CHEMICAL MANUFACTURERS ASSOCIATION

To → MJH
This is self explanatory
Pls Review the guideline and
Let's discuss your
comments
Feel free to mark on
this -
P.S. by 1/9/90

November 30, 1989

Dear Health and Safety Contacts of CMA Member Firms

Dear Contact:

Subject: Review of Draft CMA Guidelines for the Preparation of Material Safety Data Sheets

Since November, 1988, CMA has been developing a guideline for the preparation of material safety data sheets (MSDSs). The enclosed draft is being circulated to all CMA member companies for review and comment by January 10, 1990. The guideline is the first phase of a two-phase project to develop a consensus standard on MSDSs. Upon approval of the guideline by CMA, the second phase of the project will be initiated through the American National Standards Institute (ANSI), with CMA serving as the Secretariat.

This project was initiated as a result of concern expressed by CMA's Board of Directors about a number of factors impacting the MSDS. First, passage of Title III of the Superfund Amendments and Reauthorization Act of 1986, the amendment of the OSHA Hazard Communication Standard, and the proliferation of state right-to-know laws have all expanded the audiences for MSDSs beyond the health and safety professionals and industrial workers originally intended to be covered. These new audiences include fire departments, emergency responders, state and local emergency response planning groups, and community members.

Secondly, many activities of the federal government, the states, standard setting organizations, the international community, and other industry organizations were focusing on the needs of these new audiences. Developing a standard MSDS format, restricting or expanding the content of MSDSs, and supplementing the MSDS with other communication vehicles were being considered at the time. The chemical industry ultimately decided to take the lead in promoting effective MSDSs.

Toward this end, the enclosed draft guideline focuses on MSDS content, consistency and communicability. The guideline also recommends inclusion of an emergency overview in the MSDS to respond to the needs of new audiences. While the guideline recommends some new approaches to preparing MSDSs, which may represent a departure from current practices, we believe the guideline is responsive to the concerns of both industry and the ever-expanding user audiences.

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2501 M Street, NW, Washington, DC 20037 202-887-1100 Telex 89617 (CMA WSH)

During development of the guideline, we have received input from many new and long time users and developers of MSDSs. The guideline is the work product of over 40 individuals representing 30 CMA member companies. Input has also been provided by other individuals and organizations within the chemical industry, other industries, outside users and regulatory bodies. MSDSs have recently become the subject of congressional hearings, a General Accounting Office (GAO) investigation, and international discussions. A second GAO investigation and an OSHA notice requesting comment on ways to improve the MSDS are pending. Our plans include continued CMA involvement in these arenas and pursuit of international harmonization of MSDS requirements.

We recognize that your company has considerable experience with MSDSs. Your comments and suggestions on the first distribution of our work product will be greatly appreciated. Please return your comments, in writing, no later than January, 10, 1989 to Kathryn A. Rosica, Associate Director, Health Issues at the CMA address. Please call her at 202/887-1282 if you have any questions.

Sincerely yours,

Geraldine V. Cox

Geraldine V. Cox, Ph.D.
Vice President-Technical Director

Enclosure

cc: (w/enclosure)
G. D. Strickland

CHEMICAL MANUFACTURERS ASSOCIATION

DRAFT

Guidelines for the Preparation

of

Material Safety Data Sheets

11/30/89

LEGAL NOTICE

This guideline is intended to be an information document to assist individuals responsible for the development and review of Material Safety Data Sheets (MSDSs) used and handled in the United States. It is not within the scope of this guideline to analyze specific legal, policy, or technical issues that may arise in the compliance with the OSHA Hazard Communication Standard. Each company should consult with OSHA or its own legal counsel as to compliance issues. CMA does not make any warranty or representation, either express or implied, with respect to the accuracy, completeness, or utility of the information contained in this guideline; nor does CMA assume any liability of any kind whatsoever resulting from the use of or reliance upon any information, procedure, conclusion, or opinion contained in this guideline.

Draft
11/30/89

CHEMICAL MANUFACTURERS ASSOCIATION

DRAFT

Guidelines for the Preparation of Material Safety Data Sheets

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CHAPTER 1: INTRODUCTION

This guideline is intended for use by individuals responsible for developing and reviewing Material Safety Data Sheets (MSDSs) on materials and hazardous chemicals [1] used and handled primarily in the United States, and subject to the Federal OSHA Hazard Communication Standard (HCS). The guideline may also be helpful to identify additional MSDS requirements for materials used and handled in certain states, as well as outside of the United States.

In the past, the MSDS was written for health and safety professionals and for trained workers employed by chemical companies and their customers. Expansion of federal and state right-to-know regulations has broadened this audience to include fire departments, emergency responders, state and local emergency planning groups and members of the community. Because of the information needs and diverse background of this expanded audience, the information in a MSDS must be presented in a more consistent and understandable form. Wherever possible, MSDS information should also be presented in language the layman can understand.

A Material Safety Data Sheet describes the hazards of a material and provides information on how the material can be safely handled, used, and stored. It is a summary of material safety information. For completeness and clarity, it should contain sections on material identification, chemical or hazardous components, potential health effects, first aid, fire and explosion, reactivity, spill and leak response, personal protection/exposure controls, storage and handling, and physical and chemical properties. It may also include toxicological, ecological, regulatory, and other useful information. MSDSs cannot include information on each and every unique application of the material, although they should consider the hazardous exposures resulting from customary and reasonably foreseeable occupational use, misuse, handling and storage. The MSDS is only one source of information on a material; as such, it is best used along with technical bulletins, labels, training, and other communications.

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[1] The OSHA Hazard Communication Standard (HCS) requires an MSDS be prepared for chemicals that are hazardous according to the criteria described in the Standard. This guideline recommends MSDSs be prepared for all chemical materials to ensure clear communication on the material and it's hazardous nature. This guideline uses the term "material" to denote this wider scope of coverage. The term includes all types of classifications of chemicals such as products, raw materials, isolated manufacturing intermediates, as well as hazardous and non-hazardous chemicals. Also covered under "materials" are articles that may normally be considered non-hazardous, but may give off hazardous chemicals during customary and reasonably forseeable use and misuse, handling and storage.

CHAPTER 2: SCOPE

This guideline applies to the preparation of MSDSs for hazardous chemicals and materials used under industrial occupational conditions. It presents basic information on how to develop and write an MSDS. It identifies information that must be included to comply with the U.S. OSHA Hazard Communication Standard. It also identifies information that should be included for completeness, clarity, and format consistency. Optional information is also presented for compliance with other federal, state, and international health, environmental, and safety laws or regulations.

CHAPTER 3: ABOUT THE GUIDELINE

This guideline is organized to present concepts and guidance to an MSDS preparer. The whole guideline should be read and understood because many MSDS sections are interrelated. A complete, logical and internally consistent MSDS is more likely to result from the orderly approach presented in this guideline. This guideline is designed as an aid to the MSDS preparer and should be used along with the professional judgement and common sense of the experts who provide all the information included on the MSDS. This guideline cannot be considered to be a resource for providing <u>all</u> information necessary for full compliance with rules, regulations or laws. Each company and MSDS preparer must diligently remain aware of all legal requirements relating to MSDSs, both current and evolving future ones.

A. ORGANIZATION OF THE GUIDELINE

The rest of this document presents information in the order that an MSDS preparer is likely to need it.

Chapter 4 discusses the steps used to prepare an MSDS including:

- formatting issues such as recommended section headings and order of appearance
- principles for the effective communication of information in MSDSs
- general information and principles common to all MSDSs (e.g., supplier information, page numbering, use of units of measurement)
- collecting information and determining hazards

Chapter 5 discusses individual sections of an MSDS, including purpose, content and audiences. Where appropriate, brief examples are given.

Chapter 6 contains a brief discussion on evaluating the completed MSDS.

Chapter 7 presents examples of MSDS layouts and/or specific sections of MSDSs to illustrate some concepts described by this guideline. [chapter to be added]

The glossary defines terms used in this guideline as well as some terms commonly used in MSDSs. The glossary also offers some suggestions for alternative wording for technical terms.

B. AUDIENCES FOR MSDSs

In each discussion of an MSDS section, the likely audiences for the information are identified. This is done to help you decide on the technical language level to use with each section and supports one of the basic purposes of this guideline. Under the OSHA HCS, manufacturers provide MSDSs to their customers and these employers make MSDSs available to their employees. Other statutes and practices make MSDSs available to a wider audience. The audiences are identified throughout the guideline as:

- Community Member
- Emergency Responder
- Employee
- Employer
- Environmental Professional
- Medical Professional
- Occupational Health & Safety Professional

As a general rule, the language used in an MSDS should be understandable to the widest audience possible. At the same time, recognize that technical data must often be presented in technical language in order to be useful to some intended audiences.

C. CLASSIFICATION TERMS

This guideline uses the terms MANDATORY, RECOMMENDED, and OPTIONAL when discussing both specific elements and general items to include in an MSDS. These classifications appear throughout the guideline and reflects the need to include information according to the following criteria:

MANDATORY(M):	Required by the U.S. OSHA Hazard Communication Standard (29 CFR 1910.1200)
RECOMMENDED(R):	Should be included for completeness, content and format consistency, clarity, and readability of MSDSs, unless inappropriate
OPTIONAL(O):	May be useful information for some materials

CHAPTER 4: PREPARING AN MSDS

This chapter of the guideline provides information to an MSDS preparer that will help structure and organize an MSDS. Collecting information and conducting a hazard determination for a material is also discussed, along with presenting the information to readers of an MSDS.

A. MSDS ORGANIZATION

This guideline considers two main uses of the MSDS to be:

- a training tool for workers
- a resource for emergency responders

The effectiveness of MSDSs for these purposes will be improved by making the information available in the same order so it is easier for the reader to find, regardless of the supplier of the MSDS. Therefore, this guideline recommends titles and a specific order for the sections of an MSDS. The guideline also recognizes that for some materials, it will be appropriate to include additional information in optional sections for other audiences.

The logical sequence of questions which the MSDS should answer and leads to the recommended order, is listed below. Where appropriate, key information for emergency responders should be located near the beginning of the MSDS because it often is needed quickly. In cases where the information provided answers a question pertaining to both the health and safety of people and the environment, information pertaining to people should be placed first.

WHAT IS THE MATERIAL AND WHAT DO I NEED TO KNOW IMMEDIATELY FOR AN EMERGENCY?

Material Identification

- links the MSDS to the material and to lists of hazardous materials
- may also provide an emergency overview

Chemical or Hazardous Components

- lists the OSHA hazardous components
- may also list non-hazardous components
- may also include exposure guidelines of components

WHAT ARE THE POTENTIAL HAZARDS AND WHAT SHOULD I DO IF A HAZARDOUS SITUATION OCCURS?

Potential Health Effects

- provides information on the possible adverse health effects that might result from reasonably foreseeable use and misuse

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First Aid

- o provides instructions if an exposure requires immediate treatment
- o may also include instructions to medical professionals

Fire and Explosion

- o describes the fire and explosive properties of the material
- o provides basic fire-fighting guidance

Reactivity

- o identifies conditions which may result in a hazardous situation or reaction

Spill and Leak Response

- o provides instructions for responding to spills, leaks, or releases of the material

HOW CAN HAZARDOUS SITUATIONS BE PREVENTED?

Personal Protection/Exposure Controls

- o provides guidance on personal protective equipment
- o provides information on engineering controls
- o may also include exposure guidelines

Storage & Handling

- o provides information on appropriate storage and safe handling practices

IS THERE ADDITIONAL TECHNICAL OR SUPPORTING INFORMATION?

Physical and Chemical Properties

- o provides additional data that can be used to help characterize the material and design safe work practices

Toxicological Information

- o can be used to provide toxicological information on the material and/or its components

Ecological Information

- o can be used to provide information on the environmental effects of the material

Regulatory Information

- o can be used to include regulatory information the supplier would like to tell about the material

Supplemental Information

- o can be used to provide other information (including waste management/disposal)

All sections from Material Identification through Physical and Chemical Properties should appear, in the above order, on all MSDSs. Other sections may not always apply.

This guideline recommends that certain types of information be placed within certain sections. Because information has more than one purpose, some flexibility in placement is recognized. For example, exposure guidelines may be placed in the Chemical Components section along with the names of components; or they may appear under Personal Protection/Exposure Controls. Likewise, components listed strictly for state right-to-know purposes may be placed in a Chemical Components section or under the optional Regulatory section.

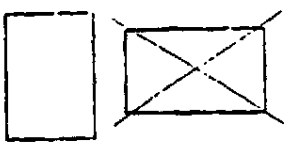
B. APPEARANCE/COMMUNICATION PRINCIPLES

Preparing a material safety data sheet involves collecting facts from a wide variety of subject areas and summarizing them. The result must be understandable and useful to a diverse audience, without oversimplifying the information so much that it is no longer useful to a trained specialist. The MSDS should be designed for use in the workplace and in an emergency where the user is under stress, under time constraints and may have poor visibility. Writers must recognize that the MSDS may be read for the first time in an emergency and could be the only immediate source of information on the material.

Some of the following suggestions may be useful for MSDS preparers:

Appearance:

For uniformity and filing, as well as for further electronic distributions, a vertical (portrait) format is recommended:



The layout should be simple, with well marked and identified sections. The text should be horizontal so the text flows from left to right, as is natural for English readers.

Avoid right justification[2] of text since this makes it more difficult to control eye movement and to read, especially for an impaired or poor reader.

Avoid frequent variation of line spacing, especially when trying to crowd more text onto a page or into a section.

Use space to separate fields and sections so reading is simplified.

Use simple type styles. Ornate styles are more difficult to read. Also avoid using a variety of type styles on the same MSDS.

Long strings of text typed in all capital letters are more difficult to read.

Arabic numbers (e.g., 1, 2, 3) are more familiar than Roman numerals (e.g., I. II, III) to the average reader.

Generally 10-14 point type size is easily readable for an MSDS. Type sizes of 12 or 14 points are usually considered easily readable. A 10 point type size is the minimum that is easily readable.

