act by the Environmental Protection Agency; (b)(6)(ii) Any hazardous substance as such term is defined by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (42 U.S.C. 9601 et seq.) when the hazardous substance is the focus of remedial or removal action being conducted under CERCLA in accordance with the Environmental Protection Agency regulations. (b)(6)(iii) Tobacco or tobacco products;	(b)(5)(iii) Any food, food additive, color additive, drug, cosmetic, or medical or veterinary device or product, including materials intended for use as ingredients in such products (e.g. flavors and fragrances), as such terms are defined in the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 et seq.) or the Virus-Serum-Toxin Act of 1913 (21 U.S.C. 151 et seq.), and regulations issued under those Acts, when they are subject to the labeling requirements under those Acts by either the Food and Drug Administration or the Department of Agriculture; (b)(5)(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, <u>Firearms and Explosives</u>; (b)(5)(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, (b)(5)(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. (b)(6) This section does not apply to: (b)(6)(i) Any hazardous waste as such term is defined by the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6901 et seq.), when subject to regulations issued under that Act by the Environmental Protection Agency; (b)(6)(ii) Any hazardous substance as such term is defined by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (42 U.S.C. 9601 et seq.) when the hazardous substance is the focus of remedial or removal action being conducted under CERCLA in accordance with Environmental Protection Agency regulations. (b)(6)(iii) Tobacco or tobacco products;

Scope and Application. (Continued)

In this paragraph, OSHA has removed reference to Appendix E, which previously provided employers with guidance information regarding the determination of their compliance obligations. Rather than include this information in the Appendix, OSHA will provide separate guidance documents to employers. Additionally, this paragraph in the HCS 2012 will continue to address the many practical accommodations OSHA has made regarding application of the HCS to different types of workplaces, as well as deal with the interface of the HCS to other Federal laws that address similar areas. No changes in these rules are necessary to incorporate the GHS; therefore, only terminology changes have been made in this paragraph of the HCS.	
HCS 1994	HCS 2012
(b)(6)(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); (b)(6)(v) Articles (as that term is defined in paragraph (c) of this section); (b)(6)(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; (b)(6)(vii) Any drug, as that term is defined in the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 et seq.), when it is in solid, final form for direct administration to the patient (e.g., tablets or pills); drugs which are packaged by the chemical manufacturer for sale to consumers in a retail establishment (e.g., over-the-counter drugs); and drugs intended for personal consumption by employees while in the workplace (e.g., first aid supplies); (b)(6)(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; (b)(6)(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; (b)(6)(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;	(b)(6)(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); (b)(6)(v) Articles (as that term is defined in paragraph (c) of this section); (b)(6)(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; (b)(6)(vii) Any drug, as that term is defined in the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 et seq.), when it is in solid, final form for direct administration to the patient (e.g., tablets or pills); drugs which are packaged by the chemical manufacturer for sale to consumers in a retail establishment (e.g., over-the-counter drugs); and drugs intended for personal consumption by employees while in the workplace (e.g., first aid supplies); (b)(6)(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; (b)(6)(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; (b)(6)(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;

Scope and Application. (Continued)

In this paragraph, OSHA has removed reference to Appendix E, which previously provided employers with guidance information regarding the determination of their compliance obligations. Rather than include this information in the Appendix, OSHA will provide separate guidance documents to employers. Additionally, this paragraph in the HCS 2012 will continue to address the many practical accommodations OSHA has made regarding application of the HCS to different types of workplaces, as well as deal with the interface of the HCS to other Federal laws that address similar areas. No changes in these rules are necessary to incorporate the GHS; therefore, only terminology changes have been made in this paragraph of the HCS.	
HCS 1994	HCS 2012
(b)(6)(v) Articles (as that term is defined in paragraph (c) of this section); (b)(6)(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; (b)(6)(vii) Any drug, as that term is defined in the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 et seq.), when it is in solid, final form for direct administration to the patient (e.g., tablets or pills); drugs which are packaged by the chemical manufacturer for sale to consumers in a retail establishment (e.g., over-the-counter drugs); and drugs intended for personal consumption by employees while in the workplace (e.g., first aid supplies); (b)(6)(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; (b)(6)(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; (b)(6)(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; (b)(6)(xi) Ionizing and nonionizing radiation; and, (b)(6)(xii) Biological hazards.	(b)(6)(v) Articles (as that term is defined in paragraph (c) of this section); (b)(6)(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; (b)(6)(vii) Any drug, as that term is defined in the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 et seq.), when it is in solid, final form for direct administration to the patient (e.g., tablets or pills); drugs which are packaged by the chemical manufacturer for sale to consumers in a retail establishment (e.g., over-the-counter drugs); and drugs intended for personal consumption by employees while in the workplace (e.g., first aid supplies); (b)(6)(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; (b)(6)(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; (b)(6)(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; (b)(6)(xi) Ionizing and nonionizing radiation; and, (b)(6)(xii) Biological hazards.

Definitions.

Several key changes have been made to update the definitions section. This final rule provides more detailed physical and health hazard criteria. However, this information has now been moved from this section into Appendices A and B.

Additionally, in order to be consistent with the GHS, OSHA has added, deleted, and modified a number of the definitions. The following changes were made to definitions in the HCS 2012:

Added the following definitions: Classification, Hazard category, Hazard class, Hazard not otherwise classified, Hazard statement, Label elements, Pictogram, Precautionary statement, Product identifier, Pyrophoric Gas, Safety data sheet, Signal word, Simple asphyxiant, and Substance.

Deleted the following definitions: Combustible liquid, Compressed gas, Explosive, Flammable, Flashpoint, Hazard warning, Identity, Material safety data sheet, Organic peroxide, Oxidizer, Pyrophoric, Unstable (reactive), and Water-reactive.

Revised the following definitions: Chemical, Chemical name, Hazardous chemical, Health hazard, Label, Mixture, Physical hazard, and Trade secret.

The definition of Hazardous Chemical was located incorrectly in the HCS 1994 and here in this document it has been properly relocated to where it should have been placed in the correct alphabetical order.

Refer to the Summary and Explanation of the Final Rule to gain a better understanding of the changes.

HCS 1994	HCS 2012
(c) <i>Definitions.</i> “Article” means a manufactured item other than a fluid or particle: (i) which is formed to a specific shape or design during manufacture; (ii) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and (iii) which under normal conditions of use does not release more than very small quantities, e.g., minute or trace amounts of a hazardous chemical (as determined under paragraph (d) of this section), and does not pose a physical hazard or health risk to employees. “Assistant Secretary” means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee. “Chemical” means any element, chemical compound or mixture of elements and/or compounds. “Chemical manufacturer” means an employer with a workplace where chemical(s) are produced for use or distribution. “Chemical name” means the scientific designation of a chemical in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS) rules of nomenclature, or a name which will clearly identify the chemical for the purpose of conducting a hazard evaluation. “Combustible liquid” means any liquid having a flashpoint at or above 100 deg. F (37.8 deg. C), but below 200 deg. F (93.3 deg. C), except any mixture having components with flashpoints of 200 deg. F (93.3 deg. C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.	(c) <i>Definitions.</i> “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 <u>substance</u>, or mixture of <u>substances</u>. “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 <u>that</u> will clearly identify the chemical for the purpose of conducting a hazard <u>classification</u>. <u>“Classification” means to identify the relevant data regarding the hazards of a chemical; review those data to ascertain the hazards associated with the chemical; and decide whether the chemical will be classified as hazardous according to the definition of hazardous chemical in this section. In addition, classification for health and physical hazards includes the determination of the degree of hazard, where appropriate, by comparing the data with the criteria for health and physical hazards.</u>

Several key changes have been made to update the definitions section. This final rule provides more detailed physical and health hazard criteria. However, this information has now been moved from this section into Appendices A and B.

Additionally, in order to be consistent with the GHS, OSHA has added, deleted, and modified a number of the definitions. The following changes were made to definitions in the HCS 2012:

Added the following definitions: Classification, Hazard category, Hazard class, Hazard not otherwise classified, Hazard statement, Label elements, Pictogram, Precautionary statement, Product identifier, Pyrophoric Gas, Safety data sheet, Signal word, Simple asphyxiant, and Substance.

Deleted the following definitions: Combustible liquid, Compressed gas, Explosive, Flammable, Flashpoint, Hazard warning, Identity, Material safety data sheet, Organic peroxide, Oxidizer, Pyrophoric, Unstable (reactive), and Water-reactive.

Revised the following definitions: Chemical, Chemical name, Hazardous chemical, Health hazard, Label, Mixture, Physical hazard, and Trade secret.

The definition of Hazardous Chemical was located incorrectly in the HCS 1994 and here in this document it has been properly relocated to where it should have been placed in the correct alphabetical order.

Refer to the Summary and Explanation of the Final Rule to gain a better understanding of the changes.

HCS 1994	HCS 2012
“Commercial account” means an arrangement whereby a retail distributor sells hazardous chemicals to an employer, generally in large quantities over time and/or at costs that are below the regular retail price. “Common name” means any designation or identification such as code name, code number, trade name, brand name or generic name used to identify a chemical other than by its chemical name. “Compressed gas” means: (i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70 deg. F (21.1 deg. C); or (ii) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130 deg. F (54.4 deg. C) regardless of the pressure at 70 deg. F (21.1 deg. C); or (iii) A liquid having a vapor pressure exceeding 40 psi at 100 deg. F (37.8 deg. C) as determined by ASTM D-323-72. “Container” means any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical. For purposes of this section, pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle, are not considered to be containers. “Designated representative” means any individual or organization to whom an employee gives written authorization to exercise such employee’s rights under this section. A recognized or certified collective bargaining agent shall be treated automatically as a designated representative without regard to written employee authorization. “Director” means the Director, National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, or designee.	“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. “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.

Several key changes have been made to update the definitions section. This final rule provides more detailed physical and health hazard criteria. However, this information has now been moved from this section into Appendices A and B.

Additionally, in order to be consistent with the GHS, OSHA has added, deleted, and modified a number of the definitions. The following changes were made to definitions in the HCS 2012:

Added the following definitions: Classification, Hazard category, Hazard class, Hazard not otherwise classified, Hazard statement, Label elements, Pictogram, Precautionary statement, Product identifier, Pyrophoric Gas, Safety data sheet, Signal word, Simple asphyxiant, and Substance.

Deleted the following definitions: Combustible liquid, Compressed gas, Explosive, Flammable, Flashpoint, Hazard warning, Identity, Material safety data sheet, Organic peroxide, Oxidizer, Pyrophoric, Unstable (reactive), and Water-reactive.

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Refer to the Summary and Explanation of the Final Rule to gain a better understanding of the changes.

HCS 1994	HCS 2012
“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	“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. “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.) “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. <u>“Hazard category” means the division of criteria within each hazard class, e.g., oral acute toxicity and flammable liquids include four hazard categories. These categories compare hazard severity within a hazard class and should not be taken as a comparison of hazard categories more generally.</u> <u>“Hazard class” means the nature of the physical or health hazards, e.g., flammable solid, carcinogen, oral acute toxicity.</u>

Several key changes have been made to update the definitions section. This final rule provides more detailed physical and health hazard criteria. However, this information has now been moved from this section into Appendices A and B.

Additionally, in order to be consistent with the GHS, OSHA has added, deleted, and modified a number of the definitions. The following changes were made to definitions in the HCS 2012:

Added the following definitions: Classification, Hazard category, Hazard class, Hazard not otherwise classified, Hazard statement, Label elements, Pictogram, Precautionary statement, Product identifier, Pyrophoric Gas, Safety data sheet, Signal word, Simple asphyxiant, and Substance.

Deleted the following definitions: Combustible liquid, Compressed gas, Explosive, Flammable, Flashpoint, Hazard warning, Identity, Material safety data sheet, Organic peroxide, Oxidizer, Pyrophoric, Unstable (reactive), and Water-reactive.

Revised the following definitions: Chemical, Chemical name, Hazardous chemical, Health hazard, Label, Mixture, Physical hazard, and Trade secret.

The definition of Hazardous Chemical was located incorrectly in the HCS 1994 and here in this document it has been properly relocated to where it should have been placed in the correct alphabetical order.

Refer to the Summary and Explanation of the Final Rule to gain a better understanding of the changes.

HCS 1994	HCS 2012
(B) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than twelve (12) percent by volume, regardless of the lower limit; (iii) "Liquid, flammable" means any liquid having a flashpoint below 100 deg. F (37.8 deg. C), except any mixture having components with flashpoints of 100 deg. F (37.8 deg. C) or higher, the total of which make up 99 percent or more of the total volume of the mixture. (iv) "Solid, flammable" means a solid, other than a blasting agent or explosive as defined in 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis. "Flashpoint" means the minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows: (i) Tagliabue Closed Tester (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24-1979 (ASTM D 56-79)) for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100 deg. F (37.8 deg. C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or (ii) Pensky-Martens Closed Tester (see American National Standard Method of Test for Flash Point by Pensky-Martens Closed Tester, Z11.7-1979 (ASTM D 93-79)) for liquids with a viscosity equal to or greater than 45 SUS at 100 deg. F (37.8 deg. C), or that contain suspended solids, or that have a tendency to form a surface film under test; or	<u>"Hazard not otherwise classified (HNOC)" means an adverse physical or health effect identified through evaluation of scientific evidence during the classification process that does not meet the specified criteria for the physical and health hazard classes addressed in this section. This does not extend coverage to adverse physical and health effects for which there is a hazard class addressed in this section, but the effect either falls below the cut-off value/concentration limit of the hazard class or is under a GHS hazard category that has not been adopted by OSHA (e.g., acute toxicity Category 5).</u> <u>"Hazard statement" means a statement assigned to a hazard class and category that describes the nature of the hazard(s) of a chemical, including, where appropriate, the degree of hazard.</u> <u>"Hazardous chemical" means any chemical which is classified as a physical hazard or a health hazard, a simple asphyxiant, combustible dust, pyrophoric gas, or hazard not otherwise classified.</u> <u>"Health hazard" means a chemical which is classified as posing one of the following hazardous effects: acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenicity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); or aspiration hazard. The criteria for determining whether a chemical is classified as a health hazard are detailed in Appendix A to §1910.1200 -- Health Hazard Criteria.</u> <u>"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.</u>

Several key changes have been made to update the definitions section. This final rule provides more detailed physical and health hazard criteria. However, this information has now been moved from this section into Appendices A and B.

Additionally, in order to be consistent with the GHS, OSHA has added, deleted, and modified a number of the definitions. The following changes were made to definitions in the HCS 2012:

Added the following definitions: Classification, Hazard category, Hazard class, Hazard not otherwise classified, Hazard statement, Label elements, Pictogram, Precautionary statement, Product identifier, Pyrophoric Gas, Safety data sheet, Signal word, Simple asphyxiant, and Substance.

Deleted the following definitions: Combustible liquid, Compressed gas, Explosive, Flammable, Flashpoint, Hazard warning, Identity, Material safety data sheet, Organic peroxide, Oxidizer, Pyrophoric, Unstable (reactive), and Water-reactive.

Revised the following definitions: Chemical, Chemical name, Hazardous chemical, Health hazard, Label, Mixture, Physical hazard, and Trade secret.

The definition of Hazardous Chemical was located incorrectly in the HCS 1994 and here in this document it has been properly relocated to where it should have been placed in the correct alphabetical order.

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HCS 1994	HCS 2012
(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 and 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.	“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 <u>an appropriate group of written, printed or graphic information elements concerning a hazardous chemical that is affixed to, printed on, or attached to the immediate container of a hazardous chemical, or to the outside packaging.</u> “Label elements” means the specified pictogram, hazard statement, signal word and precautionary statement for each hazard class and category. “Mixture” means <u>a combination or a solution composed of two or more substances in which they do not react.</u> “Physical hazard” means a chemical <u>that is classified as posing one of the following hazardous effects: explosive; flammable (gases, aerosols, liquids, or solids); oxidizer (liquid, solid or gas); self-reactive; pyrophoric (liquid or solid); self-heating; organic peroxide; corrosive to metal; gas under pressure; or in contact with water emits flammable gas. See Appendix B to §1910.1200 -- Physical Hazard Criteria.</u> “Pictogram” means <u>a composition that may include a symbol plus other graphic elements, such as a border, background pattern, or color, that is intended to convey specific information about the hazards of a chemical. Eight pictograms are designated under this standard for application to a hazard category.</u> “Precautionary statement” means <u>a phrase that describes recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a hazardous chemical, or improper storage or handling.</u>

Several key changes have been made to update the definitions section. This final rule provides more detailed physical and health hazard criteria. However, this information has now been moved from this section into Appendices A and B.

Additionally, in order to be consistent with the GHS, OSHA has added, deleted, and modified a number of the definitions. The following changes were made to definitions in the HCS 2012:

Added the following definitions: Classification, Hazard category, Hazard class, Hazard not otherwise classified, Hazard statement, Label elements, Pictogram, Precautionary statement, Product identifier, Pyrophoric Gas, Safety data sheet, Signal word, Simple asphyxiant, and Substance.

Deleted the following definitions: Combustible liquid, Compressed gas, Explosive, Flammable, Flashpoint, Hazard warning, Identity, Material safety data sheet, Organic peroxide, Oxidizer, Pyrophoric, Unstable (reactive), and Water-reactive.

Revised the following definitions: Chemical, Chemical name, Hazardous chemical, Health hazard, Label, Mixture, Physical hazard, and Trade secret.

The definition of Hazardous Chemical was located incorrectly in the HCS 1994 and here in this document it has been properly relocated to where it should have been placed in the correct alphabetical order.

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HCS 1994	HCS 2012
“Identity” means any chemical or common name which is indicated on the material safety data sheet (MSDS) for the chemical. The identity used shall permit cross-references to be made among the required list of hazardous chemicals, the label and the MSDS. “Immediate use” means that the hazardous chemical will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred. “Importer” means the first business with employees within the Customs Territory of the United States which receives hazardous chemicals produced in other countries for the purpose of supplying them to distributors or employers within the United States. “Label” means any written, printed, or graphic material displayed on or affixed to containers of hazardous chemicals. “Material safety data sheet (MSDS)” means written or printed material concerning a hazardous chemical which is prepared in accordance with paragraph (g) of this section. “Mixture” means any combination of two or more chemicals if the combination is not, in whole or in part, the result of a chemical reaction. “Organic peroxide” means an organic compound that contains the bivalent -O-O-structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical. “Oxidizer” means a chemical other than a blasting agent or explosive as defined in 1910.109(a), that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.	<u>“Precautionary statement” means a phrase that describes recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a hazardous chemical, or improper storage or handling.</u> <u>“Product identifier” means the name or number used for a hazardous chemical on a label or in the SDS. It provides a unique means by which the user can identify the chemical. The product identifier used shall permit cross-references to be made among the list of hazardous chemicals required in the written hazard communication program, the label and the SDS.</u> “Produce” means to manufacture, process, formulate, blend, extract, generate, emit, or repackage. <u>“Pyrophoric gas” means a chemical in a gaseous state that will ignite spontaneously in air at a temperature of 130 degrees F (54.4 degrees C) or below.</u> “Responsible party” means someone who can provide additional information on the hazardous chemical and appropriate emergency procedures, if necessary. <u>“Safety data sheet (SDS)” means written or printed material concerning a hazardous chemical that is prepared in accordance with paragraph (g) of this section.</u> <u>“Signal word” means a word used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label. The signal words used in this section are “danger” and “warning.” “Danger” is used for the more severe hazards, while “warning” is used for the less severe.</u> <u>“Simple asphyxiant” means a substance or mixture that displaces oxygen in the ambient atmosphere, and can thus cause oxygen deprivation in those who are exposed, leading to unconsciousness and death.</u>

Several key changes have been made to update the definitions section. This final rule provides more detailed physical and health hazard criteria. However, this information has now been moved from this section into Appendices A and B.

Additionally, in order to be consistent with the GHS, OSHA has added, deleted, and modified a number of the definitions. The following changes were made to definitions in the HCS 2012:

Added the following definitions: Classification, Hazard category, Hazard class, Hazard not otherwise classified, Hazard statement, Label elements, Pictogram, Precautionary statement, Product identifier, Pyrophoric Gas, Safety data sheet, Signal word, Simple asphyxiant, and Substance.

Deleted the following definitions: Combustible liquid, Compressed gas, Explosive, Flammable, Flashpoint, Hazard warning, Identity, Material safety data sheet, Organic peroxide, Oxidizer, Pyrophoric, Unstable (reactive), and Water-reactive.

Revised the following definitions: Chemical, Chemical name, Hazardous chemical, Health hazard, Label, Mixture, Physical hazard, and Trade secret.

The definition of Hazardous Chemical was located incorrectly in the HCS 1994 and here in this document it has been properly relocated to where it should have been placed in the correct alphabetical order.

Refer to the Summary and Explanation of the Final Rule to gain a better understanding of the changes.

HCS 1994	HCS 2012
“Physical hazard” means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive. “Produce” means to manufacture, process, formulate, blend, extract, generate, emit, or repackage. “Pyrophoric” means a chemical that will ignite spontaneously in air at a temperature of 130 deg. F (54.4 deg. C) or below. “Responsible party” means someone who can provide additional information on the hazardous chemical and appropriate emergency procedures, if necessary. “Specific chemical identity” means the chemical name, Chemical Abstracts Service (CAS) Registry Number, or any other information that reveals the precise chemical designation of the substance. “Trade secret” means any confidential formula, pattern, process, device, information or compilation of information that is used in an employer’s business, and that gives the employer an opportunity to obtain an advantage over competitors who do not know or use it. Appendix D sets out the criteria to be used in evaluating trade secrets. “Unstable (reactive)” means a chemical which in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature. “Use” means to package, handle, react, emit, extract, generate as a byproduct, or transfer.	“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. <u>“Substance” means chemical elements and their compounds in the natural state or obtained by any production process, including any additive necessary to preserve the stability of the product and any impurities deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition.</u> “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. <u>Appendix E to §1910.1200–Definition of Trade Secret</u>, sets out the criteria to be used in evaluating trade secrets. “Use” means to package, handle, react, emit, extract, generate as a byproduct, or transfer. “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.

Several key changes have been made to update the definitions section. This final rule provides more detailed physical and health hazard criteria. However, this information has now been moved from this section into Appendices A and B.

Additionally, in order to be consistent with the GHS, OSHA has added, deleted, and modified a number of the definitions. The following changes were made to definitions in the HCS 2012:

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HCS 1994	HCS 2012
“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.	

Hazard classification.

The hazard classification approach in the GHS is quite different from the performance-oriented approach in the HCS 1994. The GHS has specific criteria for each health and physical hazard, along with detailed instructions for hazard evaluation and determinations as to whether mixtures of the substance are covered. OSHA has included the general provisions for hazard classification in paragraph (d) of the revised rule, and added extensive appendixes that address the criteria for each health or physical effect. Mandatory Appendices A and B provide classification guidance for Health Hazards and Physical Hazards, respectively. The hazard classification criteria contained in the HCS 2012 is test method-neutral. That is, the person classifying a chemical or substance should use available data and no additional testing is required to classify a chemical.

Please refer to the Summary and Explanation of the Final Rule to gain a better understanding of the changes.

HCS 1994	HCS 2012
(d) <i>Hazard determination</i>. (d)(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. (d)(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: (d)(3) The chemical manufacturer, importer or employer evaluating chemicals shall treat the following sources as establishing that the chemicals listed in them are hazardous: (d)(3)(i) 29 CFR part 1910, subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA); or, (d)(3)(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. (d)(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: (d)(4)(i) National Toxicology Program (NTP), “Annual Report on Carcinogens” (latest edition); (d)(4)(ii) International Agency for Research on Cancer (IARC) “Monographs” (latest editions); or (d)(4)(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.	(d) <i>Hazard <u>classification</u></i>. (d)(1) Chemical manufacturers and importers shall evaluate chemicals produced in their workplaces or imported by them to <u>classify the chemicals in accordance with this section</u>. For each chemical, the <u>chemical manufacturer or importer shall determine the hazard classes, and where appropriate, the category of each class that apply to the chemical being classified</u>. Employers are not required to classify chemicals unless they choose not to rely on the classification performed by the chemical manufacturer or importer for the chemical to satisfy this requirement. (d)(2) Chemical manufacturers, importers or employers <u>classifying</u> chemicals shall identify and consider the full range of available scientific literature and other evidence concerning <u>the potential</u> hazards. <u>There is no requirement to test the chemical to determine how to classify its hazards</u>. Appendix A to §1910.1200 shall be consulted for <u>classification of health hazards</u>, and Appendix B to §1910.1200 shall be consulted for the <u>classification of physical hazards</u>. (d)(3) <u>Mixtures</u>. (d)(3)(i) Chemical manufacturers, importers, or employers evaluating chemicals shall follow the procedures <u>described in Appendices A and B to §1910.1200 to classify the hazards of the chemicals, including determinations regarding when mixtures of the classified chemicals are covered by this section</u>.

The hazard classification approach in the GHS is quite different from the performance-oriented approach in the HCS 1994. The GHS has specific criteria for each health and physical hazard, along with detailed instructions for hazard evaluation and determinations as to whether mixtures of the substance are covered. OSHA has included the general provisions for hazard classification in paragraph (d) of the revised rule, and added extensive appendixes that address the criteria for each health or physical effect. Mandatory Appendices A and B provide classification guidance for Health Hazards and Physical Hazards, respectively. The hazard classification criteria contained in the HCS 2012 is test method-neutral. That is, the person classifying a chemical or substance should use available data and no additional testing is required to classify a chemical.

Please refer to the Summary and Explanation of the Final Rule to gain a better understanding of the changes.

HCS 1994	HCS 2012
(d)(5) The chemical manufacturer, importer or employer shall determine the hazards of mixtures of chemicals as follows: (d)(5)(i) If a mixture has been tested as a whole to determine its hazards, the results of such testing shall be used to determine whether the mixture is hazardous; (d)(5)(ii) If a mixture has not been tested as a whole to determine whether the mixture is a health hazard, the mixture shall be assumed to present the same health hazards as do the components which comprise one percent (by weight or volume) or greater of the mixture, except that the mixture shall be assumed to present a carcinogenic hazard if it contains a component in concentrations of 0.1 percent or greater which is considered to be a carcinogen under paragraph (d)(4) of this section; (d)(5)(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, (d)(5)(iv) If the chemical manufacturer, importer, or employer has evidence to indicate that a component present in the mixture in concentrations of less than one percent (or in the case of carcinogens, less than 0.1 percent) could be released in concentrations which would exceed an established OSHA permissible exposure limit or ACGIH Threshold Limit Value, or could present a health risk to employees in those concentrations, the mixture shall be assumed to present the same hazard. (d)(6) Chemical manufacturers, importers, or employers evaluating chemicals shall describe in writing the procedures they use to determine the hazards of the chemical they evaluate. The written procedures are to be made available, upon request, to employees, their designated representatives, the Assistant Secretary and the Director. The written description may be incorporated into the written hazard communication program required under paragraph (e) of this section.	<u>(d)(3)(ii) When classifying mixtures they produce or import, chemical manufacturers and importers of mixtures may rely on the information provided on the current safety data sheets of the individual ingredients except where the chemical manufacturer or importer knows, or in the exercise of reasonable diligence should know, that the safety data sheet misstates or omits information required by this section.</u>

Hazard Communication Program.