EXAMPLE:

This is 6 point type

This is 8 point type

This is 12 point type

Printed type should be clearly legible.

Do not depend solely on color to highlight heading or text. Some users may be color blind.

The use of reversal effects (e.g., white letters on dark background) for large blocks of text can decrease readability.

Avoid pictograms and symbols, especially without training programs. If you do choose to use them, use only extremely common ones to avoid ambiguity and unfamiliarity.

Avoid using footnotes on the MSDS. Many readers are unfamiliar with them. Instead, put information in parentheses within the sentence.

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[2] Right justification is when the margins on the right hand side are even, or lined up; usually done by using uneven spacing.

Remember that the MSDS may be electronically reproduced and/or transmitted (e.g., faxed, copied or scanned). Small or ornate print, color, and symbols may not be readable on a receiving end.

Reading Level and Comprehension:

One of the greatest challenges in preparing a material safety data sheet is writing so that various audiences can read and understand the information. Reading levels of users vary widely. The target audiences range from an untrained person needing general information to a highly trained professional. The information being conveyed is often very technical and must be complete enough for the specialist and yet be understandable for the less trained MSDS user. An additional challenge is that the target audiences change from section to section. Therefore, the reading level should change as well to adapt to the target audiences.

Word choice and sentence structure greatly affect reading level and comprehension. The following rules of thumb may be helpful to improve the readability and comprehensibility of the MSDS.

Keep sentences short and direct. Use no more than two subordinate clauses. Use the active voice as much as possible.

EXAMPLE: Acid causes skin burns. (active)
Burns to the skin are caused by acid. (passive)

Sentences that include a long string of effects or other items can be made clearer by putting them into a list.

EXAMPLE: Inhalation of this material can cause:
- Eye, nose and throat irritation
- Shortness of breath
- Coughing
- Sneezing

Use short words of one or two syllables as much as possible. Choose commonly used, familiar words, but avoid colloquialisms and slang.

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Use only common abbreviations and acronyms, and then give their definition as soon after their first use as possible. Occasionally however, an abbreviation or acronym may be so familiar to intended audiences that it may be used without a definition. In fact, some may be more familiar than the full name (e.g., OSHA, EPA, SARA, ^{o}F and ^{o}C.

Avoid unnecessary technical language and jargon except for information essential to appropriately trained individuals. When technical language is necessary in sections targeted for non-technical audiences, it is advisable to also include a less technical explanation. Refer to the glossary for examples of some useful alternatives for technical words.

Responses to MSDSs from workers and customers can be very useful in determining comprehension and the readability of MSDSs.

The use of a consistent statement or phrase is beginning to gain popularity, especially where translation becomes a consideration.

C. GENERAL CONTENTS

There are nine general items common to MSDSs. Most of these items are either mandatory according to the HCS or recommended to help the reader use the MSDS. The following information will be helpful when designing the overall layout of an MSDS.

1. SUPPLIER INFORMATION (MANDATORY)

Company name and mailing address must be listed on the MSDS. A telephone number where information can be obtained is mandatory. This identification should stand out so the reader can find it quickly. It's usually part of the material identification section, in the logo or letterhead, or near the top or bottom of the first or last page.

2. EMERGENCY NUMBERS (RECOMMENDED)

A company may have a specific telephone number for quick response to emergencies. This number should be readily identifiable on the MSDS.

Indicate if the telephone number has any restrictions, such as hours of operation (e.g., M-F 8:00 a.m. - 6:00 p.m. EDT or 24 hours) or limited to a certain type of emergency (e.g., medical, transportation).

Some companies use CHEMTREC's 24 hour toll-free telephone number to help respond to their chemical transportation emergencies. To become a part of this system, contact the Chemical Manufacturers Association (2501 M Street, NW, Washington, DC 20037).

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3. REVIEW/PREPARATION DATE (MANDATORY)

Every MSDS must have a preparation or revision date. The date may be displayed in different formats; it is often printed on every page of the MSDS. This helps the reader know that the entire MSDS is the same version.

If any other dates are used, they should be clearly labeled to avoid possible confusion.

4. UNITS OF MEASUREMENT (MANDATORY)

Numerical data must be presented with the appropriate units of measurement. The units of measurement should be those most appropriate for the United States. The MSDS can also include alternate units for other countries. (e.g., the inclusion of values expressed in metric units would be appropriate for materials shipped to Europe and Canada).

Indicate the temperature scale of items such as flash point and boiling point by inserting ^{o}F or ^{o}C (Fahrenheit or Centigrade). Pressure and other properties should also be shown in appropriate units. For example, pounds per square inch (PSIG) could be used for higher pressures and millimeters of mercury (mmHg) might be appropriate for below atmospheric pressure.

For properties that vary with temperature or other conditions (e.g., vapor pressure, viscosity, solubility), indicate the conditions under which the value was measured or calculated.

EXAMPLES: Boiling Point = 200^{o}F at 10 mmHg

Vapor Pressure = 4.1 PSIG at 70^{o}F.

Some properties are dimensionless. Density has units of weight per volume, while specific gravity is a dimensionless number. However, the standard against which specific gravity is measured (most commonly water or air) should be indicated. Properties such as pH are truly dimensionless, and readers of a data sheet who seek out pH values will know this.

5. PAGE AND SECTION NUMBERS (RECOMMENDED)

Page numbers make it obvious to the reader that the pages are in the proper order and none are missing. Section numbers allow for easy referencing. Numbering makes it possible to know when all pages and sections are in hand when telefaxing or copying an MSDS.

EXAMPLES: Page 1 or page 1 of 6

Continued on next page.

This is the end of Section 2.

This is the last page of this MSDS.

Number the recommended section headings (Material Identification through Physical and Chemical Properties) using Arabic numerals (e.g., 1, 2, 3) rather than Roman numerals (e.g., I, II, III) or letters of the alphabet.

6. REVISION INDICATORS (RECOMMENDED)

Readers need some type of revision indicator to help them determine what has been changed in an updated MSDS. Below are some methods used to indicate revisions in either a cover letter or in the Supplemental section of the MSDS.

EXAMPLES:

- This MSDS has been revised in the following section(s):

  1. Material Identification
  5. Physical and Chemical Properties

- A symbol in the right hand margin of this MSDS indicates that this line has been revised.

- The personal protection section of this MSDS was revised due to new recommendations.

- The pH was added to Section 5.

7. KEY/LEGEND (RECOMMENDED)

In general, try to avoid abbreviations since they are often confusing or unknown. If used, include a key/legend to define abbreviations or potentially ambiguous terms. For example, N/A has been used to denote "not available" and "not applicable." Without an explanation, the meaning is unclear.

8. MSDS NUMBER (OPTIONAL)

Suppliers often will assign a number to an MSDS to help track or identify it. If a MSDS number is used, it will usually appear on every page to make sure that all the pages are for the same product.

9. DISCLAIMER (OPTIONAL)

The disclaimer is usually intended to provide limits on the liability of the MSDS preparer when the specific material is used, misused, handled or stored in a way that is not customary and reasonably foreseeable. The use of a disclaimer and its language is usually decided by a preparer's legal counsel and is typically found at the end of an MSDS.

D. HAZARD DETERMINATION

1. COLLECTING THE INFORMATION

The HCS requires that the MSDS present the known hazards of the material. As a first step, a preparer needs to collect information about the material and/or its components. Types of information needed include:

- component information including all ingredients and known impurities, with Chemical Abstract Service (CAS) registry numbers and concentrations
- physical and chemical characteristics
- uses and reasonably foreseeable misuses of the material
- toxicity information obtained from:
  - internal company testing
  - MSDSs or letters from suppliers
  - published information
  - trade association testing or communication
- Appendix C of the Hazard Communication Standard which provides a recommended base listing of outside sources for toxicity information

Maintain a bibliography of references used in your evaluation. This information will provide needed internal documentation. It will also help an MSDS preparer (and others) update the MSDS, answer inquiries, and have a historical reference.

2. DETERMINING HAZARDS

The collected data must then be assessed to determine the potential physical and health hazards associated with the material. This assessment of the data is the hazard determination and forms the basis for what is written on the MSDS.

In assessing physical hazards of the material, primary sources of information are actual test data for the material or calculations from data on components. The HCS defines criteria for physical hazards, which are often numeric (e.g., flammable). Professional judgement plays an important role in determining physical hazards.

Health hazards are also defined by the HCS. These hazards are generally based on animal testing or human health effects as described in Appendix A of the Standard. With health hazards, evaluations tend to rely more on interpretation and professional judgement on relevance of the data than in the case of physical hazards. The mandatory OSHA Health Hazard Determination description is found in Appendix B of the Standard (Appendix 2 of this guideline).

Some helpful concepts to remember in evaluating health hazards are:

- o One scientifically valid study with statistically significant results is sufficient evidence to note the effect on the MSDS

- o Chemicals are considered "hazardous" if they:

  - are regulated by OSHA (29 CFR 1910, Subpart Z)
  - have established TLVs listed by ACGIH[3]
  - are listed by NTP, IARC, (see glossary) or OSHA as carcinogens or potential carcinogens
  - meet the criteria of Appendix B of the HCS

- o Evaluation of untested mixtures requires that the mixture be assumed to present the same health hazards as do the components above the OSHA trigger (see discussion in Potential Health Effects, Chapter 5)

- o If the preparer has evidence to indicate that an OSHA or ACGIH exposure threshold for a component (present below OSHA concentration trigger) may be exceeded, then the mixture shall be assumed to present the hazards of that component (see discussion in Potential Health Effects, Chapter 5)

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[3] Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment, American Conference of Governmental Industrial Hygienists, latest edition

The American National Standard for Hazardous Industrial Chemicals Percautionary Labeling, Z129.1-1988 also provides a discussion of the health hazard evaluation (Appendix 1).

When the physical and health hazards have been identified their impact on all relevant sections of the MSDS must be evaluated. The primary sections in which to present the details of the hazards are Potential Health Effects for health effects and Physical and Chemical Properties, Fire and Explosion and Reactivity for physical effects. Each of the other sections in the MSDS builds on or supports the hazards identified in this step.

Now you are ready to draft the MSDS text. The rest of this guideline will help you decide what information to include. It will also help you determine where the information should be located and the appropriate language levels to use.

CHAPTER 5: SECTIONS OF AN MSDS

A. Section 1: MATERIAL IDENTIFICATION

Material Identity

PURPOSE: This subsection names the material and links the MSDS to the label, internal lists of hazardous materials and shipping documents. This information is essential for all users of the MSDS.

SCOPE: The identity of the material must be directly linked to the name found on the material label (MANDATORY), internal lists of hazardous materials (MANDATORY) and/or shipping papers (RECOMMENDED). This name should appear prominently at the top of each page (RECOMMENDED). The material may also be identified by alternate names or synonyms (OPTIONAL). A company product code may also be added for easy identification (OPTIONAL).

If one generic MSDS is used to cover several grades or minor variants of a material, all grade or material names must be listed on the MSDS (i.e. as synonyms) or the MSDS must clearly delineate the range of materials included (MANDATORY).

EXAMPLE:

- the material name on the label is Methoquin AB; the MSDS must contain both the generic name (Methyl substituted quinolites) and the specific name Methoquin AB

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- MSDS uses Polypropylene 5000 series (5000-5999) as the material name and the label states the specific name Polypropylene 5005

Emergency Overview

PURPOSE: This overview describes the material's appearance and most significant immediate concerns for emergency response personnel.

SCOPE: State the appearance which includes the physical state of the material (RECOMMENDED). Include immediate health, physical, and environmental hazards associated with emergency response situations (RECOMMENDED). Labeling statements of hazard will often be suitable to describe the hazards listed in this section (OPTIONAL). Pointers to where key information can be found in the MSDS may be used (OPTIONAL).

This overview should be made a part of the Material Identification section. It can appear as a paragraph or as a series of ANSI-style label statements.

Items considered for the emergency overview include:

What does the material look like?
(color, physical form, shape)

Does it have a distinctive odor?
(sweet, acrid, sour)

The emergency overview should also address severe immediate hazards that may be encountered in an emergency situation. Following are some questions which may assist you in determining severe immediate hazards:

Is the material flammable, combustible or explosive?
(DOT definitions)

Does it present any significant or unusual fire or explosion hazard?
(e.g., travel to source of ignition, forms explosive mixtures)

Is the material an oxidizer, organic peroxide or pyrophoric?
(OSHA/DOT definitions)

Is the material shipped under pressure?
(e.g., compressed gas, liquified gas - DOT)

Are there significant reactivity hazards associated with emergency conditions?
(e.g., uncontrolled reaction with water or organics; will spontaneously decompose)

Is the material highly toxic (OSHA) or poisonous (DOT)?
If so, by what route of entry?

Is the material severely hazardous when inhaled?
(e.g., strong narcotic action, corrosive, displaces air causing an asphyxiation hazard, respiratory sensitizer, severe irritant)

Does it cause burns to living tissue?
(e.g., corrosive to skin, eyes, respiratory tract)

Does it cause severe skin or eye irritation?

Does it require specialized medical treatment for any contact or exposure?

Is it a confirmed or probable human carcinogen?
(NTP listed, IARC Class 1 or 2A, or OSHA listed carcinogen)

Can a single exposure result in other serious adverse health effects?
(e.g., confirmed or probable human teratogen)

Is it highly toxic to aquatic organisms?
(e.g., kills fish or algae at low concentrations)

Will it be persistent in the environment?
(e.g., PCB's, mercury)

Generally, if a hazard is not included on the label, it would not be included in the Emergency Overview.

If the material is not hazardous, you may want to include a statement indicating that it presents little or no hazard (if spilled) and/or no unusual hazard if involved in a fire (RECOMMENDED).