This section of the HCS 1994 was retained. As the GHS does not include any requirements regarding Hazards Communication Programs, OSHA is maintaining the provisions of the HCS 1994. No substantive changes (only terminology) have been made in this paragraph of the HCS.	
HCS 1994	HCS 2012
(e) <i>Written hazard communication program.</i> (e)(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: (e)(1)(i) A list of the hazardous chemicals known to be present using an identity that is referenced on the appropriate material safety data sheet (the list may be compiled for the workplace as a whole or for individual work areas); and, (e)(1)(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. (e)(2) “Multi-employer workplaces.” Employers who produce, use, or store hazardous chemicals at a workplace in such a way that the employees of other employer(s) may be exposed (for example, employees of a construction contractor working on-site) shall additionally ensure that the hazard communication programs developed and implemented under this paragraph (e) include the following: (e)(2)(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; (e)(2)(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, (e)(2)(iii) The methods the employer will use to inform the other employer(s) of the labeling system used in the workplace. (e)(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).	(e) <i>Written hazard communication program.</i> (e)(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, safety data sheets, and employee information and training will be met, and which also includes the following: (e)(1)(i) A list of the hazardous chemicals known to be present using a <u>product identifier</u> that is referenced on the appropriate safety data sheet (the list may be compiled for the workplace as a whole or for individual work areas); and, (e)(1)(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. (e)(2) “Multi-employer workplaces.” Employers who produce, use, or store hazardous chemicals at a workplace in such a way that the employees of other employer(s) may be exposed (for example, employees of a construction contractor working on-site) shall additionally ensure that the hazard communication programs developed and implemented under this paragraph (e) include the following: (e)(2)(i) The methods the employer will use to provide the other employer(s) on-site access to safety data sheets for each hazardous chemical the other employer(s)’ employees may be exposed to while working; (e)(2)(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, (e)(2)(iii) The methods the employer will use to inform the other employer(s) of the labeling system used in the workplace. (e)(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).

This section of the HCS 1994 was retained. As the GHS does not include any requirements regarding Hazards Communication Programs, OSHA is maintaining the provisions of the HCS 1994. No substantive changes (only terminology) have been made in this paragraph of the HCS.

HCS 1994	HCS 2012
(e)(4) The employer shall make the written hazard communication program available, upon request, to employees, their designated representatives, the Assistant Secretary and the Director, in accordance with the requirements of 29 CFR 1910.1020 (e). (e)(5) Where employees must travel between workplaces during a workshift, i.e., their work is carried out at more than one geographical location, the written hazard communication program may be kept at the primary workplace facility.	(e)(4) The employer shall make the written hazard communication program available, upon request, to employees, their designated representatives, the Assistant Secretary and the Director, in accordance with the requirements of 29 CFR 1910.1020 (e). (e)(5) Where employees must travel between workplaces during a workshift, i.e., their work is carried out at more than one geographical location, the written hazard communication program may be kept at the primary workplace facility.

Labels.

This paragraph has been extensively re-written. While, the HCS 1994 had a simple and performance-oriented approach to labels, this final rule sets forth detailed and specific provisions for labeling. Additionally, a new mandatory Appendix C indicates what specific information is to be provided for each hazard class and category once a chemical is classified.

Under this revised paragraph; chemical manufacturers and importers must provide a label that includes: the product identifier, supplier information which is to include name, address and phone number of manufacturer, importer or distributor; and the signal word, pictogram, and hazard statement for each hazard class and category. Precautionary statements must also be provided. The HCS 1994 does not require the use of pictograms, specific signal words, or precautionary statements.

HCS 1994	HCS 2012
(f) <i>Labels and other forms of warning.</i> (f)(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: (f)(1)(i) Identity of the hazardous chemical(s); (f)(1)(ii) Appropriate hazard warnings; and (f)(1)(iii) Name and address of the chemical manufacturer, importer, or other responsible party. (f)(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; (f)(2)(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,	(f) <i>Labels and other forms of warning.</i> (f)(1) <u>Labels on shipped containers.</u> The chemical manufacturer, importer, or distributor shall ensure that each container of hazardous chemicals leaving the workplace is labeled, tagged or marked. <u>Hazards not otherwise classified do not have to be addressed on the container. Where the chemical manufacturer or importer is required to label, tag or mark the following information shall be provided:</u> (f)(1)(i) <u>Product identifier;</u> (f)(1)(ii) <u>Signal word;</u> (f)(1)(iii) <u>Hazard statement(s);</u> (f)(1)(iv) <u>Pictogram(s);</u> (f)(1)(v) Precautionary statement(s); and, (f)(1)(vi) Name, address, <u>and telephone number</u> of the chemical manufacturer, importer, or other responsible party. (f)(2) <u>The chemical manufacturer, importer, or distributor shall ensure that the information provided under paragraphs (f)(1)(i) through (v) of this section is in accordance with Appendix C to §1910.1200, for each hazard class and associated hazard category for the hazardous chemical, prominently displayed, and in English (other languages may also be included if appropriate).</u>

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Under this revised paragraph; chemical manufacturers and importers must provide a label that includes: the product identifier, supplier information which is to include name, address and phone number of manufacturer, importer or distributor; and the signal word, pictogram, and hazard statement for each hazard class and category. Precautionary statements must also be provided. The HCS 1994 does not require the use of pictograms, specific signal words, or precautionary statements.

HCS 1994	HCS 2012
(f)(2)(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). (f)(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. (f)(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. (f)(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: (f)(5)(i) Identity of the hazardous chemical(s) contained therein; and, (f)(5)(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. (f)(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.	(f)(2) <u>The chemical manufacturer, importer, or distributor shall ensure that the information provided under paragraphs (f)(1)(i) through (v) of this section is in accordance with Appendix C to §1910.1200, for each hazard class and associated hazard category for the hazardous chemical, prominently displayed, and in English (other languages may also be included if appropriate).</u> <u>(f)(3) The chemical manufacturer, importer, or distributor shall ensure that the information provided under paragraphs (f)(1)(ii) through (iv) of this section is located together on the tag, label or mark.</u> (f)(4) <u>Solid materials</u> (f)(4)(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; (f)(4)(ii) The label may be transmitted with the initial shipment itself, or with the safety data sheet that is to be provided prior to or at the time of the first shipment; and, (f)(4)(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). (f)(5) 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. <u>(f)(6) Workplace labeling.</u> Except as provided in paragraphs (f)(7) and (f)(8) of this section, the employer shall ensure that each container of hazardous chemicals in the workplace is labeled, tagged or marked with <u>either</u>:

This paragraph has been extensively re-written. While, the HCS 1994 had a simple and performance-oriented approach to labels, this final rule sets forth detailed and specific provisions for labeling. Additionally, a new mandatory Appendix C indicates what specific information is to be provided for each hazard class and category once a chemical is classified.

Under this revised paragraph; chemical manufacturers and importers must provide a label that includes: the product identifier, supplier information which is to include name, address and phone number of manufacturer, importer or distributor; and the signal word, pictogram, and hazard statement for each hazard class and category. Precautionary statements must also be provided. The HCS 1994 does not require the use of pictograms, specific signal words, or precautionary statements.

HCS 1994	HCS 2012
(f)(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. (f)(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. (f)(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. (f)(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. (f)(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.	<u>(f)(6)(i) The information specified under paragraphs (f)(1)(i) through (v) of this section for labels on shipped containers; or,</u> <u>(f)(6)(ii) Product identifier and</u> 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. (f)(7) 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)(6) of this section to be on a label. <u>The employer shall ensure the written materials are</u> readily accessible to the employees in their work area throughout each work shift. (f)(8) 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. (f)(9) 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. (f)(10) The employer shall ensure that <u>workplace</u> 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.

This paragraph has been extensively re-written. While, the HCS 1994 had a simple and performance-oriented approach to labels, this final rule sets forth detailed and specific provisions for labeling. Additionally, a new mandatory Appendix C indicates what specific information is to be provided for each hazard class and category once a chemical is classified.

Under this revised paragraph; chemical manufacturers and importers must provide a label that includes: the product identifier, supplier information which is to include name, address and phone number of manufacturer, importer or distributor; and the signal word, pictogram, and hazard statement for each hazard class and category. Precautionary statements must also be provided. The HCS 1994 does not require the use of pictograms, specific signal words, or precautionary statements.

HCS 1994	HCS 2012
	(f)(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 <u>six</u> months of becoming aware of the new information, <u>and shall ensure that</u> labels on containers of hazardous chemicals shipped after that time contain the new information. If the chemical is not currently produced or imported, the chemical manufacturer, importer, distributor, or employer shall add the information to the label before the chemical is shipped or introduced into the workplace again.

HCS Pictograms and Hazards

Health Hazard



- Carcinogen
- Mutagenicity
- Reproductive Toxicity
- Respiratory Sensitizer
- Target Organ Toxicity
- Aspiration Toxicity

Flame



- Flammables
- Pyrophorics
- Self-Heating
- Emits Flammable Gas
- Self-Reactives
- Organic Peroxides

Exclamation Mark



- Irritant (skin and eye)
- Skin Sensitizer
- Acute Toxicity (harmful)
- Narcotic Effects
- Respiratory Tract Irritant
- Hazardous to Ozone Layer (Non Mandatory)

Gas Cylinder



- Gases Under Pressure

Corrosion



- Skin Corrosion/ burns
- Eye Damage
- Corrosive to Metals

Exploding Bomb



- Explosives
- Self Reactives
- Organic Peroxides

Flame over Circle



- Oxidizers

Environment
(Non Mandatory)



- Aquatic Toxicity

Skull and Crossbones



- Acute Toxicity (fatal or toxic)

Safety Data Sheets.

Safety Data Sheets, previously referred to as Material Safety Data Sheets, will now require a 16-section format that is essentially the same as the ANSI standard for *Hazardous Workplace Chemicals-Hazard Evaluation and Safety Data Sheets and Precautionary Labeling Preparation* (ANSI Z400.1 & Z129.1 - 2010), already familiar to U.S. employers. Paragraph (g) lists the sections in the order they are to be provided on the Safety Data Sheets.

This paragraph is supplemented by new mandatory Appendix D, which details the information to be included under each heading. The HCS 1994 requires similar information, but allows any format to be used. This final rule is designed more in-line with the GHS, which has a uniform approach. This uniformity will improve the effectiveness of the safety data sheet, as well as make it easier for employers to comply.

The appendix to this side-by-side analysis compares the requirements of the new mandatory Appendix D of the final rule to the current requirements of the HCS 1994.

HCS 1994	HCS 2012
(g) Material safety data sheets. (g)(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. (g)(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: (g)(2)(i) The identity used on the label, and, except as provided for in paragraph (i) of this section on trade secrets: (g)(2)(i)(A) If the hazardous chemical is a single substance, its chemical and common name(s); (g)(2)(i)(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, (g)(2)(i)(C) If the hazardous chemical is a mixture which has not been tested as a whole: (g)(2)(i)(C)(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, (g)(2)(i)(C)(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, (g)(2)(i)(C)(3) The chemical and common name(s) of all ingredients which have been determined to present a physical hazard when present in the mixture; (g)(2)(ii) Physical and chemical characteristics of the hazardous chemical (such as vapor pressure, flash point);	(g) <i>Safety data sheets.</i> (g)(1) Chemical manufacturers and importers shall obtain or develop a safety data sheet for each hazardous chemical and for each chemical they produce or import. Employers shall have a safety data sheet in the workplace for each hazardous chemical which they use. (g)(2) <u>The chemical manufacturer or importer preparing the safety data sheet shall ensure that it is in English (although the employer may maintain copies in other languages as well), and includes at least the following section numbers and headings, and associated information under each heading, in the order listed (See Appendix D to §1910.1200--Safety Data Sheets, for the specific content of each section of the safety data sheet):</u> (i) <u>Section 1, Identification;</u> (ii) <u>Section 2, Hazard(s) identification;</u> (iii) <u>Section 3, Composition/information on ingredients;</u> (iv) <u>Section 4, First-aid measures;</u> (v) <u>Section 5, Fire-fighting measures;</u> (vi) <u>Section 6, Accidental release measures;</u> (vii) <u>Section 7, Handling and storage;</u> (viii) <u>Section 8, Exposure controls/personal protection;</u> (ix) <u>Section 9, Physical and chemical properties;</u> (x) <u>Section 10, Stability and reactivity;</u> (xi) <u>Section 11, Toxicological information.</u> (xii) <u>Section 12, Ecological information;</u> (xiii) <u>Section 13, Disposal considerations;</u> (xiv) <u>Section 14, Transport information;</u> (xv) <u>Section 15, Regulatory information; and</u> (xvi) <u>Section 16, Other information, including date of preparation or last revision.</u>

Safety Data Sheets, previously referred to as Material Safety Data Sheets, will now require a 16-section format that is essentially the same as the ANSI standard for *Hazardous Workplace Chemicals-Hazard Evaluation and Safety Data Sheets and Precautionary Labeling Preparation* (ANSI Z400.1 & Z129.1 - 2010), already familiar to U.S. employers. Paragraph (g) lists the sections in the order they are to be provided on the Safety Data Sheets.

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HCS 1994	HCS 2012
(g)(2)(iii) The physical hazards of the hazardous chemical, including the potential for fire, explosion, and reactivity; (g)(2)(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; (g)(2)(v) The primary route(s) of entry; (g)(2)(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; (g)(2)(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; (g)(2)(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; (g)(2)(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; (g)(2)(x) Emergency and first aid procedures; (g)(2)(xi) The date of preparation of the material safety data sheet or the last change to it; and, (g)(2)(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.	<u>Note 1 to paragraph (g)(2): To be consistent with the GHS, an SDS must also include the headings in paragraphs (g)(2)(xii) through (g)(2)(xv) in order.</u> <u>Note 2 to paragraph (g)(2): OSHA will not be enforcing information requirements in sections 12 through 15, as these areas are not under its jurisdiction.</u> (g)(3) If no relevant information is found for any <u>sub-heading within a section</u> on the safety data sheet, the chemical manufacturer, importer or employer preparing the safety data sheet shall mark it to indicate that no applicable information was found. (g)(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 safety data sheet to apply to all of these similar mixtures. (g)(5) The chemical manufacturer, importer or employer preparing the safety data sheet shall ensure that the information <u>provided</u> accurately reflects the scientific evidence used in making the hazard <u>classification</u>. If the chemical manufacturer, importer or employer preparing the 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 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 safety data sheet before the chemical is introduced into the workplace again. (g)(6)(i) Chemical manufacturers or importers shall ensure that distributors and employers are provided an appropriate safety data sheet with their initial shipment, and with the first shipment after a safety data sheet is updated; (g)(6)(ii) The chemical manufacturer or importer shall either provide safety data sheets with the shipped containers or send them to the distributor or employer prior to or at the time of the shipment;

Safety Data Sheets, previously referred to as Material Safety Data Sheets, will now require a 16-section format that is essentially the same as the ANSI standard for *Hazardous Workplace Chemicals-Hazard Evaluation and Safety Data Sheets and Precautionary Labeling Preparation* (ANSI Z400.1 & Z129.1 - 2010), already familiar to U.S. employers. Paragraph (g) lists the sections in the order they are to be provided on the Safety Data Sheets.