EXAMPLE 1: (Paragraph style with Pointers)

Mineral Acid

A colorless liquid which can react violently with water producing white clouds of toxic and corrosive vapor. Extremely corrosive to all body parts and may be fatal with contact, if swallowed or if inhaled. Exposures require

specialized first aid and medical follow-up. Can react violently with water producing clouds of toxic and corrosive vapor. Not flammable, but reacts with most metals to form flammable hydrogen gas.

See Sections 3, 4, 5, 6, 7, 8

EXAMPLE 2: (Label Style Without Pointers)

Inorganic Salt

White to grey solid. Causes irritation to skin and eyes. Not flammable.

EXAMPLE 3: (Label Style With Pointers)

Plastic Beads

Cylindrical beads in various colors.
Can burn in fire, releasing toxic vapors.

See First Aid and Fire and Explosion for details.

EXAMPLE 4:

a. (Paragraph Style Without Pointers)

Polymer Solution

A milky white liquid with a strong "sweet" odor. Can cause severe eye irritation and will burn if involved in a fire. Solutions are extremely slippery when spilled. Highly toxic to fish and other water organisms.

.....

b. (Label Style With Pointers)

Same Material

Milky white liquid with a strong "sweet" odor.
Causes eye irritation.
Will burn if ignited.
Extremely slippery.
Highly toxic to fish and other water organisms.
Health Hazards - Section 3
First Aid - Section 4
Fire & Explosion - Section 5
Spill and Leak Response - Section 6

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EXAMPLE 5: (Paragraph Style With Pointers)

Building Material That Contains Asbestos

A brown to green flat sheet that poses little or no immediate hazard. Repeated exposures to dusts via inhalation (breathing) can result in serious delayed effects. Does not burn, but may melt in a fire, releasing hazardous fibers.

Health Effects - Section 4

B. **Section 2: CHEMICAL OR HAZARDOUS COMPONENTS**

PURPOSE: This section must identify at least the components of a material that contribute to its hazard according to the HCS (MANDATORY). State or local regulations may require further disclosure. Some manufacturers may choose to identify all significant components of a material, and use the heading "Chemical Components." Other manufacturers may choose to identify only the chemicals that contribute to specific hazards, and use the heading "Hazardous Components". This information is useful to all MSDS users.

SCOPE: Chemical Components option:

- o List chemical name of all significant components (RECOMMENDED). Be sure to include hazardous components as defined by OSHA (MANDATORY). If one or more of the components is a trade secret, a company may so indicate in lieu of identifying the component. However, if the component is defined as hazardous by OSHA, that fact should also be included.
- o Provide percentages or ranges of percentages by weight or by volume (state which), unless percentages are trade secret (RECOMMENDED).
- o List corresponding CAS registry number, where appropriate, for each component (RECOMMENDED).
- o List OSHA PELs[4] , ACGIH TLVs, or established company exposure guidelines for components of a mixture (MANDATORY information, OPTIONAL placement; see Personal Protection/ Exposure Controls for discussion)

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[4] OSHA Permissable Exposure Limits; see Glossary

Hazardous Components option:

- o List chemical and common name of hazardous components as defined by OSHA (MANDATORY). If one or more of the hazardous components is a trade secret, a company may so indicate in lieu of identifying the component.

- o List chemical name of components for compliance with state or local right-to-know regulations (OPTIONAL).

- o Provide percentages or ranges of percentages by weight or volume (state which) for those hazardous components, unless percentages are trade secrets. (RECOMMENDED)

- o List corresponding CAS registry numbers, where appropriate, for each component. (RECOMMENDED)

- o List OSHA PELs, ACGIH TLVs, or established company exposure guidelines for components of a mixture (MANDATORY information, OPTIONAL placement; see Personal Protection/Exposure Controls for discussion)

C. Section 3: POTENTIAL HEALTH EFFECTS

PURPOSE: This section provides information on the potential adverse health effects and symptoms associated with exposure to the material, and its components or known byproducts, under reasonably foreseeable use, misuse, handling and storage conditions (MANDATORY). It also contains information required by certain regulations, related to human health hazard (e.g., positive carcinogenic potential determined by IARC, OSHA, NTP). The information should be presented in lay language since it is the primary source of health effect information for all audiences ranging from the community and employee to the health and medical professional. It will aid in determining handling and other procedures for the material. Supporting data, such as toxicology and epidemiology studies should be included in the separate Toxicological Information section of the MSDS (RECOMMENDED). If the preparer decides to place supporting data in this section, it should be placed at the end of the section so it won't distract the audience from understanding the potential health hazards of the product (RECOMMENDED).

SCOPE: This section includes information related to human health effects, if known or presumed likely. This section presents only relevant health effects and presents them in a way that can be quickly and easily understood.

The OSHA definition of health hazard is a chemical for which there is statistically significant evidence based on at least one scientifically valid study which demonstrates that acute or chronic health effects may occur in exposed individuals. (See Chapter 4 of this guideline for discussion of the hazard determination process.) Chemicals that must be addressed include:

- o OSHA regulated (29 CFR 1910.1000 Subpart Z) or ACGIH listed;
- o Carcinogens or potential carcinogens listed by IARC, NTP or OSHA;
- o All chemicals meeting criteria of Appendix B of the HCS.

The OSHA standard also establishes methods for evaluating the health hazards of untested mixtures. The basic rule is that if there is no appropriate testing on the mixture, you must address the health effects of each chemical in the mixture present at concentrations of 1% or greater (trigger is 0.1% for carcinogens or potential carcinogens) (MANDATORY). If a hazardous material is present in a mixture below the 1% concentration trigger (0.1% for carcinogens) and/but could be released in concentrations exceeding OSHA or ACGIH exposure guidelines, or present a hazard in those low concentrations, the mixture shall be assumed to present the same hazard as the components (29 CFR 1910.1200).

The mixture testing must address each of the data elements for which there are positive test results for the chemical components (MANDATORY). For example, if a component has been shown to cause reproductive effects on test animals, this information must be presented in the MSDS for the mixture unless the mixture has been tested in test animals and been shown not to cause reproductive effects.

The MSDS must include the following elements if available or known (MANDATORY):

- o Relevant route(s) of exposure (e.g., eye, skin, inhalation and ingestion)

- o Lengths of exposure (e.g., single, repeated, lifetime)

- o Severity of the effect (e.g., mild, moderate, severe)
- o Target organ(s) (e.g., liver, kidney, lung)
- o Type of effect (e.g., irritation, allergic skin response, rashes, birth defects, congestion, cancer, blood effects)
- o Signs and symptons of exposure
- o Medical conditions generally known to be aggravated by exposure to the material (see also Note to Physicians)

Identify the source of the hazard, (e.g., that the noted effect is due to a specific component within the mixture) (RECOMMENDED).

You must identify the carcinogens or potential carcinogens listed by OSHA, IARC, or NTP (MANDATORY). Include them in this section during the discussion of health hazards, or identify the hazard in this section and note the listing of the chemical in a separate section, such as the Hazardous Components, Regulatory, or Supplemental Information.

For data on effects in animals, the MSDS must list the anticipated health effects in this section if they are considered relevant to human health (MANDATORY). It may be appropriate to qualify the effect with the phrase, "based on animal testing this product is presumed to ..." This would permit the reader to understand that there are no human case histories or epidemiological studies to rely on.

This section should not include information on toxic effects which the author does not believe are relevant to humans. If appropriate, the potential effects should be mentioned here with a reference to the Toxicological Information section where appropriate discussion of the study can be made. This type of data presentation can be used to improve the readability of the document across audiences.

EXAMPLE 1: Potential health effects separate from toxicological data

Section 3: Potential Health Effects

EYE
- o May cause slight eye irritation.

SKIN
- o Prolonged exposure may cause skin irritation.
- o A single prolonged exposure is not likely to result in the material being absorbed through skin in harmful amounts.

INGESTION
- o Single dose oral toxicity is low.
- o Small amounts swallowed incidental to normal handling operations are not likely to cause injury; swallowing amounts larger than that may cause injury.
- o If aspirated (liquid enters the lung), may be rapidly absorbed through the lungs and result in injury to other body systems.

INHALATION EFFECTS
- o Excessive vapor concentrations are attainable and could be hazardous on single exposure.
- o Signs and symptoms of excessive exposure may be central nervous system effects such as sleepiness and unconsciousness.
- o May cause irregular heartbeats, especially under conditions of stress.

SUBCHRONIC EFFECTS (TARGET ORGAN)
- o Repeated excessive exposures may cause liver and kidney effects.

CHRONIC EFFECTS/CARCINOGENICITY
- o Has been shown to cause cancer in laboratory animals.
- o Is listed as a potential carcinogen by IARC.

[separate section which is located in the later part of the MSDS]

Optional Section: Toxicological Information

ACUTE ORAL EFFECTS
Single dose oral toxicity is low; the LD50 in rats given the material as a 10% corn oil solution was 1870 mg/kg for males and 3730 mg/kg for females. Liver necrosis was observed in survivors.

SKIN EFFECTS
The material was only slightly irritating to rabbit skin. The P.I. Score is 0.8 out of 8.0. The potential for absorption through the skin in acutely toxic amounts is low; the dermal LD50 in rabbits is 20,000 mg/kg.

EYE EFFECTS
The material was slightly irritating to the rabbit eye. The P.I. Score is 18 out of 110.

ACUTE INHALATION
The 4-hr LC50 in rats was 2500 mg/kg (357 ppm). CNS depression would be expected. May be a cardiac sensitizer based on structural analogy.

SUBCHRONIC EFFECTS
Repeated inhalation exposure of rats for four or seven hours per day for eight days at 1000 ppm resulted in ataxia, decreased body weight, increased SGPT, and caused increased relative liver and kidney weights with accompanying histologic changes of an adaptive nature. A two-week oral gavage study in rats given 300 mg/kg/day showed hepatic hypertrophy in females but not in males.

CHRONIC EFFECTS/CARCINOGENICITY
A bioassay was conducted by gavage in rats given 60 or 150 mg/kg/day and mice at 230 or 550 mg/kg/day. Both rats and mice showed evidence of increases in hepatocellular carcinoma and adenoma. The doses did not exceed the MTD and the material is listed as a potential carcinogen by IARC.

MUTAGENICITY
The material was negative in the Ames test. It bound covalently in vivo to DNA, RNA and tissue proteins from rats and mice when injected i.p.

EXAMPLE 2: Potential health effects incorporating toxicological data in this section

Section 3: Potential Health Effects

EYE
- o May cause slight eye irritation.

SKIN
- o Prolonged exposure may cause skin irritation.
- o A single prolonged exposure is not likely to result in the material being absorbed through skin in harmful amounts.

INGESTION
- o Single dose oral toxicity is low.
- o Small amounts swallowed incidental to normal handling operations are not likely to cause injury; swallowing amounts larger than that may cause injury.
- o If aspirated (liquid enters the lung), may be rapidly absorbed through the lungs and result in injury to other body systems.

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INHALATION EFFECTS
- o Excessive vapor concentrations are attainable and could be hazardous on single exposure.
- o Signs and symptoms of excessive exposure may be central nervous system effects such as sleepiness and unconsciousness.
- o May cause irregular heartbeats, especially under conditions of stress.

SUBCHRONIC EFFECTS (TARGET ORGAN)
- o Repeated excessive exposures may cause liver and kidney effects.

CHRONIC EFFECTS/CARCINOGENICITY
- o Has been shown to cause cancer in laboratory animals.
- o Is listed as a potential carcinogen by IARC.

[continuation of same section]

Background Toxicological Information

ACUTE ORAL EFFECTS
Single dose oral toxicity is low; the LD50 in rats given the material as a 10% corn oil solution was 1870 mg/kg for males and 3730 mg/kg for females. Liver necrosis was observed in survivors.

SKIN EFFECTS
The material was only slightly irritating to rabbit skin. The P.I. Score is 0.8 out of 8.0. The potential for absorption throught the skin in acutely toxic amounts is low; the dermal LD50 in rabbits is 20,000 mg/kg.

EYE EFFECTS
The material was slightly irritating to the rabbit eye. The P.I. Score is 18 out of 110.

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The 4-hr LC50 in rats was 2500 mg/kg (357 ppm). CNS depression would be expected. May be a cardiac sensitizer based on structural analogy.

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Repeated inhalation exposure of rats for four or seven hours per day for eight days at 1000 ppm resulted in ataxia, decreased body weight, increased SGPT, and caused increased relative liver and kidney weights with accompanying histologic changes of an adaptive nature. A two-week oral gavage study in rats given 300 mg/kg/day showed hepatic hypertrophy in females but not in males.

CHRONIC EFFECTS/CARCINOGENICITY
A bioassy was conducted by gavage in rats given 60 or 150 mg/kg/day and mice at 230 or 550 mg/kg/day. Both rats and mice showed evidence of increases in hepatocellular carcinoma and adenoma. The doses did not exceed the MTD and the material is listed as a potential carcinogen by IARC.

MUTAGENICITY
The material was negative in the Ames test. It bound covalently in vivo to DNA, RNA and tissue proteins from rats and mice when injected i.p.

D. Section 4: FIRST AID

PURPOSE: The HCS requires that MSDSs include appropriate emergency and first aid procedures (MANDATORY). This section should provide instruction, in lay language, when the results of exposure require immediate treatment (first aid) and when simple measures may be taken before professional medical assistance is available. First aid procedures should be brief and easily understood by any untrained individual.

SCOPE: Provide instructions by route of exposure (RECOMMENDED). Use subheadings to indicate the procedure for each route (e.g., inhalation, skin, eye and ingestion). Arrange these subheadings in the same order as those in the Potential Health Effects section, if appropriate (RECOMMENDED).

Include simple remedial measures (such as washing contacted area, removing of clothing, or removing the exposed individual) if it will lessen exposure (RECOMMENDED).

If applicable, include information on first aid for exposures that result from a specific method of handling as opposed to the toxicity of the material (e.g., frost bite from cryogenic liquids, or thermal burns from molten solids) (RECOMMENDED).

Include any known antidotes that may be administered by a lay person (RECOMMENDED). List them under the subheading "ANTIDOTES" or within the appropriate route of exposure.

Few specific antidotes and treatments for excessive exposure are known for most chemicals; even fewer are suitable for administration by lay persons. There are, however, some measures that may be useful to a general audience. Note any antidotes that require special training to use (RECOMMENDED).

EXAMPLE for cyanides and cyanide-like substances:

> Antidote: Always have on hand a cyanide first-aid kit. Break an amyl nitrite pearl in a cloth and hold lightly under nose for 15 seconds. Repeat five times at about 15 second intervals. Call a physician.

Use of "No Antidote Known" is not recommended as this may create confusion regarding the toxic potential of the material.

Indicate whether immediate medical attention is required and if delayed effects can be expected after exposure. When there is no specific information, the following types of information should be cited, based on sound professional judgement:

- Removal of exposed individual from area (to fresh air)
- Removal of material from individual
- Advice on removal and handling of contaminated clothing and shoes
- Advice on whether to contact a physican

In certain cases, it may be desirable to acquaint the physician or medical professional with an antidote or with a specific form of medical management. This can be done through a separate "NOTE TO PHYSICIANS" included within the First Aid section of the MSDS or under the specific area of first aid treatment (e.g., ingestion, skin contact)

NOTE TO PHYSICIANS

PURPOSE: This subsection conveys additional information on specific treatments. It is intended for use by medical professionals following an exposure and may be written in medically technical language.

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SCOPE: The information contained under "NOTE TO PHYSICIANS" can relate to both immediate and delayed effects. The information can address both treatment/therapy and diagonostic procedures. Some considerations include:

- Symptoms are presented in the Potential Health Effects section. Additional information may be presented here. Symptoms detectable only by clinical testing should be addressed here. Delayed effects may also be highlighted here.

- Recommend specific procedures for treatment. This would include details on emesis or lavage, antidotes, contraindications.

- For mixtures, discuss symptoms/treatment for the material and any components of health concern. List of possible "aggravated medical conditions" may be placed in the "NOTE TO PHYSICIANS" since knowledge of such conditions involves a medical judgement.

- When there is no specific information available, use statements of the following type:

  Treat symptomatically

  Treatment may vary with condition of victim and specifics of incident.

EXAMPLE: Note to Physician for corrosive and toxic gas

NOTE TO PHYSICIAN

- Any inhalation of this gas requires a period of bed rest and observation. A significant exposure should require hospitalization under medical observation for a period of 48-72 hrs. Delayed pulmonary edema and other respiratory effects may develop in that time period.

- Oxygen, intermittent positive pressure breathing, assisted respiration, and steroid therapy should be considered in treatment. Physical exertion potentiates the effects during the first 24-72 hrs.

- If burn is present, treat as any thermal burn, after decontamination.

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E. Section 5: FIRE AND EXPLOSION

PURPOSE: The information contained in this section is MANDATORY. It should describe:

- o the fire and explosive properties of the material,
- o appropriate extinguishing media,
- o basic fire fighting guidance.

This section is intended for employees, emergency responders, and occupational health and safety professionals. Language should be simple and easily understood. It should convey the properties of the material that a trained fire fighter needs to know before fighting a fire.

SCOPE: FLAMMABLE PROPERTIES

Certain physical and chemical properties describe the potential fire hazard of the material. Most properties are numeric (like flash point) and can be presented in tabular form. Present all values with both the appropriate units of measurement and where appropriate, the conditions of measurement.

It is recommended that all temperature values be expressed in degrees Farenheit to be most useful for emergency responders in the United States. An additional value expressed in degrees Centigrade can be useful on data sheets intended for distribution to other countries.

Include the following:

- o flash point (MANDATORY) and method (RECOMMENDED)
- o upper & lower flammable (explosive) limits in air (RECOMMENDED)
- o autoignition temperature (RECOMMENDED)
- o flammability classification, as defined by 29CFR 1910.1200 (RECOMMENDED)
- o flame propagation or burning rate of solid materials (RECOMMENDED)
- o known or anticipated hazardous products of combustion (OPTIONAL)
- o properties of both flammable and nonflammable materials that may initiate or uniquely contribute to the intensity of a fire (RECOMMENDED)

For solids:
- o potential for dust explosion
- o reactions that release flammable gases or vapors
- o fast or intensely burning characteristics

For liquids:
- o potential for release of flammable vapors

EXAMPLE for flammable liquid:

> Vapors may travel considerable distance to ignition source and flash back.

Text should also cover nonflammables that could contribute unusual hazards to a fire, such as strong oxidizing and reducing agents or peroxide formers.

EXAMPLE for a certain acid:

> Hydrogen gas is released upon contact with common metals.

EXAMPLE for alkali metal:

> Hydrogen and heat is released upon contact with water.

EXAMPLE text for an oxidizer:

> Strong Oxidizer. Contact with combustible materials may cause fire.

Reactivity hazards that enhance the fire and explosion potential should be stated here. Dangerous or explosive reactions with specific chemicals should be covered in the Reactivity Section.

The potential release of unique toxic products of combustion, such as carbon monoxide should be mentioned. Since a variety of combustion products are possible from a given material, depending on fire conditions, a brief statement may be all that is appropriate. General terms such as "acrid fumes including...," "possible cyanide containing fumes" or "highly toxic fumes of..." are appropriate when the material is likely to emit potentially hazardous combustion products. The MSDS should identify likely toxic components if the "smoke" (products of combustion) could be an unusually greater hazard than might occur in a typical structural fire.

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SCOPE: EXTINGUISHING MEDIA

List the proper extinguishing media. Logic should be similar to that found in the latest edition of the NFPA guide, "Fire Protection Guide on Hazardous Materials." This reference contains both extinguishing

media and fire fighting information for a number of specific chemicals. It is written so that the information can also be easily applied to chemicals not specifically listed in the text. Possible reactions of the subject material with the extinguishing media should be covered, such as using water on water-reactive materials or spattering and frothing from spraying water or foam on high flash point liquids.

EXAMPLE for flammable organic liquid:

> Use foam, CO2, or dry chemical extinguishants. Water may be ineffective. Water spray should be used to keep fire exposed containers cool.

SCOPE: FIRE FIGHTING INSTRUCTIONS

Instructions should be directed at protecting lives of those in the fire area (including firefighters), noting unusual impact on the environment and minimizing property loss.

Because you cannot anticipate the size of the fire, the amount of material(s) involved, the immediate surroundings and other factors, guidance should reflect the specific properties of the material. Text should cover appropriate actions for materials that emit highly toxic fumes where direct contact with the material would be hazardous, or when the material is explosive or an unusual fire hazard. Special environmental warnings, such as toxicity of fire water run off, should be made when appropriate.

EXAMPLE for a flammable gas:

> Stop flow of gas before attempting to extinguish fire. Gas could form explosive mixture and reignite.

EXAMPLE for explosive or highly toxic materials:

> Evacuate personnel to a safe area.

EXAMPLE for a heat sensitive material:

> Fight fire from maximum distance. Use extreme caution, as heat may decompose material and rupture containers.

EXAMPLE for a reactive monomer:

> Vapors are uninhibited and can cause plugs in relief vents.

For all fires, minimum protection stated in the MSDS text should include self-contained breathing apparatus (SCBA) and full protective equipment (Bunker Gear). For specific materials where this is not adequate protection, the text should note the specific hazard and direct the reader to the Personal Protective Equipment (PPE) subsection where the PPE logic is explained for emergencies.

EXAMPLE for most hydrocarbon flammables with no unusual toxicity:

> Keep personnel removed from and upwind of fire. Wear full protective equipment: eye/face (shield), body (full Bunker Gear), respiratory (SCBA). Cool container with water spray.

The NFPA "Fire Protection Guide on Hazardous Materials" has fire fighting guidance for many specific materials as well as for many classes of materials. Much of the text used in the NFPA reference is suitable for the MSDS. Where appropriate, include advice on fighting small and large fires.

This section is not intended to deal with proper handling and storage of flammables. Such information belongs in the Storage and Handling section.

F. Section 6: REACTIVITY

Purpose: The OSHA HCS requires disclosure of potential reactivity hazards (MANDATORY). This can be accomplished by describing the conditions that could result in a potentially hazardous chemical reaction (RECOMMENDED). This section is intended for employees and occupational health and safety professionals. Some information will also be useful for emergency responders.

Scope: The information presented in this section should be based, where available, on specific test data for the material. This section may also contain the specific data. However, the information may also be based on general data for the class or family of chemical if it adequately represents the anticipated hazard of the material. This section should address the following elements:

Chemical stability:
Indicate if the material is stable or dangerously unstable under normal ambient and anticipated storage and handling conditions of temperature and pressure (RECOMMENDED).

Conditions to avoid:
List conditions such as heat, pressure, shock, or other conditions that might result in a hazardous situation (RECOMMENDED).

Incompatibility with other materials:
Address chemicals and other materials that the product could react with to produce a hazardous situation (e.g., explosion, release of toxic or flammable materials, liberation of excessive heat). In determining incompatibility, consider the materials, containers, and contaminants that the product might be exposed to during transportation, storage, and use (RECOMMENDED).

Hazardous decomposition products:
List known and reasonably anticipated hazardous materials produced as a result of oxidation (burning), heating, or reaction with another material, including the production of flammable and toxic materials (RECOMMENDED).

Hazardous polymerization:
State if the material will polymerize releasing excess pressure, heat, or creating other hazardous conditions. Also state under what conditions the hazardous polymerization could occur (RECOMMENDED).

G. Section 7: SPILL AND LEAK RESPONSE

PURPOSE: This section contains information for responding to spills, leaks or releases in order to prevent or minimize the adverse effects on persons, property, and the environment. It is intended to be used by emergency responders and environmental professionals.

SCOPE: Include information on containment techniques, cleanup procedures, equipment and other emergency advice relating to spills and releases (MANDATORY). Include information specific to spill and leak response (RECOMMENDED). Where no special instructions are necessary, it may be useful to indicate that fact and reference other sections which could be helpful.

Containment techniques could include diking or capping procedures. Clean up procedures and equipment could include neutralization and decontamination techniques, sorbent materials, sweeping or vacuuming techniques, and the use of nonsparking tools and equipment. Personal protective equipment is specified in the Personal Protection/Exposure Controls section.

Other emergency advice would include evacuation procedures and special instructions necessary to protect the health and safety of the responders and others, as well as the environment. Examples could include removal of ignition sources for flammable materials, warnings to stay upwind, and securing the area.

There may be specific reporting requirements associated with spills, leaks, or releases. It may be useful to reference such reporting requirements in this section or in the separate Regulatory section (OPTIONAL).

H. Section 8: PERSONAL PROTECTION/EXPOSURE CONTROLS

Personal Protective Equipment (PPE)

PURPOSE: This subsection provides guidance for selection of personal protective equipment (PPE) needed to minimize the potential for illness or injury due to exposure from the material. This section is intended for employees, occupational health and safety professionals, and emergency responders.

SCOPE: Recommend PPE for each route of exposure - inhalation, skin and eye/face (MANDATORY). Note specific regulatory requirements for PPE (e.g., TSCA 5(e), OSHA chemical specific standards)

Emphasize the importance of minimizing or preventing contact or exposure to the product.

EXAMPLES:

Always wear a positive pressure air supplied respirator when handling this material.

Wear ... , as appropriate, to prevent ANY contact with this material.

Base recommendations on:

- the specific properties and hazards of the subject material;
- coupled with a general note on the circumstances requiring the recommended PPE.

Assume that the intended audience is trained in principles of proper selection and use of the PPE and can apply the training to the specific, local conditions of product handling or emergencies. Proper PPE training is an OSHA requirement for PPE wearers and program administrators.

Since the preparer does not know the local conditions of use and exposure (e.g., quantity of product handled, process equipment, ventilation), PPE guidance can, for the most part, only be of a general nature. You may, however, provide some specific guidance on PPE based on the properties of the material.

The text should cover PPE appropriate for:

- normal use and handling where the exposure potential has been determined.
- emergency situations where the potential for exposure is not well defined.

This section should contain guidance for PPE selection for fire fighting, spill clean up, and other emergencies (RECOMMENDED). The Fire and Explosion, and/or Spill and Leak Response sections should warn of the general need for PPE and refer the reader to the PPE section for instruction.

Fire fighting now universally requires full respiratory protection and bunker gear to protect the wearer from a variety of hazards associated with fire fighting. If the material has some toxic hazard that could render the bunker gear inadequate under some conditions, state this fact in the Fire and Explosion section, and refer the reader to the PPE section for special guidance.

Similiarly in a spill, proper PPE selection would depend on a number of circumstances, such as location and size of spill. Basic PPE guidance text in a MSDS needs to be reviewed before PPE decisions are made.

Recommend, when known, materials of construction, such as neoprene or butyl rubber, that provide the best chemical barrier. Conversely, identify materials known to be unacceptable. Specify PPE for handling radioactive materials or materials that routinely present a thermal hazard (e.g., molten chemicals, cyrogenics).

Note the specific regulatory requirements on PPE for the subject material (MANDATORY).

DATA ELEMENTS:

Eye/Face Protection

Specify type of eye protection, safety glasses, goggles, and face shield based on the potential hazard of contact. Include a general note on the circumstances requiring the PPE.

For a corrosive material, the text would require goggles and face shield when there is potential for contact.

EXAMPLE for a corrosive material:

> Wear safety glasses. Wear coverall, chemical splash goggles and face shield when eye and face contact is possible due to splashing or spraying of material.

Skin Protection

Recommend when known, the best barrier material (such as butyl rubber or neoprene) for PPE. Base the recommendation on laboratory permeation data, or appropriate field experience.

What to wear (e.g., gloves, boots, bodysuit) can only be specified in a general way. Allow the reader to make decisions based on both MSDS data and an assessment of the local exposure potential. What should be stressed is the relative importance of preventing contact.

EXAMPLE

Wear ...., as appropriate, to prevent ANY contact.