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HCS 1994	HCS 2012
(g)(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. (g)(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. (g)(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. (g)(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; (g)(6)(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; (g)(6)(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, (g)(6)(iv) The chemical manufacturer or importer shall also provide distributors or employers with a material safety data sheet upon request. (g)(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;	(g)(6)(iii) If the 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, (g)(6)(iv) The chemical manufacturer or importer shall also provide distributors or employers with a safety data sheet upon request. (g)(7)(i) Distributors shall ensure that safety data sheets, and updated information, are provided to other distributors and employers with their initial shipment and with the first shipment after a safety data sheet is updated; (g)(7)(ii) The distributor shall either provide 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; (g)(7)(iii) Retail distributors selling hazardous chemicals to employers having a commercial account shall provide a safety data sheet to such employers upon request, and shall post a sign or otherwise inform them that a safety data sheet is available; (g)(7)(iv) Wholesale distributors selling hazardous chemicals to employers over-the-counter may also provide 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 safety data sheet is available; (g)(7)(v) If an employer without a commercial account purchases a hazardous chemical from a retail distributor not required to have 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 safety data sheet can be obtained;

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HCS 1994	HCS 2012
(g)(7)(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; (g)(7)(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; (g)(7)(iv) Wholesale distributors selling hazardous chemicals to employers over-the-counter may also provide material safety data sheets upon the request of the employer at the time of the over-the-counter purchase, and shall post a sign or otherwise inform such employers that a material safety data sheet is available; (g)(7)(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; (g)(7)(vi) Wholesale distributors shall also provide material safety data sheets to employers or other distributors upon request; and, (g)(7)(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. (g)(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.)	(g)(7)(vi) Wholesale distributors shall also provide safety data sheets to employers or other distributors upon request; and, (g)(7)(vii) Chemical manufacturers, importers, and distributors need not provide 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. (g)(8) The employer shall maintain in the workplace copies of the required 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 and other alternatives to maintaining paper copies of the safety data sheets are permitted as long as no barriers to immediate employee access in each workplace are created by such options.) (g)(9) Where employees must travel between workplaces during a workshift, i.e., their work is carried out at more than one geographical location, the 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. (g)(10) 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). (g)(11) Safety data sheets shall also be made readily available, upon request, to designated representatives, the Assistant Secretary, <u>and the Director</u>, in accordance with the requirements of 29 CFR 1910.1020(e).

Safety Data Sheets, previously referred to as Material Safety Data Sheets, will now require a 16-section format that is essentially the same as the ANSI standard for *Hazardous Workplace Chemicals-Hazard Evaluation and Safety Data Sheets and Precautionary Labeling Preparation* (ANSI Z400.1 & Z129.1 - 2010), already familiar to U.S. employers. Paragraph (g) lists the sections in the order they are to be provided on the Safety Data Sheets.

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HCS 1994	HCS 2012
(g)(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. (g)(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). (g)(11) Material safety data sheets shall also be made readily available, upon request, to designated representatives and to the Assistant Secretary, in accordance with the requirements of 29 CFR 1910.1020(e). The Director shall also be given access to material safety data sheets in the same manner.	

Training and Information.

The provisions in paragraph (h) indicate that the new label, safety data sheet formats and presentation of information must be discussed in training. All employers will be required to conduct additional training to ensure that their employees are familiar with the new standardized labels and safety data sheets. Otherwise, the training provisions remain the same as the HCS 1994.

HCS 1994	HCS 2012
(h) Employee information and training. (h)(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. (h)(2) Information. Employees shall be informed of: (h)(2)(i) The requirements of this section; (h)(2)(ii) Any operations in their work area where hazardous chemicals are present; and, (h)(2)(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. (h)(3) Training. Employee training shall include at least: (h)(3)(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.); (h)(3)(ii) The physical and health hazards of the chemicals in the work area; (h)(3)(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, (h)(3)(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.	(h) Employee information and training. (h)(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 <u>chemical hazard</u> 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 safety data sheets. (h)(2) Information. Employees shall be informed of: (h)(2)(i) The requirements of this section; (h)(2)(ii) Any operations in their work area where hazardous chemicals are present; and, (h)(2)(iii) The location and availability of the written hazard communication program, including the required list(s) of hazardous chemicals, and safety data sheets required by this section. (h)(3) Training. Employee training shall include at least: (h)(3)(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.); (h)(3)(ii) The physical, health, <u>simple asphyxiation, combustible dust and pyrophoric gas hazards, as well as hazards not otherwise classified</u>, of the chemicals in the work area; (h)(3)(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, (h)(3)(iv) The details of the hazard communication program developed by the employer, including an explanation of the <u>labels received on shipped containers and the workplace labeling system used by their employer; the safety data sheet, including the order of information</u> and how employees can obtain and use the appropriate hazard information.

Trade secrets.

The trade secret provisions of the GHS are consistent with the HCS 1994 and therefore only a few changes were made to this section. The GHS, unlike the current HCS, requires disclosure of the percentage composition of mixtures on the SDS. This final rule adopts this requirement, but allows the manufacturer to claim trade secret protection for this requirement. This is the only substantive change to the existing standard's trade secret protections.

HCS 1994	HCS 2012
(i) <i>Trade secrets.</i> (i)(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)(1)(i) The claim that the information withheld is a trade secret can be supported; (i)(1)(ii) Information contained in the material safety data sheet concerning the properties and effects of the hazardous chemical is disclosed; (i)(1)(iii) The material safety data sheet indicates that the specific chemical identity is being withheld as a trade secret; and, (i)(1)(iv) The specific chemical identity is made available to health professionals, employees, and designated representatives in accordance with the applicable provisions of this paragraph. (i)(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. (i)(3) In non-emergency situations, a chemical manufacturer, importer, or employer shall, upon request, disclose a specific chemical identity, otherwise permitted to be withheld under paragraph (i)(1) of this section, to a health professional (i.e. physician, industrial hygienist, toxicologist, epidemiologist, or occupational health nurse) providing medical or other occupational health services to exposed employee(s), and to employees or designated representatives, if: (i)(3)(i) The request is in writing; (i)(3)(ii) The request describes with reasonable detail one or more of the following occupational health needs for the information: (i)(3)(ii)(A) To assess the hazards of the chemicals to which employees will be exposed;	(i) <i>Trade secrets.</i> (i)(1) The chemical manufacturer, importer, or employer may withhold the specific chemical identity, including the chemical name, other specific identification of a hazardous chemical, <u>or the exact percentage (concentration) of the substance in a mixture</u>, from the safety data sheet, provided that: (i)(1)(i) The claim that the information withheld is a trade secret can be supported; (i)(1)(ii) Information contained in the safety data sheet concerning the properties and effects of the hazardous chemical is disclosed; (i)(1)(iii) The safety data sheet indicates that the specific chemical identity <u>and/or percentage of composition</u> is being withheld as a trade secret; and, (i)(1)(iv) The specific chemical identity <u>and percentage</u> is made available to health professionals, employees, and designated representatives in accordance with the applicable provisions of this paragraph (i). (i)(2) Where a treating physician or nurse determines that a medical emergency exists and the specific chemical identity <u>and/or specific percentage of composition</u> 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 <u>or percentage composition</u> 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. (i)(3) In non-emergency situations, a chemical manufacturer, importer, or employer shall, upon request, disclose a specific chemical identity <u>or percentage composition</u>, otherwise permitted to be withheld under paragraph (i)(1) of this section, to a health professional (i.e. physician, industrial hygienist, toxicologist, epidemiologist, or occupational health nurse) providing medical or other occupational health services to exposed employee(s), and to employees or designated representatives, if: (i)(3)(i) The request is in writing; (i)(3)(ii) The request describes with reasonable detail one or more of the following occupational health needs for the information:

The trade secret provisions of the GHS are consistent with the HCS 1994 and therefore only a few changes were made to this section. The GHS, unlike the current HCS, requires disclosure of the percentage composition of mixtures on the SDS. This final rule adopts this requirement, but allows the manufacturer to claim trade secret protection for this requirement. This is the only substantive change to the existing standard's trade secret protections.

HCS 1994	HCS 2012
(i)(3)(ii)(B) To conduct or assess sampling of the workplace atmosphere to determine employee exposure levels; (i)(3)(ii)(C) To conduct pre-assignment or periodic medical surveillance of exposed employees; (i)(3)(ii)(D) To provide medical treatment to exposed employees; (i)(3)(ii)(E) To select or assess appropriate personal protective equipment for exposed employees; (i)(3)(ii)(F) To design or assess engineering controls or other protective measures for exposed employees; and, (i)(3)(ii)(G) To conduct studies to determine the health effects of exposure. (i)(3)(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: (i)(3)(iii)(A) The properties and effects of the chemical; (i)(3)(iii)(B) Measures for controlling workers' exposure to the chemical; (i)(3)(iii)(C) Methods of monitoring and analyzing worker exposure to the chemical; and, (i)(3)(iii)(D) Methods of diagnosing and treating harmful exposures to the chemical; (i)(3)(iv) The request includes a description of the procedures to be used to maintain the confidentiality of the disclosed information; and, (i)(3)(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. (i)(4) The confidentiality agreement authorized by paragraph (i)(3)(iv) of this section:	(i)(3)(ii)(A) To assess the hazards of the chemicals to which employees will be exposed; (i)(3)(ii)(B) To conduct or assess sampling of the workplace atmosphere to determine employee exposure levels; (i)(3)(ii)(C) To conduct pre-assignment or periodic medical surveillance of exposed employees; (i)(3)(ii)(D) To provide medical treatment to exposed employees; (i)(3)(ii)(E) To select or assess appropriate personal protective equipment for exposed employees; (i)(3)(ii)(F) To design or assess engineering controls or other protective measures for exposed employees; and, (i)(3)(ii)(G) To conduct studies to determine the health effects of exposure. (i)(3)(iii) The request explains in detail why the disclosure of the specific chemical identity <u>or percentage composition</u> 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: (i)(3)(iii)(A) The properties and effects of the chemical; (i)(3)(iii)(B) Measures for controlling workers' exposure to the chemical; (i)(3)(iii)(C) Methods of monitoring and analyzing worker exposure to the chemical; and, (i)(3)(iii)(D) Methods of diagnosing and treating harmful exposures to the chemical; (i)(3)(iii)(iv) The request includes a description of the procedures to be used to maintain the confidentiality of the disclosed information; and, (i)(3)(iii)(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.

The trade secret provisions of the GHS are consistent with the HCS 1994 and therefore only a few changes were made to this section. The GHS, unlike the current HCS, requires disclosure of the percentage composition of mixtures on the SDS. This final rule adopts this requirement, but allows the manufacturer to claim trade secret protection for this requirement. This is the only substantive change to the existing standard's trade secret protections.

HCS 1994	HCS 2012
(i)(4)(i) May restrict the use of the information to the health purposes indicated in the written statement of need; (i)(4)(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, (i)(4)(iii) May not include requirements for the posting of a penalty bond. (i)(5) Nothing in this standard is meant to preclude the parties from pursuing non-contractual remedies to the extent permitted by law. (i)(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. (i)(7) If the chemical manufacturer, importer, or employer denies a written request for disclosure of a specific chemical identity, the denial must: (i)(7)(i) Be provided to the health professional, employee, or designated representative, within thirty days of the request; (i)(7)(ii) Be in writing; (i)(7)(iii) Include evidence to support the claim that the specific chemical identity is a trade secret; (i)(7)(iv) State the specific reasons why the request is being denied; and, (i)(7)(v) Explain in detail how alternative information may satisfy the specific medical or occupational health need without revealing the specific chemical identity. (i)(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. (i)(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)(9)(i) The chemical manufacturer, importer, or employer has supported the claim that the specific chemical identity is a trade secret;	(i)(4) The confidentiality agreement authorized by paragraph (i)(3)(iv) of this section: (i)(4)(i) May restrict the use of the information to the health purposes indicated in the written statement of need; (i)(4)(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, (i)(4)(iii) May not include requirements for the posting of a penalty bond. (i)(5) Nothing in this standard is meant to preclude the parties from pursuing non-contractual remedies to the extent permitted by law. (i)(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. (i)(7) If the chemical manufacturer, importer, or employer denies a written request for disclosure of a specific chemical identity <u>or percentage composition</u>, the denial must: (i)(7)(i) Be provided to the health professional, employee, or designated representative, within thirty days of the request; (i)(7)(ii) Be in writing; (i)(7)(iii) Include evidence to support the claim that the specific chemical identity <u>or percent of composition</u> is a trade secret; (i)(7)(iv) State the specific reasons why the request is being denied; and, (i)(7)(v) Explain in detail how alternative information may satisfy the specific medical or occupational health need without revealing the trade secret. (i)(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. (i)(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:

The trade secret provisions of the GHS are consistent with the HCS 1994 and therefore only a few changes were made to this section. The GHS, unlike the current HCS, requires disclosure of the percentage composition of mixtures on the SDS. This final rule adopts this requirement, but allows the manufacturer to claim trade secret protection for this requirement. This is the only substantive change to the existing standard's trade secret protections.