Wear ...., as appropriate, when possibility exists for contact with sprayed material.

Respiratory Protection

Identify different types of respiratory protection for different conditions.

The text should indicate if air purifying respirators may be used under certain circumstances. It should also specify the proper purifying element (cartridge or canister). As a reminder to the reader, state the limitations of the different types of air purifying respirators and the need to use positive pressure air supplied respirators at conditions exceeding the limits of air purifying devices or unknown contaminant levels; assume that the reader is trained in respirator selection and use, as required by federal regulations.

EXAMPLE

A NIOSH/MSHA approved air purifying respirator with an organic vapor cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air purifying respirators is limited. Use a positive pressure air supplied respirator if there is any potential for uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection.

If an air purifying respirator is not adequate protection, the text should specify a positive pressure, air supplied respirator.

Note or reference any respiratory requirements specified by regulation.

General

Include PPE recommendations on what to wear for any specific operation known to occur repeatedly with the majority of users, such as unloading a pressurized tank car, or spraying the material. Although optional, this information is valuable for high exposure potential operations with highly toxic materials. For example, you could recommend an air supplied respirator and full protective gear for an operation that normally presents virtually no exposure but has a potential for an uncontrolled release.

Engineering Controls

PURPOSE: This subsection discusses the engineering controls needed to help minimize chemical or physical hazards. This information is intended for employers and occupational health and safety professionals.

SCOPE: The MSDS must mention any generally applicable control measures, including engineering controls, that are known to the MSDS preparer (MANDATORY). This subsection contains any recommended engineering controls including ventilation needs and special process conditions needed to control exposures or other hazards of the material during its normal anticipated use.

You may want to include a statement such as "no specific controls are needed" for relatively innocuous materials or "handle only in fully enclosed systems and equipment" for materials that pose a high degree of hazard. Other good engineering practices may be included on an MSDS, such as use of safety showers and eyewashes.

EXAMPLE:

Use exhaust ventilation to keep airborne concentrations below exposure limits.

State the goals and limitations of ventilation systems and other engineering controls. Design criteria usually cannot be specified in an MSDS because of its complexity. This information is more appropriate in a technical design bulletin.

Exposure Guidelines

Purpose: This subsection identifies established exposure guidelines for the product and/or its components (MANDATORY). The information is intended for occupational health and safety professionals and employees.

Scope: OSHA PELs, ACGIH TLVs and established company exposure guidelines must be listed in the MSDS for a pure material and for the components of a mixture (MANDATORY). Include other exposure guidelines at your discretion. List the exposure guidelines in this specific section of the MSDS if not already listed in the Chemical/Hazardous Components section (see options at end of this section).

Exposure guidelines are numerical entries depicting an airborne concentration of a specific material and a time frame of exposure to that material. Indicate the units used to describe both the airborne concentration and the time frame (usually eight-hours, 15 minutes, or ceiling). Exposure guidelines should include the "skin notation" qualifier where applicable.

List the exposure guidelines for each component of the mixture as appropriate (MANDATORY). Certain chemical mixtures, such as a product that has a solvent base of several different hydrocarbons, contain components that may act upon the same organ system. The combined health effects may be additive. For these mixtures, refer to sources of appropriate explanations and formulae for determining the exposure limit for mixtures (RECOMMENDED).

EXAMPLE:

See 29CFR 1910.1000 (d) (2) and ACGIH Threshold Limit Values and Biological Exposure Indices booklet (Appendix C) for the determination of exposure limits for mixtures.

List mandatory exposure guidelines first, followed by any optional exposure guidelines (RECOMMENDED). It is not mandatory to mention that exposure guidelines are unavailable for the material or components of the mixture; however, providing this information would let the reader know that the lack of an exposure guideline was not an omission.

OPTION: Exposure guidelines placed with components

Section 2: Chemical (or Hazardous) Components

Component	Cas No.	% (by wt.)	Exposure Guidelines						Units
			OSHA		ACGIH		XYZ Company		
			TWA	STEL	TWA	STWL	TWA	STEL	
Chemical A	xxx-xx-x	40	100	150	100	150	50	100	ppm
Chemical B	xxxx-xx-x	30	50	N.E.	50	N.E.	50	N.E.	ppm
Chemical C	xxxxx-xx-x	20	200(s)	250(s)	200(s)	250(s)	200(s)	250(s)	ppm
Chemical D	xxxx-xx-x	10	N.E.	N.E.	250	N.E.	250	N.E.	ppm

N.E. - Not Established

(s) - Skin

OPTION: Exposure guidelines in Personal/Exposure Controls Section

Section 8: PERSONAL PROTECTION/EXPOSURE CONTROLS

Exposure Guidelines:

Chemical A - TWA 100 ppm, STEL 150 ppm (OSHA AND ACGIH)
- TWA 50 ppm, STEL 100 ppm (XYZ Company)
Chemical B - TWA 50 ppm, STEL N.E.
Chemical C - TWA 200 ppm, STEL 250 ppm (skin)
Chemical D - TWA 250 ppm (ACGIH and XYZ Company)

N.E. - Not Established

I. Section 9: STORAGE AND HANDLING

Storage

PURPOSE: Information about appropriate storage practices is mandatory. State the information in lay language (RECOMMENDED). This information is directed to employees, including those involved in storage or transport of the material.

SCOPE: Emphasis should be placed on avoiding unusual or unique conditions that could damage physical structures and equipment, as well as individuals working in contact with the stored material. Consider explosive atmospheres, corrosive conditions, and flammability hazards.

Emphasis should be placed on avoiding conditions that could damage or destroy the product and its container. Consider incompatible materials, evaporative conditions, and ambient conditions (e.g., pressure, temperature, humidity, vibration). You may also include information on conditions necessary to maintain the integrity of the material (OPTIONAL).

Handling

PURPOSE: This subsection provides guidance on safe handling practices that will minimize the potential hazards from the subject material. The information is intended for employees, occupational health and safety professionals, and employers (customers).

SCOPE: Emphasize precautions that are proper for the unique properties of the material rather than reviewing general good industrial practices.

Note or reference specific federal regulatory requirements on the safe handling of the material (MANDATORY).

List handling practices that:

- minimize contact between the worker and the material
- minimize continued contact after the material has been handled
- minimize risks from fire for flammables and combustibles or dangerous reactions with incompatible materials
- minimize release of the material to the environment

Include general warnings on what practices to avoid or restrict.

Standard precautionary label statements are suitable text for this section. (Refer to American National Standard for Hazardous Industrial Chemcicals - Precautionary Labeling; ANSI Z129.1-1988.)

EXAMPLE of general warning to prevent overexposure:

Do not breathe dust or vapor.

Avoid contact with skin, eyes or clothing.

EXAMPLE of hygiene recommendations to prevent continued exposure:

Wash throughly after handling.

Destroy contaminated shoes.

Include handling practices such as how to prevent vapor release, the need for a totally enclosed system and other useful practices to avoid while unloading.

EXAMPLE

Loosen closure cautiously before opening.

Avoid dust generation.

To prevent injury, include statements about use of non-sparking tools, explosion proof equipment and grounding when handling flammables.

EXAMPLE

Ground containers when pouring.

List which practices should be followed to avoid dangerous reactions, such as inert blanketing, using oil in equipment for strong oxidizers, or opening drums that could be under pressure.

EXAMPLE

If frozen, do not use steam to liquify.

Use only clean, dry utensils in handling.

Include precautions about handling molten or hot materials, and cryogenics.

Generally keep the precautionary statements simple and relate them to a specific property of the material.

EXAMPLE for physical states such as compressed gas, dusty solid, volatile liquid, or handled molten:

Handle [specific gas] only in a totally enclosed system

EXAMPLE for a chemical property such as flammability or reactivity:

Use of non-sparking or explosion-proof equipment may be necessary depending upon type of operation

EXAMPLE for toxic properties such as corrosive, readily absorbed through the skin or highly toxic via inhalation:

Use adequate ventilation to keep airborne concentrations below exposure limits

J. Section 10: PHYSICAL AND CHEMICAL PROPERTIES

PURPOSE: This section identifies the physical and chemical properties that characterize the material (MANDATORY). This information is useful in determining proper product handling procedures. All data sheet users may use some or all of this information.

SCOPE: List and include data, when known, on the following characteristics:

Recommended Characteristics
Appearance
Odor
Physical state (recommended, if not described in Material Identification)
pH
Vapor pressure (include reference temperature)
Vapor density
Boiling point
Freezing/melting point (specify)
Solubility in water
Specific gravity or density

These characteristics should always appear on an MSDS. Clearly identify if specific characteristics do not apply or for which data are not available.

Other properties may be specific to only certain materials. When applicable, include data on the following characteristics:

Optional Characteristics

Softening point
Evaporation rate
Viscosity
Bulk density
% volatile
Octanol/water partition coefficient
Saturated vapor concentration
Molecular weight

You do not need to list these characteristic names if data are unavailable.

Identify appropriate units of measurement for characteristics (see discussion in Chapter 4 on Units of Measurement).

K. Optional Section: TOXICOLOGICAL INFORMATION

Any connection here w/page 2?

PURPOSE: This section provides information on toxicity testing of the material and/or its components (OPTIONAL). It is intended for medical professionals, occupational health and safety professionals, and toxicologists.

SCOPE: This section may contain background data (either positive or negative) used to determine the hazards presented in the Potential Health Effects section. Include studies of questionable human relevance if not

mentioned in Potential Health Effects and if discussion will assist in the evaluation of the material. The following data types could be addressed:

- o Acute data (e.g., LD50 (oral & dermal), irritation scores, LC50 (inhalation))
- o Subchronic (e.g., for determination of target organs, effect and no-effect levels, species differences, type of effect)
- o Special Studies such as:
  - Epidemiology
  - Carcinogenicity
  - Teratogenicity
  - Reproductive effects
  - Neurotoxicity
  - Mutagenicity
  - Other studies relevant to material

In some cases there may be a wealth of testing on the components of material, or on the material itself. If so, it may be desirable to summarize the results either by route of exposure or end-point of the test, whichever is most relevant.

L. Optional Section: ECOLOGICAL INFORMATION

Ecotoxicological Information

PURPOSE: The information in this subsection is intended to help environmental professionals predict how the material will interact with living organisms following its release into the environment. It may also be useful in treatment of wastes (OPTIONAL).

SCOPE: List effects on plants and animals such as fish, birds, and other aquatic and terrestrial species and plants. You may want to include a summary or environmental assessment statement.

Consider including data on:

- o algal and lemna growth inhibition
- o acute and long term toxicity to fish and invertebrates
- o toxicity to plants (aquatic and terrestrial)
- o acute and dietary toxicity in birds

Chemical Fate Information

PURPOSE: This subsection contains information that can be used by environmental professionals to determine how long a material may persist and how it will be distributed in the environment or waste treatment systems. This

information will help the reader determine environmental persistence, treatability of the material, and measures useful for spill control.

SCOPE: Include information on environmental degradation studies, oxygen demand, soil mobility, reaction rate studies and bioaccumulation/bioconcentration in organisms.,

M. Optional Section: REGULATORY INFORMATION

Transportation

PURPOSE: This subsection provides basic regulatory transportation information. This information will help a knowledgeable user prepare a material for shipment and is important to the employer, distributor, internal and customer transportation/shipping departments and emergency responders.

SCOPE: Include the U.S. Department of Transportation (DOT) classification/description necessary to ship a material within, to, or from a place in the U.S. This section is not intended to contain every regulatory detail involving the transportation of a material. International regulatory transportation information may also be included.

Include DOT basic description consisting of:

- Hazardous Materials Description/Proper Shipping Name
- Hazard Class
- Identification Number

Indicate if a product is not regulated by DOT or if the classification changes based on quantity, packaging or method of shipment.

An optional way to provide transportation information is to include a telephone number to contact for special instructions.

Additional elements may include:

- Other DOT requirements such as technical names, hazardous substances/reportable quantities, modal restrictions, packaging, labeling, or exemptions,

- Classification/descriptions under International Transportation Regulations including :

  IMO (International Maritime Organization) regulations pertaining to water shipments

ICAO (International Civil Aviation Organization) and IATA (International Air Transport Association) regulations pertaining to air shipments

Transport Canada regulations for shipping

ADR (European Agreement Concerning the International Carriage of Dangerous Goods by Road)

RID (European Agreements Concerning the Carriage of Dangerous Goods by Rail)

U.S. Federal Regulations

PURPOSE: This subsection provides information on the regulatory status of materials (including their components) and their regulated uses. The information will be useful for compliance with various health, safety and environmental laws and regulations, and is aimed at employers and regulatory compliance personnel.

SCOPE: Address U.S. federal regulations that you wish to cover. Examples are: OSHA, TSCA, FIFRA, CERCLA, EPCRA (SARA Title III), and CAA, CWA, SDWA, CPSA, DEA and FDA/USDA. (Acronyms are defined in the glossary.)

Address the status of the material and its components under OSHA with a simple statement about whether the product is considered to be hazardous as defined by the OSHA HCS (29 CFR 1910.1200) or a chemical specific standard. (RECOMMENDED) This information may also be included in the section on Hazardous Components.

Indicate whether the material complies with TSCA Inventory requirements (RECOMMENDED).

Provide the status of the material under other sections of TSCA (OPTIONAL). These sections may include but are not limited to the following:

- 5(a)(2): Significant New Use Rule (SNUR)
- 5(e): Final Consent/ Orders
- 5(h)(3): Research and Development Limitations
- 12(b): Export Notification Requirements
- Exempt: Exempt from TSCA, registered pesticide under FIFRA

List the reportable quantity of the material under CERCLA (RECOMMENDED). If the product does not have a reportable quantity, include a statement to that effect.

Provide information on the material and/or its components as defined under SARA Title III (RECOMMENDED). These sections may include the following:

- o Section 302 Extremely Hazardous Substances: Provide the chemical identity of the listed substance, its threshold planning quantity (TPQ) and its reportable quantity (RQ).

- o Section 311/312: List the hazard class(es) of the material.

- o Section 313 Toxic Chemicals: Provide the chemical identity of the listed substance, its CAS number or other designated reference, and its percent (%) by weight.

International Regulations

PURPOSE: This subsection provides information on materials to those exporting outside the U.S. Its purpose is to help in complying with various health, safety, environmental and classification requirements. This information is directed at employers and regulatory compliance personnel.

SCOPE: This subsection may include information on WHMIS, EEC, EINECS, AICS and Canadian Inventory.

The following elements may be included in this section:

1. WHMIS: -hazard class(es)
   -hazard symbol(s)
   -trade secret notices

2. EEC: -Risk and Safety (R&S) statements
   -hazard symbols

3. EINECS: -a statement that the product complies with the provisions of the European Inventory

4. AICS: -a statement that the product complies with the provisions of the Australian inventory

5. Canadian Inventory (CEPA): -a statement that the product complies with the provisions of the Canadian inventory

6. MITI - a statement that the product complies with the provisions of the Japanese inventory

State Regulations

PURPOSE: This subsection provides information required by state right-to-know and other related state laws. When providing information, you can assume that the audience is relatively well versed on the subject. Audiences include occupational health and safety, and environmental professionals within your own company or your customers. Generally, the information will be specified by regulation and somewhat technical even though the audiences may be non-technical.

SCOPE: Most states have adopted the OSHA Hazard Communication Standard, but many have additional information requirements.

When evaluating the regulatory requirements for your materials, consult the state regulations for the states in which you manufacture or market the material. Some state agency contacts are listed in Appendix 3.

Types of state right-to-know requirements are described below. Do not consider this to be a complete presentation of the requirements. For more information, you should contact the states that affect your business.

- Many states require inclusion of state listed substances on the MSDS. There are often requirements to list these substances at below the OSHA HCS concentration levels. (Massachusetts, Pennsylvania, Rhode Island)

- States may require disclosure of non-hazardous ingredients (Pennsylvania).

- States may require specialized data requirements. Examples are volatile organic compounds or VOCs (California) and environmental effects (Vermont).

N. Optional Section: SUPPLEMENTAL INFORMATION

Waste Management Information (Disposal)

PURPOSE: This subsection provides information that may be useful in the proper disposal of the material. The information is primarily intended for environmental professionals who are responsible for waste management activities.

SCOPE: Designate whether or not the material (as waste) is a hazardous waste according to 40 CFR 261. If the waste material is designated a hazardous waste, include:

- o USEPA hazardous waste number(s)
- o description of the waste
- o hazard code (I, C, R, E, H, or T)
- o DOT hazard class code (01 through 16)

If the material (as waste) exhibits the characteristics of EP (extraction procedure) toxicity (40 CFR 261.24), and the concentration(s) of the contaminant(s) listed for USEPA hazardous waste numbers D004 through D017 is (are) known, such information may be presented in this section.

Properties, characteristics and other descriptors, such as heat value, particle size and volatile organic compound content, that are useful information in the filing of hazardous waste profile forms and authorization request forms, should be presented in the Physical and Chemical Properties section of the MSDS.

If the waste material is classified as an acute hazardous waste (hazard code H), disposal of the empty container and/or the container rinsate may also be regulated. Include information for handling this disposal.

The MSDS should advise the reader that waste disposal regulations within a state or locality may be more restrictive or otherwise different from federal regulations. A typical statement on the MSDS for alerting the reader may read:

> Please be advised that state and local requirements for waste disposal may be more restrictive or otherwise different from federal laws and regulations. Consult state and local regulations regarding the proper disposal of this material.

The MSDS should also alert the reader that any changes to the material as received (e.g., chemical additions to the material, processing of the material) may make the waste management information in the MSDS inappropriate. A typical statement on the MSDS may read:

> Chemical additions, processing or otherwise altering this material may make the waste management information presented in this MSDS incomplete, inaccurate or otherwise inappropriate.

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Statements that provide obvious information such as "Dispose in accordance with all applicable laws and regulations" do not add much to the MSDS.

The MSDS writer should also consider other pertinent information and/or references to regulations promulgated under the Clean Water Act, the Federal Insecticide, Fungicide and Rodenticide Act, and the Federal Water Pollution Act, when the handling/management of the material as waste is impacted by such regulations.

Label Text

PURPOSE: Label text is written using information provided in the MSDS and typically uses language recommended in the ANSI standard for Hazardous Industrial Chemicals-Precautionary Labeling (ANSI Z129.1-1988). Some companies will use label statements of hazards as part of the Emergency Overview and may not choose to repeat them in an optional label subsection. Other companies may wish to display their label statements as a service to customers or to help ensure label text will be consistent with MSDS text.

SCOPE: Label text consists of the statements of hazard and accompanying associated statements that have been selected from information in the MSDS for use on the label.

Hazard Rating Systems

PURPOSE: This subsection provides a location for hazard rating codes or symbols using one or more rating systems. This information is intended solely for the use of individuals trained in a particular system.

SCOPE: Several different hazard rating systems have been developed, and differences exist among the systems. Typically these systems include acute health hazards, flammability and reactivity, and may also include other hazards. Different systems can frequently result in different ratings, causing potential confusion to readers not familiar with a system. If an MSDS contains a hazard rating code or symbol, you should clearly identify which system was used to generate the rating. Internal company codes should not be used on MSDSs in general distribution.

Hazard ratings may also be included as an independent element in the Regulatory Information section.

The MSDS may contain a disclaimer indicating that the rating is intended only for individuals trained in the use of that particular system.

Some organizations may require that a company register its material with them before using the rating on the MSDS.

CHAPTER 6: EVALUATING THE COMPLETED MSDS

Once the text for each section of the MSDS has been drafted, the entire document must be evaluated. The following items need to be considered:

- Is the data/information included in each section consistent with the data/information in other sections? For example, is a high vapor pressure value indicated in the Physical and Chemical Properties section properly reflected by appropriate comments in Fire and Explosion, Reactivity, or other sections.

- Does the data/information included on the MSDS accurately reflect the data on hand and the writer's professional judgement?

- Is the data/information included on the MSDS consistent with the data/information included in other company literature, such as technical bulletins?

- Is the data/information included on the MSDS current? The HCS requires that the information on the sheet be current. Significant new hazards of a material must be included on the MSDS within 90 days from when the company becomes aware of the information. The information must then be communicated to the customer with the next shipment.

- Is there a system in place for collection and review of new information, and for updating the MSDS? The responsibilities under the HCS continue after an MSDS has been prepared and issued. It is essential that a system is in place to ensure that each MSDS is current.

- Have you followed the principles for effective communication in design, appearance and language use?

References
[not yet complete]

1. Occupational Safety and Health Administration's Hazard Communication Standard, 29 C.F.R. 1910.1200 et seq.

2. American National Standard for hazardous industrial chemicals - precautionary labeling; ANSI Z129.1-1988.

3. National Fire Protection Association's Fire Protection Guide on Hazardous Materials; 9th Edition; 1986.

4. American Conference of Governmental Industrial Hygienists' Threshold Limit Values and Biological Exposure Indices for 1989-1990.

FORMS AND EXAMPLES
[To Be Added]

GLOSSARY

INTRODUCTION

The glossary defines terms used in this Guideline as well as some terms commonly used in MSDSs. The glossary also offers suggested alternatives for some technical terms.

The glossary contains many regulatory definitions (current as of 1/90). Where multiple regulatory definitons exist (e.g., DOT, OSHA, EPA), the OSHA definition presented first, others are given as appropriate.

Non-regulatory definitions were chosen from a wide variety of reference materials commonly used in the hazard communications profession as well as from other commonly used in the hazard communicaitons profession as well as from other chemical-related regferences.

There are some terms whose definitions have been developed by the authors of this Guideline. Although these unique definitions convey the concepts presented in the text of Guideline, they are not meant to be used outside of the context of the Guideline.

The terms included in the glossary that are protected by copyright are being reprinted with permission of the sources listed below. The footnote numbers are shown on the left.

[3]- American National Standard for Hazardous Industrial Chemicals - Precautionary Labeling (ANSI Z129.1-1988). © 1988 American National Standards Institute, Inc.

[4]- The Condensed Chemical Dictionary (G.G. Hawley 11th ed.1987) © 1987 Van Nostrand Reinhold Company.

[5]- Websters Ninth New Collegiate Dictionary © 1989 Merriam Webster, Inc.

[7]- K. Verschueren, Handbook of Environmental Data on Organic Chemicals (2nd ed. 1983). © 1983 Van Norstrand Reinhold Company.

[8]- Dorland's Illustrated Medical Dictionary (E.J. Taylor 27th ed. 1988) © 1988 W.B. Saunders Company

[11]- Dorland's Pocket Medical Dictionary (24th ed. 1989). © 1989 W.B. Saunders Company

[12]- NFPA-49, Hazardous Chemical Data. © 1975 National Fire Protection Association, Quincy, Mass. 02269. This reprinted material is not the complete and official position of the NFPA on the referenced subject which is represented only by the standard in its entirety.

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TERM	DEFINITION
Acid	Acids are materials which have a pH of 0 to 6. Acids with pH in the 0 to 2 range are considered corrosive and will cause burns to skins and eyes. Acids will react with alkali material. [1]
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. [2]
Acute health effect	Health effects that usually occur rapidly as a result of short-term exposures, and are of short duration. Examples of some acute health effects are irritation, corrosivity (tissue destruction), narcosis, and death. [1] LAY LANGUAGE DESCRIPTION: Immediate Health Effect
Adequate ventilation	A condition falling within either or both of the following categories: (1) Ventilation sufficient to reducece levels of air contaminant below that which may cause personal injury or illness. (2) Ventilation sufficient to prevent accumulation to e concentra-tion of contaminant vapor in air at a level in excess of 25 percent of the level set for the lower flammable limit. [3]
Aerosol	A suspension of liquid or solid particles in a gas, the particles often being in the colloidal size range. Fog and smoke are common examples of natural aerosols; find sprays (perfumes, insecticides, inhalants, anti-perspirants, paints, etc.) are man-made aerosols. Suspensions of various kinds may be formed by placing the components, together with a compressed gas, in a container (bomb). The pressure of the gas causes the mixture to be released as a find spray (aerosol) or foam (aerogel) when a valve is opened. [4]
AICS	Australian Inventory Chemical Substances. A list fo chemical substances which may be used commercially in Australia. Similar to TSCA Chemical Substances Inventory. [1]
Alkali	Alkalis (or bases) are materials which have pH values from 8 to 14. Alkalis with pHs between 12 to 14 are considered corrosive and will cause severe damage to skin and eyes. [1]
Analgesia	Insensibility to pain without loss of consciousness. [5]
Anesthesia	Loss of sensation with or without loss of consciousness. [5]
Antagonism	When speaking of health effects it is the effect of one material or chemical that tends to counteract the effect of another material or chemical. Literally antagonism means to work against. [1]
Antidote	A remedy to relieve, prevent or counteract the effects of e poison. [2]

TERM	DEFINITION
Apnea	Temporary stoppage of breathing [1]
Article	OSHA defines an article as follows: A manufactured item: (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 does not release, or otherwise result in exposure to a hazardous chemical, under normal conditions of use. [6]
Asphyxia	A lack of oxygen in the blood and tissues, which causes unconsciousness, may be caused by materials which interfer with the exchange of oxygen and carbon dioxide (eg. ethylene) or by physical injuries creating strangulation. [1] LAY LANGUAGE DESCRIPTION: Suffocation
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. [2] LAY LANGUAGE DESCRIPTION:
Aspiration hazard	The danger of inhaling liquids into the lungs, particularly when unconscious or semi-conscious; a danger when inducing vomiting. May lead to aspiration pneumonitis, an acute inflammation of the lungs. [1]
ASTM	American Society for Testing and Materials is the world's largest source of voluntary consensus standards for material, 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. [2]
Ataxia	Loss of reflexes or muscle coordination. Depending on muscles affected signs can include - twitching, stumbling or unsteady walk, shaking, and slurred speech [1] LAY LANGUAGE DESCRIPTION: Loss of muscle control (describe known signs and symtpoms).
Atrophy	Used when referring to an effect on an organ or tissue where the size has decreased from the normal size. Atrophy can be attributed to heriditary factors, secondary to a disease process, or due to a chemical action. [1] LAY LANGUAGE DESCRIPTION: Shrinkage
Autoignition	The temperature at which a material will ignite spontaneously or burn. [1]
Bioconcentration	The build-up of a chemical in plants and animals to levels above what is found in its surroundings. [1]
BOD	Biochemical Oxygen Demand. An empirical bioassay type test that measures the dissolved oxygen consumed by microbial life while assimilating and oxidizing the organic matter present in organic waste discharges. It allows calculating the effect

TERM	DEFINITION
	of the discharges on the oxygen resources of the receiving water. [7]
Boiling point	The temperature at which a liquid becomes a vapor. Mixtures will not have a distinct boiling point, on the MSDS indicate either the initial boiling point or the boiling range. [1]
Bronchitis	Inflammation of the larger air passages of the lungs. It may be caused by disease or physical or chemical irritants. Symptoms are generally that of a chest cold and may include in addition chest pain and coughing. [1] LAY LANGUAGE DESCRIPTION: Inflammation of lungs
Bulk density	Mass of powdered or granulated solid material per unit of volume. [2]
Burning rate	The time it take a sample of solid material to burn a prescribed distance. The results are given in units of distance/time. [1]
°C	Degree Celsius or Centigrade, a unit of temperature. Using these scales, water boils at 100°C and freezes at 0°C. [1]
CC	Closed cup. Encountered in flash point measurements and indicates a test procedure using a closed cup. [1]
CAA	Clean Air Act (CAA) regulates air pollutants. It is administered by U.S. Environmental Protection Agency. [1]
Carcinogen	A material that causes cancer. A chemical is considered to be a carcinogen, by OSHA regulation, 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; or, (d) There is valid scientific evidence in man or animals demonstrating a cancer causing potential. [1]
Cardio-	A prefix that refers to the heart. [1]
Cardiovascular	A term indicating the heart and blood vessels. [1]
CAS Number	The Chemical Abstracts Service (CAS) Registry Number is a number assigned by the American Chemical Society's Chemical Abstracts Service. It identified a specific chemical substance. This number is very useful in searching for information, particularly where various chemical names and descriptions may be used. [1]
Caustic	See Alkali.
Ceiling Value	The maximum allowable human exposure limit for an airborne substance which is not to be exceeded even momentarily. Also see PEL and TLV. [2]