HCS 1994	HCS 2012
(i)(9)(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, (i)(9)(iii) The health professional, employee or designated representative has demonstrated adequate means to protect the confidentiality. (i)(10)(i) If OSHA determines that the specific chemical identity requested under paragraph (i)(3) of this section is not a “bona fide” trade secret, or that it is a trade secret, but the requesting health professional, employee, or designated representative has a legitimate medical or occupational health need for the information, has executed a written confidentiality agreement, and has shown adequate means to protect the confidentiality of the information, the chemical manufacturer, importer, or employer will be subject to citation by OSHA. (i)(10)(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. (i)(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.	(i)(9)(i) The chemical manufacturer, importer, or employer has supported the claim that the specific chemical identity <u>or percentage composition</u> is a trade secret; (i)(9)(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, (i)(9)(iii) The health professional, employee or designated representative has demonstrated adequate means to protect the confidentiality. (i)(10)(i) If OSHA determines that the specific chemical identity <u>or percentage composition</u> 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. (i)(10)(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, 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. (i)(11) If a citation for a failure to release <u>trade secret</u> 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.

The trade secret provisions of the GHS are consistent with the HCS 1994 and therefore only a few changes were made to this section. The GHS, unlike the current HCS, requires disclosure of the percentage composition of mixtures on the SDS. This final rule adopts this requirement, but allows the manufacturer to claim trade secret protection for this requirement. This is the only substantive change to the existing standard's trade secret protections.

HCS 1994	HCS 2012
(i)(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. (i)(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.	(i)(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. (i)(13) Nothing in this paragraph shall be construed as requiring the disclosure under any circumstances of process information which is a trade secret.

OSHA's final rule requires employers to train employees on the new label elements and safety data sheet format by December 1, 2013. All other provisions are to be in effect by June 1, 2015, with two exceptions. First, distributors will be given an extra six months to ensure all manufacturer labels are updated. Second, all employers will have an additional year to ensure that updated workplace signs, hazard communication program, and auxiliary training necessary for newly identified physical or health hazards, as provided in (h)(1), are in place.

HCS 1994	HCS 2012
(j) Effective dates. Chemical manufacturers, importers, distributors, and employers shall be in compliance with all provisions of this section by March 11, 1994. Note: The effective date of the clarification that the exemption of wood and wood products from the Hazard Communication standard in paragraph (b)(6)(iv) only applies to wood and wood products including lumber which will not be processed, where the manufacturer or importer can establish that the only hazard they pose to employees is the potential for flammability or combustibility, and that the exemption does not apply to 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 has been stayed from March 11, 1994 to August 11, 1994.	(j) Effective dates. (j)(1) <u>Employers shall train employees regarding the new label elements and safety data sheets format by December 1, 2013.</u> (j)(2) Chemical manufacturers, importers, distributors, and employers shall be in compliance with all <u>modified provisions of this section no later than June 1, 2015, except:</u> <u>(j)(2)(i) After December 1, 2015, the distributor shall not ship containers labeled by the chemical manufacturer or importer unless the label has been modified to comply with paragraph (f)(1) of this section.</u> <u>(j)(2)(ii) All employers shall, as necessary, update any alternative workplace labeling used under paragraph (f)(6) of this section, update the hazard communication program required by paragraph (h)(1), and provide any additional employee training in accordance with paragraph (h)(3) for newly identified physical or health hazards no later than June 1, 2016.</u> <u>(j)(3) Chemical manufacturers, importers, distributors, and employers may comply with either §1910.1200, revised as of October 1, 2011, or the current version of this standard or both during the transition period.</u>

Appendix

Section-By-Section Comparison of the Changes to Safety Data Sheets to the Requirements of the 1994 Hazard Communication Standard

Section 1. Identification: The requirements in this section are not new except for format and the requirement to list recommended uses and restrictions on use.

HCS 1994	HCS 2012
· Product identity same as on label and common names (g)(2)(i)(A) - (C) · Name address and telephone number of the manufacturer, distributor, employer or other responsible party (g)(2)(xii)	1. Identification (a) Product identifier used on the label; (b) Other means of identification; (c) Recommended use of the chemical and restrictions on use; (d) Name, address, and telephone number of the manufacturer, importer, or other responsible party; (e) Emergency phone number.

Section 2. Hazard(s) identification: In this section, the employer must identify the hazards according to the new classification criteria in Appendices A and B. Pictograms, standardized hazard statements, signal words, and precautionary statements are now required.

HCS 1994	HCS 2012
· Physical hazards (g)(2)(iii) · Health hazards (g)(2)(iv)	2. Hazard(s) identification (a) Classification of the chemical in accordance with paragraph (d) of §1910.1200; (b) Signal word, hazard statement(s), symbol(s) and precautionary statement(s) in accordance with paragraph (f) of §1910.1200. (Hazard symbols may be provided as graphical reproductions in black and white or the name of the symbol, e.g., flame, skull and crossbones); (c) Describe any hazards not otherwise classified that have been identified during the classification process; (d) Where an ingredient with unknown acute toxicity is used in a mixture at a concentration $\geq 1\%$ and the mixture is not classified based on testing of the mixture as a whole, a statement that X% of the mixture consists of ingredient(s) of unknown acute toxicity is required.

Section 3. Composition/information on ingredients. This section contains no new requirements other than format.

HCS 1994	HCS 2012
· Chemical and common name of ingredients contributing to known hazards (g)(2)(i)(A), (B) · For untested mixtures, the chemical and common name of ingredients at 1% or more that present a health hazard and those that present a physical hazard in the mixture (g)(2)(i)(C)(1), (3) · Ingredients at 0.1% or greater, if listed carcinogens (g)(2)(i)(C)(2)	3. Composition/information on ingredients Except as provided for in paragraph (i) of §1910.1200 on trade secrets: <u>For Substances</u> (a) Chemical name; (b) Common name and synonyms; (c) CAS number and other unique identifiers; (d) Impurities and stabilizing additives which are themselves classified and which contribute to the classification of the substance. <u>For Mixtures</u> In addition to the information required for substances: (a) The chemical name and concentration (exact percentage) or concentration ranges of all ingredients which are classified as health hazards in accordance with paragraph (d) of §1910.1200 and (1) are present above their cut-off/concentration limits; or (2) present a health risk below the cut-off/concentration limits. (b) The concentration (exact percentage) shall be specified unless a trade secret claim is made in accordance with §1910.1200(i), when there is batch-to-batch variability in the production of a mixture, or for a group of substantially similar mixtures (See A.0.5.1.2) with similar chemical composition. In these cases, concentration ranges may be used. <u>For All Chemicals Where a Trade Secret is Claimed</u> Where a trade secret is claimed in accordance with paragraph (i) of §1910.1200, a statement that the specific chemical identity and/or exact percentage of composition (concentration) has been withheld as a trade secret is required.

Section 4. First-aid measures. This section contains no new requirements other than format.

HCS 1994	HCS 2012
4. First-aid measures · Emergency and first-aid procedures (g)(2)(x) · Signs and symptoms of exposure (g)(2)(iv)	(a) Description of necessary measures, subdivided according to the different routes of exposure, i.e., inhalation, skin and eye contact, and ingestion; (b) Most important symptoms/effects, acute and delayed. (c) Indication of immediate medical attention and special treatment needed, if necessary.

Section 5. Fire-fighting measures. This section contains no new requirements other than format.

HCS 1994	HCS 2012
- Physical hazards (potential for fire, explosion) (g)(2)(iii) - Emergency procedures (g)(2)(x)	5. Fire-fighting measures (a) Suitable (and unsuitable) extinguishing media. (b) Specific hazards arising from the chemical (e.g., nature of any hazardous combustion products).

Section 6. Accidental release measures. This section contains no new requirements other than format.

HCS 1994	HCS 2012
- Procedures for cleanup of spills and leaks (g)(2)(viii) - Protective measures during maintenance and repair of contaminated equipment (g)(2)(viii)	6. Accidental release measures (a) Personal precautions, protective equipment, and emergency procedures. (b) Methods and materials for containment and cleaning up.

Section 7. Handling and storage. This section contains no new requirements other than format

HCS 1994	HCS 2012
Precautions for safe handling and use, including appropriate hygienic practices (g)(2)(viii)	7. Handling and storage (a) Precautions for safe handling. Section 8. Exposure controls/personal protection. This section contains no new requirements other than format.
- General applicable control measures, such as appropriate engineering controls, work practices, and personal protective equipment (g)(2)(ix) - Protective measures during maintenance and repair of contaminated equipment (g)(2)(viii) (g)(2)(ix) - Permissible exposure levels, threshold limit values, listed by OSHA, ACGIH, and other limit recommended or used by the MSDS preparer (g)(2)(vi)	8. Exposure controls/personal protection (a) OSHA permissible exposure limit (PEL), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV), and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the safety data sheet, where available. (b) Appropriate engineering controls.

Section 9. Physical and chemical properties. This section contains no new requirements other than format.

HCS 1994	HCS 2012
Physical and chemical properties such as vapor pressure, flash point, etc. (g)(2)(ii)	9. Physical and chemical properties (a) Appearance (physical state, color, etc.); (b) Odor; (c) Odor threshold; (d) pH; (e) Melting point/freezing point; (f) Initial boiling point and boiling range; (g) Flash point; (h) Evaporation rate; (i) Flammability (solid, gas); (j) Upper/lower flammability or explosive limits; (k) Vapor pressure; (l) Vapor density; (m) Relative density; (n) Solubility(ies); (o) Partition coefficient: n-octanol/water; (p) Auto-ignition temperature; (q) Decomposition temperature; (r) Viscosity.

Section 10. Stability and reactivity. Although the information on conditions to avoid and hazardous decomposition products is new to HCS, it has been required in the ANSI Z400.1 standard for a number of years.

HCS 1994	HCS 2012
- Physical hazards (potential for fire, explosion, reactivity) (g)(2)(iii) - Organic peroxides, pyrophoric, unstable(reactive), or water-reactive hazards (g)(2)(iii), definitions in (c)	10. Stability and reactivity (a) Reactivity; (b) Chemical stability; (c) Possibility of hazardous reactions; (d) Conditions to avoid (e.g., static discharge, shock, or vibration); (e) Incompatible materials; (f) Hazardous decomposition products.

Section 11. Toxicological information. This section contains no new requirements other than format.

HCS 1994	HCS 2012
· Health hazards, including signs and symptoms of exposure, and any medical conditions which are generally recognized as being aggravated by exposure to the chemical (g)(2)(iv) · Primary routes of entry (g)(2)(iv) · Whether the hazardous chemical is listed in the National Toxicology Program (NTP) 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. (g)(2)(vi)	11. Toxicological information Description of the various toxicological (health) effects and the available data used to identify those effects, including: (a) Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact); (b) Symptoms related to the physical, chemical and toxicological characteristics; (c) Delayed and immediate effects and also chronic effects from short- and long-term exposure; (d) Numerical measures of toxicity (such as acute toxicity estimates). (e) Whether the hazardous chemical is listed in the National Toxicology Program (NTP) 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.

Section 12. Ecological information (Non-mandatory). To be GHS-compliant the requirements for this section are provided.

HCS 1994	HCS 2012
· No present requirements	12. Ecological information (Non-mandatory) (a) Ecotoxicity (aquatic and terrestrial, where available); (b) Persistence and degradability; (c) Bioaccumulative potential; (d) Mobility in soil;

Section 13. Disposal considerations (Non-mandatory). To be GHS-compliant the requirements for this section are provided, but OSHA will not enforce. However, OSHA may enforce provisions associated with safe handling and use, including appropriate hygienic practices. See Section 7 above.

HCS 1994	HCS 2012
· See Section 7 · No present requirements	13. Disposal considerations (Non-mandatory) Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging.

Section 14. Transport information (Non-mandatory). To be GHS-compliant the requirements for this section are provided, but OSHA will not enforce.

HCS 1994	HCS 2012
· No present requirements	14. Transport information (Non-mandatory) (a) UN number; (b) UN proper shipping name; (c) Transport hazard class(es); (d) Packing group, if applicable; (e) Environmental hazards (e.g., Marine pollutant (Yes/No)); (f) Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code); (g) Special precautions, which a user needs to be aware of, or needs to comply with, in connection with transport or conveyance either within or outside their premises.

Section 15. Regulatory information (Non-mandatory). To be GHS-compliant the requirements for this section are provided, but OSHA will not enforce.

HCS 1994	HCS 2012
· No present requirements	15. Regulatory information (Non-mandatory) Safety, health and environmental regulations specific for the product in question.

Section 16. Other information, including date of preparation or last revision. This section contains no new requirements other than format.

HCS 1994	HCS 2012
· Date of preparation of MSDS or date of last change (g)(2)(xi)	16. Other information, including date of preparation or last revision. The date of preparation of the SDS or the last change to it.



Chapter 14

Appendix 2— SDS Glossary

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

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 can quickly become 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.

Aerosols Any non-refillable receptacles made of metal, glass or plastics and containing a gas compressed, liquefied or dissolved under pressure, with or without a liquid, paste or powder, and fitted with a release device allowing the contents to be ejected as solid or liquid particles in suspension in a gas, as a foam, paste or powder or in a liquid state or in a gaseous state. Aerosol includes aerosol dispensers.

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

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

Alkali Any chemical substance that forms soluble

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

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

Alloy A metallic material, homogeneous the naked eye, consisting of two or more elements so combined that they cannot be readily separated by mechanical means. Alloys are considered to be mixtures for the purpose of classification under the GHS.

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.

APEC Asia-Pacific Economic Cooperation

API American Petroleum Institute is a 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.

Aquatic 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.

Aspiration The entry of a liquid or solid chemical product into the trachea and lower respiratory system directly through the oral or nasal cavity, or indirectly from vomiting.

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.

BCF Bioconcentration factor.

BCM Blood-clotting mechanism effects.