TERM	DEFINITION
Central Nervous System	The brain and spinal cord which control the activity of the entire System (CNS) nervous system. Both sensory and motor impulses. [1]
CERCLA	Comprehensive Environmentel 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. [1]
CFR	United States Code of Federal Regulations (CFR). It is a publicaton of the regulations that have been promulgated under United States Law. The CFR is divided into Titles. The following titles may be useful when following this guideline: Title 29 - Contains OSHA Hazard Communication Standard and other OSHA regulations Title 40 - Contains Environmental Protection Agency regulations, including TSCA Title 49 - Contains Department of Transporation (DOT) regulations Changes to the regulations are published in the Federal Register. These publications can be ordered through the *US Government Printing Office*. [1]
Chemical Family	A group of substances that have a chemical similarity. Example: acetone, methyl ethyl ketone (MEK), and methyl isobutyl ketone (MIBK) are the "Ketone" family; acrolein, furfural, and acetaldehyde are of the "aldehyde" family. [1]
Chemical	OSHA defines a chemical as any element, chemical compound or mixture of elements and/or compounds. [6]
Chemical Manufacturer [6]	An employer with a workplace where chemical(s) are produced for use or distribution.
Chemical name	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. [6]
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 for companies who have registed with them for this service. [1]
Chronic health effect	An adverse health effect may describe a health effect that occurs after a long-term exposure or a health effect that persists over a long-time or recurs frequently as a result of exposure(s). [1] LAY LANGUAGE DESCRIPTION: Delayed health effect or long term health effect.
Clastogenic	Giving rise to or inducing disruption or breakages, as of chromosomes. [8] LAY LANGUAGE DESCRIPTION: Causes damage to genetic material

TERM	DEFINITION
Closed system	System (Equipment or apparatus) designed and used to so that there is no release of the chemicals from the into the surroundings. Closed systems are indicated as a means to control exposures to hazardous materials or to conditions which would pose a physical hazard. [1]
COD	Chemical Oxygen Demand. The amount of oxygen required under specified test conditions for the oxidation of waterborne organic and inorganic matter. [7]
Combustible liquid	
-OSHA	Any liquid having a flashpoint at or above 100°F (37.8°C), but below 200°F (93.3°C), except any mixture having components with flashpoints of 200°F (93.3°C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture. [6]
-DOT	A combustible liquid is defined as any liquid that does not meet the definition of any other DOT classification and has a flash point at or above 100°F (37.8°C) and below 200°F (93.3°C) except any mixture having one component or more with a flash point at 200°F (93.3°C) or higher, that makes up at least 99 percent of the total volume of the mixture. [9]
Common name	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; e.g., the common name for dimethyl ketone is acetone. [6]
Component	A constituent part; ingredient. [5]
Compressed gas	
-OSHA	(i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40psi at 70°F (21.1°C); or (ii) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104psi at 130°F (54.4°C) regardless of the pressure at 70°F (21.1°C); or (iii) A liquid having a vapor pressure exceeding 40psi at 100°F (37.8°C) as determined by ASTM D-323-72. [6]
-DOT	The term "compressed gas" designates any material or mixture having in the container an absolute pressure exceeding 40psi at 70°F or, regardless of the pressure at 70°F, having an absolute pressure exceeding 104psi at 130°F; or any liquid flammable material having a vapor pressure exceeding 40psi absolute at 100°F as determined by ASTM Test D-323. [9]
Compressed gas in solution	DOT defines as a non-liquified compressed gas which is dissolve in a solvent. [9]
Conjunctivitis	Inflammation of the lining of the eyelid and covering of eye. [1] LAY LANGUAGE DESCRIPTION: Eye irritation

TERM	DEFINITION
Consumer commodity	DOT defines as "a material that is packaged and distributed in a form intended or suitable for sale through retail sales agencies or instrumentalities for consumption by individuals for purposes of personal care or household use. This term also includes drug and medicines." [9]
Container	OSHA defines as any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical. Pipes and piping systems, and engines, fuel tanks or other operating systems in a vehicle, are not considered to be containers. [6]
Cornea	The transparent part of the eye which coats the iris and pupil. Eye irritation studies grade the degree of damage seen in the cornea and the time until complete recovery as an endpoint [1]
Corrosive material -OSHA	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 of 49 CFR Part 173, it destroys or changes irreversible 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. [6]
-DOT	A corrosive material is a liquid or solid that causes visible destruction or irreversible alterations in human skin tissue at the site of contact, or in the case of leakage from its packaging, a liquid that has severe corrosion rate on steel. (a) A material is considered to be destructive or to cause irreversible alteration in human skin tissue if when tested on the intact skin of the albino rabbit by the technique described by DOT, the structure of the tissue at the site of contact is destroyed or changed irreversible after an exposure period of 4 hours or less. (b) A liquid is considered to have a severe corrosion rate if its corrosion rate exceeds 0.250 inch per year (IPY) on steel (SAE 1020) at a test temperature of 130°F. An acceptable test is described in NACE Standard TM-01-69. (c) Human experience or other data takes precedence over animal experiments. [9]
Cryogenic liquid	DOT defines as a refrigerated liquefied gas having a boiling point colder than -130°F (-90°C) at one atmosphere, absolute. [9]
Cutaneous	Related to the skin. See dermal. [2] LAY LANGUAGE DESCRIPTION: Of the skin
CWA	Clean Water Act. Federal law enacted to regulate water pollutants. CWA is administered by EPA. (99)
Cyanosis	A condition where the observable vascular body parts become bluish (e.g., nailbeds, lips, and skin) The condition is caused by a lower oxygen in the blood hemoglobin (e.g., in venous blood). Chemical such as carbon monoxide can reduce hemoglobin function. [1] LAY LANGUAGE DESCRIPTION: Blue skin and nails

TERM	DEFINITION
Dangerously reactive chemical	A chemical that is able to undergo a violent self-accelerating exothermic chemical reaction with common materials, or by itself. [3]
Decomposition	Breakdown of a material or substance (by heat, chemical reaction, electrolysis, decay, or other processes) into parts or elements or simpler compounds. [2] LAY LANGUAGE DESCRIPTION: Breakdown
Delayed hazard	The potential to cause an adverse effect which may not appear until a long period of time. Carcinogenicity, teratogenicity and certain target organ/system effects are examples of delayed hazards. [3]
Density	The mass (weight) per unit volume of a substance. For example, lead is much more dense than aluminum. [2]
Dermal	Relating to the skin. [2] LAY LANGUAGE DESCRIPTION: Skin
Dermatitis	Inflammation or irritation of the skin. Symptoms of dermatitis are rash, itching, blisters and crustiness. [1] LAY LANGUAGE DESCRIPTION: Skin irritation or rash
DOT	Department of Transportation. Headquartered in Washington, DC, it is the Agency of the Federal Government that publishes regulations pertaining to the transport of hazardous material sin 49 CFR. (10)
Dysplasia	Malformation; abnormal development of an organ or tissue [1]
Dyspnea	Difficulty in breathing; labored breathing or shortness of breath. [1] LAY LANGUAGE DESCRIPTION: Shortness of breath
EC_50	EC = Effective Concentration. A calculated value, derived experimentally, which represents a concentration which would effect to 50% of the tested population. [1]
ED_50	ED = Effective dose. The calculated dose, derived experimentally, which would produce a specified effect in 50 percent of the test population [1]
Edema	Swelling tissues or cells in which abnormally large amounts of fluid collect in intercellular spaces. [1] LAY LANGUAGE DESCRIPTION: Swelling
EDI	Electronic Data Interchange. Efforts have been underway to develop a standard for the transmission format for MSDS within the context of an EDI environment. [10]

TERM	DEFINITION
EEC	European Economic Community.
EINECS	European Inventory of Existing Chemical Substances. Similar to the TSCA inventory. Contains all substances marketed to 1982 in the European Community. Any substance, not in EINECS, is subject to premarketing notification to the appropriate authorities. (10)
Emphysema	A condition of the lungs in which it becomes difficult to exhale this may be due to mucus plugging passage ways. [1]
Employer	OSHA defines as a person engaged in a business where chemicals are either used, distributed, or are produced for use or distribution. Including a contractor or subcontractor. [6]
EPA	U.S. Environmental Protection Agency. An Agency regulatory and enforcement authority on environmental matters. Administers FIFRA, CWA, CAA, RCRA, TSCA and other environmentally related Acts. [2]
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. [2] LAY LANGUAGE DESCRIPTION: Study of disease origin
Epistaxis	Nosebleed, hemorrhage from the nose. [11] LAY LANGUAGE DESCRIPTION: Nosebleed
Erythema	Redness of the skin due to congestion of the capillaries. [11] LAY LANGUAGE DESCRIPTION: Redness rash
Excessive	Exceeding the usual, proper, or normal. As distinguished from words such as immoderate and inordinate, excessive implies an amount or degree too great to be reasonable or acceptable. [5]
Explosive -OSHA	A chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature. [6]
-DOT	An explosive is defined as any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion, i.e., with substantially instantaneous release of gas and heat, unless such compound, mixture, or device is otherwise specifically classified by DOT. [9]
Explosive limits	The range of concentration of a flammable gas or vapor (% by volume in air) in which explosion can occur upon ignition in a confined area. [4] The boundary-line mixtures of vapor or gas with air, which, if ignited will just

TERM	DEFINITION
	propagate the flame. They are known as the "lower and upper or explosive limits," and are usually expressed in terms of percentage by volume of gas or vapor in air. [12]
Exposure	OSHA defines as, "'exposure; or 'exposed' means that an employee is subjected to a hazardous chemical in the course of employment through any route of entry (inhalation, ingestion, skin contact or absorption, etc.) and includes potential (e.g. accidental or possible) exposure." [6]
Extremely flammable liquid	Any liquid having a flash point below 20°F (-6.7°C), unless the liquid is a mixture having components that constitute 99 percent or more of the liquid by volume and that have flash points of 20°F or greater. [3]
Extremely hazardous substance (SARA)	A substance listed under Section 302 of SARA Title III with certain reporting and emergency planning requirements. [1]
°F	Degree Fahrenheit, a unit for measuring temperature. On the Fahrenheit scale, water boils at 212°F and freezes at 32°F. [2]
First Aid	Immediate measures that can be taken by the victim or others persons in case of contact or exposure to a material, including ending the exposure and using materials generally available to reduce or eliminate adverse health effects. [1]
Flammable aerosol	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. [6]

TERM	DEFINITION
Flammable compressed gas	DOT defines as any compressed gas if any of the following occurs: (1) Either a mixture of 13 percent or less (by volume) with air forms a flammable mixture or the flammable range with air is wider than 12 percent regardless of the lower limit. These limits shall be determined at atmospheric temperature and pressure. (2) Using the Bureau of Explosives' Flame Projection Apparatus, the flame projects more than 18 inches beyond the ignition source with valve opened fully, or, the flame flashes back and burns at the valve with any degree of valve opening. (3) Using the Bureau of Explosives' Open Drum Apparatus there is any significant propagation of flame away from the ignition source. (4) Using the Bureau of Explosives' Closed Drum Apparatus there is any explosion of the vapor-air mixture in the drum. [9]
Flammable gas	-OSHA (A) A gas, that at ambient temperature and pressure, forms a flammable mixture with air at a concentration of thirteen (13) percent by volume or less; or (B) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than twelve (13) percent by volume, regardless of the lower limit. [6]
Flammable liquid	-OSHA Liquid, flammable means any liquid having a flashpoint below 100°F (37.8°C) except any mixture having components with flashpoints of 100°F (37.8°C) or higher, the total of which make up 99 percent or more of the total volume of the mixture. [6]
	-DOT A flammable liquid means any liquid having a flash point below 100°F (37.8°C), with the following exceptions: a) Any liquid meeting the definition of a compressed gas; b) Any mixture having one component or more with a flash point of 100°F, (37.8°C) or higher, that makes up at least 99 percent of the total volume of the mixture; A distilled spirit of 140 proof or lower is considered to have a flash point no lower than 73°F. [9]
Flammable range	The term flammable range designates the difference between the minimum and maximum volume percentages of the material in air that forms a flammable compressed gas. [9]
Flammable solid	
	-OSHA A solid, other than a blasting agent or explosive 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. [6]
	-DOT Any solid material, other than an explosive, which, under conditions normally incident to transportation is liable to cause fires through friction, 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 transportation hazard. Included in this class are spontaneously combustible and water-reactive materials. [9]

TERM	DEFINITION
Flash point	
-OSHA	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 D56-79) for liquids with a viscosity of less than 45 Saybolt University Seconds (SUS) at 100°F (37.8°C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or (ii) Pensky-Martens Closed Tester (See American National Standard Method of Test for Flash Point by Pensky-Martens Closed Tester, Z11.7-1979 (ASTM D93-79) for liquids with a fiscosity equal to or greater than 45 SUS at 100°F (37.8°C), or that contain suspended solids, or that have a tendency to form a surface film under test; or (iii) Setaflash Closed Tester (see American National Standard Method of Test for Flash Point by Setaflash Closed Tester (ASTMD 3278-78) Organic peroxides, which undergo autoeccelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above. [6]
-DOT	The minimum temperature at which a liquid gives off vapor within a test vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid. DOT prescribes certain test methods. [9]
Forseeable emergency	Any potential occurrence such as, but no 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. [6]
Freezing point	See melting point.
Fume	Smoke or vapor with solid particles. Often with metals chemical reactions or heating (as in welding) will produce volatilized metals which may lead to an series of occupational illness termed "metal fume fever". [7]
Gavage	Forced feeding, especially through a tube passed into the stomach. [11]
Gastric lavage	Medical procedure involving irrigation or washing out of the stomach. [1]
Gestation	The development of the fetus in the uterus from conception to birth; pregnancy. [2] LAY LANGUAGE DESCRIPTION: Pregnancy
Hazard Communication Standard	The Hazard Communication Standard is an OSHA regulation issued under 29 CFR Part 1910.1200. It details the requirements of MSDSs and labeling. [1]
Hazardous _____	The term hazardous is used by many federal and state agencies to describe substances subject to laws and regulations. Some examples are given below.
OSHA	A "hazardous chemical" is any chemical which is a physical hazard or a health hazard according to OSHA Hazard Communication Standard Criteria.
DOT	DOT describes a "hazardous material" as a substance or material which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and which has been so designated.