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

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

Biopsy Removal and examination of tissue from the living body.

BLD Blood effects.

BOD/COD Biochemical Oxygen Demand/Chemical Oxygen Demand.

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

Flammable materials with low boiling points generally

present special fire hazards. Some approximate boiling points:

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

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

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

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

C Centigrade, a unit of temperature.

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

CA Competent Authority: A "competent authority" is any national body or authority designated or otherwise recognized as such in connection with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

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:

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

carcinogen in the **Annual Report on Carcinogens** published by the National Toxicology Program (NTP) (latest edition); or

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

Carcinogenicity The ability to produce cancer.

Carcinoma A malignant tumor. A form of cancer.

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

Caustic See Alkali.

CBI Confidential Business Information

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.

CG/HCCS Coordinating Group for the Harmonization of Chemical Classification Systems

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 Identity A name that will uniquely identify a chemical. This can be a name that is in accordance with the nomenclature systems of the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS), or a technical name.

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.

CMA Chemical Manufacturers Association. See CHEMTREC.

CO Carbon monoxide is a colorless, odorless, flammable, and very toxic gas produced by the incomplete combustion of carbon. It is also a 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.

CO₂ 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. CO₂ will not burn and is relatively nontoxic (although high concentrations, especially in confined spaces, can create hazardous oxygen-deficient environments).

COC Cleveland Open Cup is a flash point test method.

Combustible A term used by NFPA, DOT, and others to classify certain liquids that will burn, on the basis of flash points. Both NFPA and DOT generally define “combustible liquids” as having a flash point of 100°F (37.8°C) or higher but below 200°F (93.3°C). Also see “flammable.” Nonliquid 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.

Contact Sensitizer A substance that will induce an allergic response following skin contact. The definition for “contact sensitizer” is equivalent to “skin sensitizer.”

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 49 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.

Criteria The technical definition for the physical, health and environmental hazards.

Critical Temperature The temperature above which a pure gas cannot be liquefied, regardless of the degree of compression.

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 Corrosion see Skin Corrosion.

Dermal Irritation see Skin Irritation.

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

DHS U.S. Department of Health and Human Services. NIOSH and the Public Health Service (PHS) are part of DHS.

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.

Dissolved Gas A gas which when packaged under pressure is dissolved in a liquid phase solvent.

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

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

Dry Chemical A 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.

EC₅₀ The effective concentration of a substance that causes 50% of the maximum response.

EC Number or (ECN°) A reference number used by the European Communities to identify dangerous substances, in particular those registered under EINECS.

ECOSOC Economic and Social Council of the United Nations.

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

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

EINECS European Inventory of Existing Commercial Chemical Substances

Endocrine Glands Glands that regulate body activity by secreting hormones.

Endometrium The mucous membrane lining the uterus.

End Point Physical, health and environmental hazards.

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.

ErC₅₀ EC₅₀ in terms of reduction of growth rate.

Estrogen Principal female sex hormone.

EU European Union

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 Naphtha = 1.4, MIBK = 1.6.
- 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.

Explosive Article An article containing one or more explosive substances.

Explosive Substance A solid or liquid substance (or mixture of substances) which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings. Pyrotechnic substances are included even when they do not emit gases.

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 Irritation The production of changes in the eye following the application of test substance to the front surface of the eye, which are fully reversible within 21 days of application.

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 tissue, usually in the lungs.

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

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

Flammable A chemical that includes one of the following categories:

- (a) "Aerosol, flammable." An aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of 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 CFR 1500.44, it ignites and burns with a self sustained flame at a rate greater than one tenth of an inch per second along its major axis.

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

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

- (a) Tagliabue Closed Tester (see American National Standard Method of Test for Flash Point by 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 D 3278-78]).

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

Formula The scientific expression of the chemical composition of a material (e.g., water is H₂O, sulfuric acid is H₂SO₄, sulfur dioxide is SO₂).

Fume A solid condensation 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.

Gas A substance which (i) at 50 °C has a vapor pressure greater than 300 kPa; or (ii) is completely gaseous at 20 °C at a standard pressure of 101.3 kPa.

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.

GESAMP The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection of IMO, FAO, UNESCO, WMO, WHO, IAEA, UN, UNEP.

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

GHS Globally Harmonized System of Classification and Labeling of Chemicals

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.

Hazard Category The division of criteria within each hazard class, e.g., oral acute toxicity includes five hazard categories and flammable liquids includes four hazard categories. These categories compare hazard severity within a hazard class and should not be taken as a comparison of hazard categories more generally.

Hazard Class The nature of the physical, health or environmental hazard, e.g., flammable solid carcinogen, oral acute toxicity.

Hazard Statement A statement assigned to a hazard class and category that describes the nature of the hazards of a hazardous product, including, where appropriate, the degree of hazard.

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 (LD50) of 50 milligrams or less per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.
- (b) A chemical with a median lethal dose (LD50) of 200 milligrams or less per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between 2 and 3 kilograms each.
- (c) A chemical that has a median lethal concentration (LC50) in air of 200 parts per million by volume or less of gas or vapor, or 2 milligrams per liter or less of mist, fume, or dust, when administered by continuous inhalation for 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 the Research on Cancer.

IFCS International Forum on Chemical Safety

Ignitable Capable of being set afire.

ILO International Labor Organization

IMO International Maritime Organization

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

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

Ingestion Taking in by the mouth.

Inhal See inhalation.

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

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

Initial Boiling Point The temperature of a liquid at which its vapor pressure is equal to the standard pressure (101.3kPa), i.e., the first gas bubble appears.

Insol See insoluble.

Insoluble Incapable of being dissolved in a liquid.

Intrauterine Within the uterus.

IOMC Inter-organization Program on the Sound Management of Chemicals

IPCS International Program on Chemical Safety

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 exposure or by other appropriate techniques, it results in an empirical score of 5 or more. A chemical is an eye irritant if so determined under the procedure listed in 16 CFR 1500.42 or other appropriate techniques.

Irritating As 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.

ISO International Standards Organization

IUPAC International Union of Pure and Applied Chemistry

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

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

Lacrimation Secretion and discharge of tears.

Label An appropriate group of written, printed or graphic information elements concerning a hazardous product, selected as relevant to the target sector(s), that is affixed to, printed on, or attached to the immediate container of a hazardous product, or to the outside packaging of a hazardous product.

Label Element A type of information that has been harmonized for use in a label, e.g., pictogram, signal word.

Lactation The secretion of milk by the breasts.

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

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

LC₅₀ The concentration of a material in air that will kill 50 percent of a group of test animals with a single

exposure (usually 1 to 4 hours). The LC₅₀ is expressed as parts of material per million parts of air, by volume (ppm) for gases and vapors, or as micrograms of material per liter of air (g/l) or milligrams of material per cubic meter of air (mg/m³) for dusts and mists, as well as for gases and vapors.

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

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

LD₅₀ A single dose of a material expected to kill 50 percent of a group of test animals. The LD₅₀ dose is usually expressed as milligrams or grams of material per kilogram of animal body weight (mg/kg or g/kg). The material may be administered by mouth or applied to the skin.

L(E)C₅₀ equivalent to LC₅₀ or EC₅₀.

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.

Liquefied Gas A gas which when packaged under pressure, is partially liquid at temperatures above -50°C. A distinction is made between the following:

- i. High pressure liquefied gas: a gas with a critical temperature between -50°C and +65°C; and
- ii. Low pressure liquefied gas: a gas with a critical temperature above +65°C.

Liquid A substance or mixture which at 50°C has a vapor pressure of not more than 300kPa (3bar), which is not completely gaseous at 20 °C and at a standard pressure of 101.3kPa, and which has a melting point or initial melting point of 20°C or less at a standard pressure of 101.3 kPa. A viscous substance or mixture for which a specific melting point cannot be determined shall be subjected to the ASTM D 4359-90 test; or to the test for determining fluidity (penetrometer test) prescribed in section 2.3.4 of Annex A of the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR).

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

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

m³ Cubic meter is a metric measure of volume, approximately 35.3 cubic feet or 1.3 cubic yards.

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

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

Mammary Pertaining to the breast.

MARPOL The International Convention for the Prevention of Pollution from Ships

Material Safety Data Sheet (MSDS) 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. (Referred to as Safety Data Sheet under GHS)

Mechanical Exhaust A powered device, such as a motor-driven fan or air steam 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/m³ Milligrams per cubic meter is a unit for expressing concentrations of dusts, gases, or mists in air.

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

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

Mld Mild

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

mmHg Millimeters (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/m³.

MSDS Material Safety Data Sheet under OSHA's Hazard Communication Standard (HCS). See definition for Material Safety Data Sheet above.

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

Mutagen An agent giving rise to an increased occurrence of mutations in populations of cells and / or organisms.

Mutation A permanent change in the amount or structure of the genetic material in a cell.

MW See molecular weight.

N₂ Nitrogen is a colorless, odorless, and tasteless gas

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

NAFTA North American Free Trade Agreement

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

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

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

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

Neo See neoplasia.

Neonatal The first 4 weeks after birth.

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

Nephrotoxin A substance that causes injury to the kidneys.

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

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

ng nanogram, one-billionth of a gram.

NGO Non-governmental organization.

NIOSH National Institute for Occupational Safety and Health, U.S. Public Health Service, U.S. Department of Health and Human Services (DHHS), among other

activities, tests and certifies respiratory protective devices and air sampling detector tubes, recommends occupational exposure limits for various substances and assists OSHA and MSHA in occupational safety and health investigations and research.

NOEC No Observed Effect Concentration

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

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

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

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

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.

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.

OECD The Organization for Economic Cooperation and Development

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. The term also includes organic peroxide formulation (mixtures).

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).

Oxidizing Gas Any gas which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does.

Oxidizing Liquid A liquid which, while in itself not necessarily combustible, may, generally by yielding oxygen, cause, or contribute to, the combustion of other material.

Oxidizing Solid A solid which, while in itself not necessarily combustible, may, generally by yielding oxygen, cause, or contribute to, the combustion of other material.

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⁺) concentration to that of a given standard solution. A pH of 7 is neutral. Numbers increasing from 7 to 14 indicate greater alkalinity. Numbers decreasing from 7 to 0 indicate greater acidity.

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

Pictogram A graphical composition that may include a symbol plus other graphic elements, such as a border, background pattern or color that is intended to convey specific information.

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

Poison, Class B A DOT term for liquid, solid, paste or semisolid 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 (by volume) of the gas or vapor in a million parts of air; also the concentration of a particulate in a liquid or solid.

Precautionary Statement A phrase (and/or pictogram) that describes recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a hazardous product, or improper storage or handling of a hazardous product. Product identifier means the name or number used for a hazardous product on a label or in the SDS. It provides a unique means by which the product user can identify the substance or mixture within the particular use setting (e.g. transport, consumer or workplace).

Prenatal Preceding birth.

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

Pul See pulmonary.

Pulmonary Relating to, or associated with, the lungs.

Pulmonary Edema Fluid in the lungs.

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

Pyrophoric Liquid A liquid which, even in small quantities, is liable to ignite within five minutes after coming into contact with air.

Pyrophoric Solid A solid which, even in small quantities, is liable to ignite within five minutes after coming into contact with air.

Pyrotechnic Article An article containing one or more pyrotechnic substances.

Pyrotechnic Substance A substance or mixture of substances designed to produce an effect by heat, light, sound, gas or smoke or a combination of these as the result of non-detonative, self-sustaining exothermic (heat-related) chemical reactions.

QSAR Quantitative Structure-Activity Relationships

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.

Readily Combustible Solid A powdered, granular, or pasty substance or mixture which is dangerous if it can be easily ignited by brief contact with an ignition source, such as a burning match, and if the flame spreads rapidly.

Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria The latest revised edition of the United Nations publication bearing this title, and any published amendment thereto.

Recommendations on the Transport of Dangerous Goods, Model Regulations The latest revised edition of the United Nations publication bearing this title, and any published amendment thereto.

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.

Refrigerated Liquefied Gas A gas which when packaged is made partially liquid because of its low temperature.

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

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

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

in excess of the allowable exposure limit.

Respiratory Sensitizer A substance that induces hypersensitivity of the airways following inhalation of the substance.

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.

RID The Regulations concerning the International Carriage of Dangerous Goods by Rail [Annex 1 to Appendix B (Uniform Rules concerning the Contract for International Carriage of Goods by Rail) (CIM) of COTIF (Convention concerning international carriage by rail)], as amended.

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.

SAR Structure Activity Relationship

Safety Data Sheet (SDS) 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. (Referred to as Material Safety Data Sheet under HCS)

Sarcoma A tumor that is often malignant.

SDS Safety Data Sheet under the Globally Harmonized System (GHS) of Chemical Labeling. See definition for Safety Data Sheet above.

Self-Accelerating Decomposition Temperature (SADT) The lowest temperature at which self-accelerating decomposition may occur with substance as packaged.

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.

Self-Heating Substance A solid or liquid substance, other than a pyrophoric substance, which, by reaction

with air and without energy supply, is liable to self-heat; this substance differs from a pyrophoric substance in that it will ignite only when in large amounts (kilograms) and after long periods of time (hours or days).

Self-Reactive Substance A thermally unstable liquid or solid substance liable to undergo a strongly exothermic decomposition even without participation of oxygen (air). This definition excludes substances or mixtures classified under the GHS as explosive, organic peroxides or as oxidizing.

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.

Serious Eye Damage The production of tissue damage in the eye, or serious physical decay of vision, following application of a test substance to the front surface of the eye, which is not fully reversible within 21 days of application.

SETA Setaflash Closed Tester. See Flashpoint.

Signal Word A word used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label. The GHS uses 'Danger' and 'Warning' as signal words.

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 or TLV for that substance.

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

Skin Corrosion The production of irreversible damage to the skin following the application of a test substance for up to 4 hours.

Skin Irritation The production of reversible damage to the skin following the application of a test substance for up to 4 hours.

Skin Sensitizer A substance that will induce an allergic response following skin contact. The definition for

"skin sensitizer" is equivalent to "contact sensitizer".

Skin Toxicity See Dermal Toxicity.

SME Small and medium sized enterprises

Solid A substance or mixture which does not meet the definitions of a liquid or gas.

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

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

SO_x Oxides of sulfur.

Species On the MSDSs, species refers to the test animals—usually rats, mice, or rabbits—used to obtain the toxicity test data reported.

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

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

SPR Structure Property Relationship

Squamous Scaly or plate like.

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.

Substance Chemical elements and their compounds in the natural state or obtained by any production process, including any additive necessary to preserve the stability of the product and any impurities deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition.

Supplemental Label Element Any additional non-harmonized type of information supplied on the container of a hazardous product that is not required or specified under the GHS. In some cases this information may be required by other competent authorities or it may be additional information provided at the discretion of the manufacturer/distributor.

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

Symbol A graphical element intended to succinctly convey information.

Sys System or systemic.

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

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

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

Target Organ Effects The following is a target organ categorization of effects that may occur, including examples of signs and symptoms and chemicals that have been found to cause such effects. These examples are presented to illustrate the range and diversity of effects and hazards found in the workplace, and the broad scope employers must

consider in this area, but they are not intended to be all inclusive.

- (a) **Hepatotoxins:** Chemicals that produce liver damage.
Signs & Symptoms: Jaundice; liver enlargement.
Chemicals: Carbon tetrachloride; nitrosamines.
- (b) **Nephrotoxins:** Chemicals that produce kidney damage.
Signs & Symptoms: Edema; proteinuria.
Chemicals: Halogenated hydrocarbons; uranium.
- (c) **Neurotoxins:** Chemicals that produce their primary toxic effects on the nervous system
Signs & Symptoms: 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 tissues of oxygen.
Signs & Symptoms: Cyanosis; loss of consciousness.
Chemicals: Carbon monoxide; cyanides
- (e) **Agents that damage the lung:** Chemicals that irritate or damage the pulmonary tissue.
Signs & 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 & Symptoms: Birth defects; sterility.
Chemicals: Chemicals: Lead; DBCP
- (g) **Cutaneous hazards:** Chemicals that affect the dermal layer of the body.
Signs & Symptoms: Defatting of the skin; rashes; irritation.
Chemicals: Ketones; chlorinated compounds.
- (h) **Eye hazards:** Chemicals that affect the eye or visual capacity.
Signs & 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.

Technical Name A name that is generally used in commerce, regulations and codes to identify a substance or mixture, other than the IUPAC or CAS name, and that is recognized by the scientific community. Examples of technical names include those used for complex mixtures (e.g., petroleum fractions or natural products), pesticides (e.g., ISO or ANSI systems), dyestuffs (Color Index system) and minerals.

Temp Temperature.

Ter See Teratogen.

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

TFHCL Task Force on the Harmonization of Classification and Labeling

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 (LD50) 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 (LD50) of more than 200 milligrams per kilogram but not more than 1,000 milligrams per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each.
- (c) A chemical that has a median lethal concentration (LC50) in air of more than 200 parts per million but not more than 2,000 parts per million by volume of gas or vapor, or more than two milligrams per liter but not more than 20 milligrams per liter of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within 1 hour) to albino rats weighing between 200 and 300 grams each.

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

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

Trade Name The trademark name or commercial trade name for a material or product.

Transplacental An agent that causes physical defects in the developing embryo.

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

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

Also see TLV.

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

ug Microgram, one-millionth of a gram.

UN United Nations

UNCED United Nations Conference on Environment and Development

UNCETDG United Nations Committee of Experts on the Transport of Dangerous Goods

UNCETDG/GHS United Nations Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labeling of Chemicals

UNITAR United Nations Institute for Training and Research

UNSCGHS The United Nations Sub-Committee of Experts on the Globally Harmonized System of Classification and Labeling of Chemicals.

UNSCETDG The United Nations Sub-Committee of Experts on the Transport of Dangerous Goods.

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

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

USDA U.S. Department of Agriculture.

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

Vapor Density The weight of a vapor or gas compared to the weight of an equal volume of air is an expression of the density of the vapor or gas. Materials lighter than air have vapor densities less than 1.0 (examples: acetylene, methane, hydrogen). Materials heavier than air (examples: propane, hydrogen sulfide, ethane, butane, chlorine, sulfur dioxide) have vapor densities greater than 1.0. All vapors and gases will mix with air, but the lighter materials will tend to rise and dissipate (unless confined). Heavier vapors and gases are likely to

concentrate in low places— along or under floors, in sumps, sewers, and manholes, in trenches and ditches—where they may create 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 MSDSs are in millimeters of mercury (mmHg) at 68°F (20°C), unless stated otherwise. Three facts are important to remember:

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

WG work group

WHMIS Workplace Hazardous Materials Information System

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.

WSSD World Summit on Sustainable Development

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



Chapter 15

Appendix 3— States with Approved Plans

States with Approved Plans

If your facility is located in an OSHA-approved State-plan, you must comply with the Hazard Communication requirements of the state. OSHA approved state plans are required to promulgate standards that are “at least as effective” as the Federal rule, but they may differ in some respects. This Appendix provides information regarding the appropriate state offices to contact for more information.

State Plan States*

Alaska Department of Labor and Workforce Development, P.O. Box 111149, Juneau, AK 99811-1149, (907) 465-2700

Industrial Commission of Arizona, 800 W. Washington, Phoenix, AZ 85007-2922, (602) 542-4411

California Department of Industrial Relations, 455 Golden Gate Avenue, 10th Floor, San Francisco, CA 94102, (415) 703-5050

Connecticut Department of Labor, 200 Folly Brook Boulevard, Wethersfield, CT 06109, (860) 263-6505

Hawaii Department of Labor and Industrial Relations, 830 Punchbowl Street, Honolulu, HI 96813, (808) 586-8844

Illinois Department of Labor, 900 South Spring Street, Springfield, IL 62702, (217) 782-6206

Indiana Department of Labor, State Office Building, 402 West Washington Street, Room W195, Indianapolis, IN 46204-2751, (317) 232-2378

Iowa Division of Labor Services, 1000 E. Grand Avenue, Des Moines, IA 50319-0209, (515) 281-5082

Kentucky Labor Cabinet, U.S Highway 127 South, Suite 4, Frankfort, KY 40601, (502) 564-5387

Maryland Division of Labor, Licensing and Regulation Division, 1100 North Eutaw Street, Room 606, Baltimore, MD 21201-2206, (410) 767-2241

Michigan Occupational Safety and Health Administration, P O. Box 30643, Lansing, MI 48909-8143, (517) 322-1817

Minnesota Department of Labor and Industry, 444 Lafayette Road, St. Paul, MN 55155, (651) 284-5010

Nevada Department of Industrial Relations, 400 West King Street, Suite 400, Carson City, NV 89703, (775) 684-7260

New Mexico Environmental Improvement Division, Health and Environment Department, P.O Box 5469, Santa Fe, NM 87502, (505) 827-2855

New York Department of Labor, W. Averell Harriman State Office Campus, Building 12, Albany, NY 12240, (518) 457-9000

North Carolina Department of Labor, 1101 Mail Service Center, Raleigh, NC 27699-1101, (919) 733-0359

Oregon Department of Consumer and Business Services, 350 Winter Street, NE, Room 430, P.O. Box 14480, Salem, OR 97309-0405, (503) 378-3272

Puerto Rico Department of Labor and Human Resources, Prudencio Rivera Martinez Bldg. 21st Floor, 505 Munoz Rivera Avenue, Hato Rey, PR 00918, (809) 754-2119

South Carolina Department of Labor, Synergy Business Park, Kingstree Building, 110 Centerview Drive, P.O. Box 11329, Columbia, SC 29211-1329, (803) 896-4300

Tennessee Department of Labor, 220 French Landing Drive, Nashville, TN 37243, (615) 741-2582

Utah Occupational Safety and Health, 160 East 300 South, 3rd Floor, P.O. Box 146600, Salt Lake City, UT 84114-6600, (801) 530-6848

Vermont Department of Labor and Industry, 5 Green Mountain Drive, P.O. Box 488, Montpelier, VT 05601-0488, (802) 828-4301

Virgin Islands Department of Labor, 3012 Golden Rock, Christiansted, St. Croix, VI 00840, (340) 772-1315

Virginia Department of Labor and Industry, Powers-Taylor Building, 13 South 13th Street, Richmond, VA 23219-4101, (804) 786-2377

Washington Department of Labor and Industries, General Administration Building, PO Box 44001, Olympia, WA 98504-4001, (360) 902-4200

Wyoming Department of Employment, Workers' Safety and Compensation Division, 1510 East Pershing Boulevard - West Wing, Cheyenne, WY 82002, (307) 777-7159

*These states and territories operate their own OSHA-approved job safety and health programs (the Connecticut, New Jersey and New York plans cover public employees only and OSHA currently is exercising concurrent private-sector Federal enforcement authority in California).



Chapter 16

Appendix 4— OSHA/State Consultation Project Directory

OSHA Onsite Consultation Directory

Consultation programs provide free services to employers requesting help in (1) identifying and correcting specific hazards, (2) improving their safety and health programs, and/or need further assistance in training and education. Funded by OSHA and delivered by well-trained professional staff of state governments, consultation services are comprehensive, and include an appraisal of all workplace hazards, practices, and job safety and health programs; conferences and agreements with management; assistance in implementing recommendations; and a follow-up appraisal to ensure that any required corrections are made.

In a typical review of a company's operation, the consultant will examine the structural condition of the building, check equipment (such as forklifts), examine storage conditions, check control of toxic substances and other environmental hazards, and confer with management about employee supervision and job training. The ultimate benefits of a successful consultation experience may include a highly effective safety and health program as well as recognition by OSHA.

For more information on consultation programs, contact the appropriate office in your state listed in this Appendix.

Offices and Addresses:

ALABAMA

Safe State Program
University of Alabama
432 Martha Parham West
Box 870388
Tuscaloosa, Alabama 35487
(205) 348-8975
(205) 348-9878 FAX
Email: ddechant@ccs.ua.edu
Website: <http://www.alabamasafestate.ua.edu>

ALASKA

Consultation and Training
State of Alaska
Department of Labor and Workforce Development
Labor Standards and Safety - OSH
3301 Eagle Street, Suite 305
Anchorage, Alaska 99503-4149
1-800-656-4972 or (907) 269-4957
(907) 269-3723 FAX

Email: krystyna.markiewicz@alaska.gov
Website: <http://www.labor.state.ak.us/lss/oshhome.htm>

ARIZONA

Consultation & Training
Industrial Commission of Arizona
Division of Occupational Safety & Health
2675 East Broadway Road; Suite 239
Tucson, Arizona 85716
(520) 628-5478
(520) 322-8008 FAX
Email: Norton.Mark@dol.gov
Website: http://www.ica.state.az.us/ADOSH/ADOSH_Consultation_and_Training.aspx

ARKANSAS

OSHA Consultation
Arkansas Department of Labor
10421 West Markham
Little Rock, Arkansas 72205
(501)-682-4522
(501) 682-4532 FAX
Email: thomas.clark@dol.gov
Website: <http://www.arkansas.gov/labor/divisions/oshap1.html>

CALIFORNIA

CAL/OSHA Consultation Service
Department of Industrial Relations
2424 Arden Way, Suite 485
Sacramento, California 95825
1-800-963-9424
(916) 263-5760 FAX
Email: InfoCons@hq.dir.ca.gov
Website: <http://www.dir.ca.gov/DOSH/consultation.html>

COLORADO

Colorado State University
Department of Environmental and Radiological Health Services
Occupational Health and Safety Consultation
1681 Campus Delivery
Fort Collins, Colorado 80523
(970) 491-6151
(970) 491-7778 FAX
Email: OHSS@lamar.colostate.edu
Website: <http://www.bernardino.colostate.edu/public/>

CONNECTICUT

Connecticut Department of Labor
Division of Occupational Safety & Health
38 Wolcott Hill Road
Wethersfield, Connecticut 06109
(860) 263-6900
(860) 263-6940 FAX
Email: pierce.james.1@dol.gov
Website: <http://www.ctdol.state.ct.us/osha/osha.htm>

DELAWARE

Delaware Department of Labor
Occupational Safety & Health
Division of Industrial Affairs
4425 North Market Street
Wilmington, Delaware 19802
(302)-761-8217
(302) 761-6602 FAX
Email: sandra.danner@state.de.us
Website: <http://www.delawareworks.com/industrialaffairs/services/OSHAConsultation.shtml>

DISTRICT OF COLUMBIA

(Program available only for employers within the District of Columbia, DC)
Office of Occupational Safety & Health
D.C. Department of Employment Services
64 New York Avenue, NE-Room 2106
Washington, D.C. 20002
(202) 671-1800
(202) 673-2380 FAX
Email: john.cates@dc.gov
Website: <http://www.does.dc.gov>

FLORIDA

Safety Florida Consultation Program
University of South Florida
13201 Bruce B. Downs Boulevard, MDC 56
Tampa, Florida 33612
1-866-273-1105
(813) 974-8270 FAX
Email: cvespi@health.usf.edu
Website: <http://www.safetyflorida.usf.edu>

GEORGIA

21(d) Onsite Consultation Program
Georgia Institute of Technology
430 10th St., N.E.
North Building
Atlanta, Georgia 30332-0837
(404) 407-8276
(404) 894-8275 FAX

Email: daniel.ortiz@gtri.gatech.edu
Website: <http://www.oshainfo.gatech.edu>

GUAM

Guam Department of Labor
OSHA Onsite Consultation Program
GCIC Building, 8th Floor
414 West Soledad Avenue
Hagatna, Guam 96910
(671) 475-7069
(671) 475-7070 FAX
Email: anderson.anthony@dol.gov
Website: <http://www.guamdol.net>

HAWAII

Consultation & Training Branch
Department of Labor & Industrial Relations
830 Punchbowl Street
Room #425
Honolulu, Hawaii 96813
(808)-586-9083
(808)-586-9099 FAX
Email: kondo.ellen@dol.gov
Website: <http://hawaii.gov/labor/hiosh>

IDAHO

Idaho OSHA Consultation Program
Boise State University
1910 University Drive, M.S. 1825
Boise, Idaho 83725-1825
(208) 426-3283
(208) 426-4411 FAX
Email: consultation@boisestate.edu
Website: <http://www.boisestate.edu/oshcon>

ILLINOIS

Illinois Onsite Consultation
Industrial Service Division
Department of Commerce & Economic Opportunity
State of Illinois Center, Suite 3-400
100 West Randolph Street
Chicago, Illinois 60601
(800)-972-4216 or (217)-524-7946
(217) 558-4044 FAX
Email: peter.wagner@illinois.gov
Website: <http://www2.illinoisbiz.biz/osha/index.htm>

INDIANA

INSafe
Indiana Department of Labor
402 West Washington, W195
Indianapolis, Indiana 46204
(317) 234-4792
(317) 233-1868 FAX
Email: mellison@dol.in.gov
Website: <http://www.in.gov/dol/insafe.htm>

IOWA

Iowa Workforce Development
Division of Labor Services
Bureau of Consultation and Education
1000 East Grand Avenue
Des Moines, Iowa 50319
(515) 281-7629
(515) 281-5522 FAX
Email: mullen.joseph@dol.gov
Website: <http://www.iowaworkforce.org/labor/iosh/consultation/index.htm>

KANSAS

Kansas Consultation Project
Kansas Department of Labor
700 SW Harrison - Room 420
Topeka, Kansas 66612-1227
(785)-296-4386
(785) 296-1775 FAX
Email: cliff.morris@dol.ks.gov
Website: <http://www.dol.ks.gov/safety/assistance.html>

KENTUCKY

Kentucky Labor Cabinet
Division of Education & Training
Kentucky OSH Program
1047 U.S. Highway 127, South, Suite 4
Frankfort, Kentucky 40601
(502) 564-3070
(502) 564-4769 FAX
Email: kim.perry@ky.gov
Website: <http://www.labor.ky.gov/Pages/LaborHome.aspx>

LOUISIANA

21(d) Consultation Program
Louisiana Department of Labor
OSHA Consultation, Office of Workers' Compensation
P.O. Box 94094
Baton Rouge, Louisiana 70804-9094
(225)-342-0720

(225) 342-6756 FAX
Email: sstokes@lwc.la.gov
Website: <http://www.laworks.net/>

MAINE

Maine Bureau of Labor Standards
Workplace Safety & Health Division
State House Station #45
Augusta, Maine 04333-0045
(207) 623-7900
(207) 623-7938 FAX
Email: david.e.wacker@maine.gov
Website: <http://www.safetyworksmaine.com/consultations/>

MARYLAND

MOSH Consultation Services
10946 Golden West Drive, Suite 160
Hunt Valley, MD 21031
(410) 527-4472
(410) 527-5678 FAX
Email: mosh.consultation@dol.gov
Website: <http://www.dllr.state.md.us/labor/mosh/volc.shtml>

MASSACHUSETTS

Division of Occupational Safety
Dept. of Labor
1001 Watertown Street
West Newton, Massachusetts 02465
(617) 969-7177
(617) 727-4581 FAX
Email: kathy.flannery@state.ma.us
Website: <http://www.mass.gov>

MICHIGAN

Consultation Education & Training Division
Michigan Occupational Safety and Health
Administration
Labor & Economic Growth
7150 Harris Drive
P.O. Box 30643
Lansing, Michigan 48909-8413
1-800-866-4674 or (517) 322-1809
(517) 322-1374 FAX
Email: coneil@michigan.gov
Website: <http://www.michigan.gov/lara>

MINNESOTA

Department of Labor & Industry
Consultation Division
443 LaFayette Road
Saint Paul, Minnesota 55155
(651) 284-5060
(651) 284-5739 FAX
Email: patricia.todd@state.mn.us
Website: <http://www.doli.state.mn.us/Wsc.asp>

MISSISSIPPI

Mississippi State University
Center for Safety and Health
2151 Hwy 18
Suite B
Brandon, MS 39042
(601) 825-0783
(601) 825-6609 FAX
Email: ktucker@csd.msstate.edu
Website: <http://www.csd.msstate.edu/onsite.php>

MISSOURI

Onsite Consultation Program
Division of Labor Standards
Dept. of Labor & Industrial Relations
3315 West Truman Boulevard
Post Office Box 449
Jefferson City, Missouri 65102
(573) 751-3403
(573) 751-3721 FAX
Email: stateconsultation@dolir.mo.us
Website: <http://www.labor.mo.gov/DLS/WorkplaceSafety>

MONTANA

Department of Labor & Industry
Occupational Safety and Health Bureau
PO Box 1728
1625 11th Avenue
Helena, Montana 59601
(406) 444-6401
(406) 444-9396 FAX
Email: smihalik@mt.gov
Website: <http://erd.dli.mt.gov/safety-and-health/safety-consultation-program.html>

NEBRASKA

Nebraska Department of Labor
550 So. 16th Street
P. O. Box 94600
Lincoln, NE 68509-4600
(402) 471-4717

(402) 471-5039 FAX
Email: eldon.diedrichs@nebraska.gov
Website: <http://www.dol.nebraska.gov/index.cfm>

NEVADA

Safety Consultation & Training Section
Division of Industrial Relations
Department of Business & Industry
1301 North Green Valley Parkway #200
Henderson, Nevada 89074
(702)-486-9147
(702) 990-0326 FAX
Email: nugent.joe@dol.gov
Website: <http://www.4safenv.state.nv.us/>

NEW HAMPSHIRE

Occupational Health and Safety Consultation Service
New Hampshire Department of Environmental Services
P.O. Box 95
29 Hazen Drive
Concord, New Hampshire 03302-0095
(603) 271-8590
(603) 271-2667 FAX
Email: stephen.beyer@des.nh.gov
Website: <http://www.des.state.nh.us/>

NEW JERSEY

New Jersey Department of Labor and Workforce Development
1 John Fitch Plaza
P.O. Box 386
Trenton, New Jersey 08625-0386
(609) 292-0404
(609) 292-4409 FAX
Email: Wadiak.mark@dol.gov
Website: <http://lwd.dol.state.nj.us/labor/index.shtml>

NEW MEXICO

New Mexico Environment Department
Occupational Health & Safety Bureau
Address: 525 Marquez Plaza
Santa Fe, New Mexico 87502
(505)-827-4230 or (877)-610-6742
(505)-827-4422 FAX
Toll Free: 877-610-6742
Email: carol.walker@state.nm.us
Website: <http://www.nmenv.state.nm.us/>

NEW YORK

Division of Safety & Health
State Office Building Campus
Building 12, Room 168
Albany, New York 12240
(518) 457-2238
(518) 457-3454 FAX
Email: rush.jim@dol.gov
Website: http://www.labor.state.ny.us/workerprotection/safetyhealth/DOSH_ONSITE_CONSULTATION.shtm

NORTH CAROLINA

Bureau of Consultative Services
North Carolina Department of Labor
1101 Mail Service Center
Raleigh, North Carolina 27699-1101
(919) 807-2905
(919) 807-2902 FAX
Email: john.bogner@nclabor.com
Website: <http://www.nclabor.com/>

NORTH DAKOTA

North Dakota Occupational Safety & Health
Consultation - Bismarck State College
Corporate & Continuing Education
1815 Schafer St
PO Box 5587
Bismarck, North Dakota 58506
(877) 846-9387 or (701) 224-5778
(701) 224-5763 FAX
Email: albert.koch@bsc.nodak.edu
Website: <http://www.bismarckstate.edu/ceti/ndosh/consultation/>

OHIO

Ohio Bureau of Workers' Compensation
Division of Safety and Hygiene
OSHA On-Site Consultation
13430 Yarmouth Drive
Pickerington, Ohio 43147
Toll Free: 1-800-282-1425
614-644-3133 FAX
Email: greg.collins@bwc.state.oh.us
Website: <http://www.ohiobwc.com/employer/programs/safety/SandHOSHAandPERRP.asp>

OKLAHOMA

Oklahoma Department of Labor
OSHA Consultation Division
3017 N. Stiles, Suite 100
Oklahoma City, Oklahoma 73105-5212

(405) 521-6100
(405)-557-1214 FAX
Email: diana.jones@labor.ok.gov
Website: <http://www.ok.gov/odol/>

OREGON

Oregon OSHA Consultation and Services
Department of Consumer & Business Services
350 Winter Street, N.E., Room 430
Salem, Oregon 97301-3882
(503)-947-7434
(503) 947-7462 FAX
Email: roy.c.kroker@state.or.us
Website: <http://www.orosha.org/>

PENNSYLVANIA

Indiana University Pennsylvania
Room 210 Walsh Hall
302 East Walk
Indiana, Pennsylvania 15705-1087
1-800-382-1241
(724) 357-2396
(724) 357-2385 FAX
Email: gualardo.sam@dol.gov
Website: <http://www.iup.edu/pa-oshaconsultation>

PUERTO RICO

Puerto Rico Occupational Safety & Health
Administration (PR OSHA)
Voluntary Programs Division
P.O. Box 195540
San Juan, Puerto Rico 00919-5540
1-800-981-5720
(787) 767-6051 FAX
Email: droz.israel@dol.gov
Website: <http://www.dtrh.gobierno.pr/>

RHODE ISLAND

OSH Consultation Program
Division of Occupational Health & Radiation Control
Rhode Island Department of Health
3 Capital Hill,
Cannon Building, Room 206
Providence, Rhode Island 02908
(401)-222-7745
(401) 222-2456 FAX
Email: james.bruckshaw@health.ri.gov
Website: <http://www.health.ri.gov/programs/oshaconsultation/index.php>

SOUTH CAROLINA

South Carolina Department of Labor, Licensing & Regulation
110 Centerview Dr.
P.O. Box 11329
Columbia, South Carolina 29211-1329
(803) 896-7744
(803) 896-7750 FAX
Email: jessuph@llr.sc.gov
Website: <http://www.llr.state.sc.us>

SOUTH DAKOTA

South Dakota State University
Engineering Extension - OSHA Consultation
SHH 201, Box 2220
Brookings, South Dakota 57007-0597
(605) 688-4101
605-688-6290 FAX
Email: sdsu.engineeringextension@sdstate.edu
Website: <http://www.sdstate.edu/engr/outreach/resource/extension/index.cfm>

TENNESSEE

TOSHA Consultation Services
Tennessee Department of Labor and Workforce Development
TOSHA/Consultation
220 French Landing Drive
Nashville, Tennessee 37243
(615) 741-7155
(615) 532-2997 FAX
Email: Jim.Cothron@state.tn.us
Website: <http://www.state.tn.us/labor-wfd/toshcons.html>

TEXAS

Workers' Health & Safety Division- MS 22
Texas Department of Insurance
7551 Metro Center Drive
Austin, Texas 78744-1609
(512) 804-4693
(512) 804-4641 FAX
OSHCON Request Line: 800-687-7080
Email: steve.marcyes@tdi.state.tx.us
Website: <http://www.tdi.state.tx.us/wc/safety/oshcon.html>

UTAH

Utah OSHA Consultation Program
160 East 300 South, Third Floor
Salt Lake City, Utah 84114-6650
801-530-6868 or 800-530-5090

(801) 530-7606 FAX
(801) 530-6901 TDY
1-800-530-5090
Email: kmcneill@utah.gov
Website: <http://laborcommission.utah.gov/UOSH/index.html>

VERMONT

Vermont Department of Labor
Workers' Compensation and Safety Division
P.O. Box 488, 5 Green Mountain Drive
Montpelier, VT 05601-0488
(802) 888-2598
(802) 828-2195 FAX
Email: scott.meyer@state.vt.us
Website: <http://www.labor.vermont.gov/>

VIRGINIA

Virginia Department of Labor & Industry
Occupational Safety & Health
Training & Consultation
13 South 13th Street
Richmond, Virginia 23219
(804) 786-6613
(804) 786-8418 FAX
Email: warren.rice@doli.virginia.gov
Website: http://www.doli.virginia.gov/vosh_coop/vosh_consultation_p1.html

VIRGIN ISLANDS

Safety in Paradise
University of the Virgin Islands
Community Engagement and Lifelong Learning Center
#2 John Brewer's Bay
St. Thomas, Virgin Islands 00803
(340) 639-1100
(340) 693-1155 FAX
Email: igarner@uvi.edu
Website: <http://www.uvi.edu/sites/uvi/>

WASHINGTON

WISHA Services Division
P.O. Box 4648
Olympia, WA 98504-4648
(360) 902-5554
(360) 902-5438 FAX
Email: ston235@lni.wa.gov
Website: <http://www.lni.wa.gov/safety/basics/Assistance/Consultation/default.asp>

WEST VIRGINIA

West Virginia Department of Labor
WISHA Services Division
Capitol Complex Building #6
1800 East Washington Street, Room B-749
Charleston, West Virginia 25305
(304) 558-7890
(360) 902-5438 FAX
Email: jennifer.w.burgess@wv.gov
Website: http://www.wvlabor.com/newwebsite/Pages/Safety_osh_consultation.html

WISCONSIN

University of Wisconsin State Laboratory of Hygiene
2601 Agriculture Drive
P.O. Box 7996
Madison, WI 53707-7996
Toll Free: 1-800-947-0553
(608) 226-5240 or (800) 947-0553
(360) 902-5438 FAX
Email: moente@mail.slh.wisc.edu
Website: <http://www.slh.wisc.edu/wiscon/>

WYOMING

Wyoming Workers' Safety
1510 East Pershing Blvd.
Cheyenne, Wyoming 82002
(307) 777-7786
(307) 777-3646 FAX
Email: ecarls@state.wy.us
Website: <http://www.wyomingworkforce.org/>