TERM	DEFINITION

A material, including its mixtures and solutions, that -
(1) Is listed in the Appendix to the DOT Hazardous Materials Table;
(2) Is in a quantity, in one package, which equals or exceeds the reportable quantity (RQ) listed in the Appendix to the hazardous Materials Table; and
(3) When in a mixture or solution, is in a concentration by weight which equals or exceeds the concentration corresponding to the RQ of the material, as shown in the following table:

RQ pounds (kilograms)	Concentration by weight	
	Percent	PPM
5000 (2270)	10	100,000
1000 (454)	2	20,000
100 (45.4)	0.2	2,000
10 (4.54)	0.02	200
1 (0.454)	0.002	20

CERCLA — A "hazardous substance" is any substance designated under section 311(b)(4) of the Clean Water Act; section 307(a) of the Clean Water Act; section 112 of the Clean Air Act and any RCRA hazardous waste. Each of these substances is assigned a "reportable quantity" or RQ. (9)

RCRA — RCRA describes a "hazardous waste" as any discarded material that is regulated under RCRA because it exhibits the characteristic of ignitability, corrosivity, reactivity or EP toxicity as described therein or because it is listed.

Hazard warning — Defined by OSHA as any words, pictures, symbols, or combination thereof appearing on a label or other appropriate form of warning which convey the hazard(s) of the chemical(s) in the container(s). [6]

Health hazard — 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 effect 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. [6]

Hepato — Prefix meaning liver. [1]

Hepatotoxins — Chemicals which product liver damage. [6]

LAY LANGUAGE DESCRIPTION: Liver toxins

Highly toxic chemical — OSHA defines as follows:
A chemical falling within any of the following categories:
(a) A chemical that has a median lethal dose (LD_50) of 50 milligrams or less per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each
(b) A chemical that has a median lethal dose (LD_50) of 200 milligrams or less per kilogram of body weight when administered by continuous contact for 24 hours (or less, if death occurs within 24 hours) with the bare skin of albino rabbits weighing between 2 and 3 kilograms each

TERM	DEFINITION
	(c) A chemical that has a medial lethal concentration (LC_50) of gas or vapor in air of 200 parts per million (ppm) or less by volume, 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. [6]
HMIS	Hazardous Material Information System. A system, developed by the National Paint and Coatings Association, designed to inform workers of the hazards of the chemicals they use and of means of protecting themselves from those hazards. It uses a numerical rating to indicate the level of hazard, with 4 being the highest and 0 the lowest. It addresses acute health, flammability and reactivity hazards. [18]
IARC	International Agency for Research on Cancer. [describe monograph program]
IC_50	A calculated statistical value whereby a concentration causes inhibition of an effect, behavior, or biological action to 50% of the treated subjects or animals.
Identity	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. ([6]
Ignition temperature	The minimum temperature required to initiate or cause self-sustained combustion in any substance in the absence of a spark or flame. [4]
Immediate hazard	A hazard with immediate effect(s). See acute health effects. [2]
Impervious	A material that does not allow another substance to pass through or penetrate it. [2]
Importer	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. [6]
Incompatible	Materials that could cause dangerous reactions by direct contact with one another. [2]
Inflammable	A synonym of flammable.
Ingestion	Taking in by the mouth. [2] LAY LANGUAGE DESCRIPTION: Swallowing
Inhalation	Breathing in of a substance in the form of a gas, vapor, fume, mist, or dust. [2] LAY LANGUAGE DESCRIPTION: Breathing
Inhalation hazard - DOT	A chemical that is a liquid having a saturated vapor concentration (ppm) at 68°F (20°C) equal to or greater than ten times its LC_50 (vapor) value (ppm), if the LC_50 value is 1000 parts per million (ppm) or less 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, provided such concentration, or condition, or both, are likely to be encountered by man when the chemical is used in any reasonable foreseeable manner. [9]

TERM	DEFINITION
Intubation	The administration of a test dose through a tube inserted into the nose, throat, or larynx. [1]
in vivo	Experiments in live animals. [1]
in vitro	Experiments with cells or tissues from organisms conducted outside of the organism. (99)
I.P.	Intraperitoneally. A route of administration of a material in which the material is injected in to the pertioneal (abdominal/pelvic) cavity. [1]
Iritis	Inflammation of the iris, the circular pigmented membrane behind the cornea, perforated by the pupil. [11]
	LAY LANGUAGE DESCRIPTION: Eye irritation
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. [6]
Irritating material	DOT defines an irritating material as a liquid or solid substance which upon contact with fire or when exposed to air gives off dangerous or intensely irritating fumes, such as bromobenzylcyanide, chloracetophenone, diphenylaminechlorarsine, and diphenylchlorarsine, but not including any poisonous material, Class A. [9]
Irritation	A condition of irritability, soreness, roughness or inflammation of a bodily part. [5]
I.V.	Injection into a vein. Not a common route of occupational exposure. [1]
Jaundice	A symptom of liver damage, characterized by yellow appearance of the skin and eyes. [1]
	LAY LANGUAGE DESCRIPTION: Yellowish skin
Lay language	Language that can be understood by the public at large. [1]
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". [2]
LEL	When speaking of toxicity data LEL = lowest effect level. It is the lowest dose used in a test which produced toxic effects. [13]

TERM	DEFINITION
LC_50	The calculated concentration of a material in air that is expected to kill 40 percent of a group of test animals with a single exposure (usually 1 to 4 hours). The LC_50 is expressed as parts of material per million parts of air, by volume (ppm) for gases and vapors, or as milligrams of material per liter of air (mg/l) or milligrams of material per cubic meter of air (mg/m^3) for dusts and mists, as well as for gases and vapors. [2]
LCL_0	Lethal Concentration Low - the lowest concentration of a substance in air, other than LC_50, which has been reported to have caused death in humans or animals. The reported concentrations may be entered for periods of exposure which are less than 24 hours (acute) or greater than 24 hours (subacute and chronic).
LD_50	A single calculated dose of a material expected to kill 50 percent of a group of test animals. LD_50 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. [2]
LDL_0	Lethal Dose Low - the lowest dose (other than LD_50) of a substance introduced by an route, other than inhalation, over any given period of time in one or more divided portions and reported to have caused death in humans or animals. (2)
Lacrimation	Secretion and discharge of tears. [2]
Lacrimator	A material which causes tearing in the eyes either from direct contact or vapors. [1] LAY LANGUAGE DESCRIPTION: chemical causing tearing
Lethargy	The condition of drowsiness, tiredness, or indifference. [11] LAY LANGUAGE DESCRIPTION: fatigue or slowness, tiredness
Liquified compressed gas	DOT describes as a gas which, under the charged pressure, is partially liquid at a temperature of 70°F. [9]
Malaise	A feeling of general discomfort, distress or uneasiness, an out-of-sorts feeling. [2] LAY LANGUAGE DESCRIPTION: flu-like
Material	
Material Safety Data Sheet (MSDS)	Written or printed material concerning a hazardous chemical which is prepared in accordance with OSHA regulations in 29 CFR 1910.1200. [6]
Melting point	The melting point or freezing point of a pure substance is the temperature at which its crystals are in equilibrium with the liquid phase at atmospheric pressure. The term "melting point" is used when the equilibrium temperature is approached by heating the solid. The terms melting point and freezing point are often used interchangeably, depending on whether the substance is being heated or cooled. [4]

TERM	DEFINITION
Mist	Liquid droplets suspended in air generated by condensation from the gaseous to the liquid state or by breaking up a liquid into a dispersed state of splashing, foaming, atomizing, or the like. [3]
MITI	Japanese Ministry International Trade & Industry. A chemical inventory system. [1]
Molecular formula	A written representation, using symbols, of a chemical entity. It shows the actual number and kind of atoms in a molecule. [4]
Molecular weight	Weight (mass) of a molecule based on the sum of the atomic weights of the atoms that make up the molecule. [2]
Mutagen	A substance or agent capable of altering the genetic material in a living cell. [2] LAY LANGUAGE DESCRIPTION: may damage genetic material
Narcosis	A state of stupor, unconsciousness, or arrested activity produced by the influence of narcotics or other chemicals. [2]
Narcotic	An material that produces narcosis. [1]
Nausea	Tendancy to vomit, feeling of sickness at the stomach. [2]
NCI	National Chemical 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. [2]
Necrosis	Death of tissue. Corrosive chemical may cause localized necrosis at site of contact which will lead to permanent damage and scarring. [1] LAY LANGUAGE DESCRIPTION: tissue destruction
Neoplasia	A condition characterized by the presence of new growths (tumors). [2] LAY LANGUAGE DESCRIPTION: tumor
Nephrotoxin	A material that may cause effects and potential injury to the kidneys. [1] LAY LANGUAGE DESCRIPTION: kidney toxin
Neuritis	Inflammation of a nerve. [11]
Neural	Describing a nerve or the nervous system [1]

TERM	DEFINITION
Neurotoxin	A material that effects the nerve cells and may produce emotional or behavioral abnormalities. [2] LAY LANGUAGE DESCRIPTION: cause effects on nervous system
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. [2]
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 material as they might be encountered under fire or related emergency conditions, using the familiar diamond-shaped label or placard with appropriate numbers or symbols. [2]
NIOSH	National Institute for Occupational Safety and Health, U.S. Public Health Service, U.S. Department of Health and Human Services (DHHS), amount 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. [2]
NLM	National Library of Medicine.
NOEL	No observed effect level - The highest dose of a substance used in a test which produces no observed adverse effects. [1]
Non-liquified compressed gas	DOT describes as a gas, other than gas in solution, which under the charged pressure is entirely gaseous at a temperature of 70°F. [9]
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. [2]
NTP	National Toxicology Program. The NTP publishes an Annual Report on Carcinogens which identifies substances that have been studied and ~~found to be~~ carcinogens, in animal or human evaluations. [2]
Odor threshold	The lowest concentration of a substance's vapor, in air, that can be smelled. [2]
Orel	Used in or taken into the body through the mouth. [2]
Organic peroxide	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. [6,9]

TERM		DEFINITION
ORM-A (DOT)		An ORM-A material is a material which has an anesthetic, irritating, noxious, toxic, or other similar property and which can cause extreme annoyance or discomfort to passenger and crew in the even of leakage during transportation. [9]
ORM-B (DOT)		An ORM-B material is a material (including a solid when wet with water) capable of causing significant damage to a transport vehicle from leakage during transportation. Materials meeting one or both of the following criteria are ORM-B materials: 1. A liquid substance that has a corrosion rate exceeding 0.250 inch per year (IPY) on aluminum (nonclad 7075-T6) at a test temperature of 130°F. An acceptable test is described in NACE Standard TM-01-69. 2. Specifically designated by name in the Hazardous Materials Table; (49 CFR 172.101). [9]
ORM-C (DOT)		An ORM-C material is a material which has other inherent characteristics not described as an ORM-A or ORM-B but which make it unsuitable for shipment, unless properly identified and prepared for transportation. Each ORM-C material is specifically named in the Hazardous Materials Table (49 CFR 172.101) [9]
ORM-D (DOT)		An ORM-D material is a material such as a consumer commodity which though otherwise subject to the DOT regulations, presents a limited hazard during transportation due to its form, quantity and packaging. [9]
ORM-E (DOT)		An ORM-E is a material that is not included in any other hazard class, but is subject to transportation regulations. Materials in this class include: 1 Hazardous waste. 2 Hazardous substances. [9]
OSHA		Occupational Safety and Health Administration, U.S. Department of labor regulates workplace conditions. [1]
Oxidizer	-OSHA	"Oxidizer" means a chemical other than a blasting agent or explosive as defined in §1910.109 (1) by OSHA, that initiates or promotes combustion n other materials, thereby causing fire either of itself or through the release of oxygen or other gases. [6]
	-DOT	An oxidizer is a substance such as a chlorate, premanganate, inorganic peroxide, or a nitrate, that yields oxygen readily to stimulate the combustion of organic matter. [9]
PEL		Permissible Exposure Limit is an occupations exposure limit established by OSHA's regulatory authority. it may be a time-weighted average (TWA) concentration or a maximum concentration never to be exceeded either instantaneously (CEILING) or during any 15 minute period (STEL). [1]
Pensky-Martens Closed Cup		A method for determining flash point. [2]
Peripheral neuropathy		Functional disturbances and/or pathological changes in the nerves in the extremities (hands, feet, ems and legs). [1]

TERM	DEFINITION
Personal protection	The act of protecting the body against contact with known or anticipated chemical hazards. Equipment for this purpose includes respirators, gloves, safety glasses, chemical resistant clothing, etc. (16)
pH	The symbol relating the hydrogen ion (H+) concentration of 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. [2]
Physical hazard	A chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive. [6]
Pneum(o)	Word element pertaining to lung, air or gas. [11]
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. [2] LAY LANGUAGE DESCRIPTION: deposits in lungs causing disease
Poison A-DOT	Extremely dangerous poisons, Class A, are poisonous gases or liquids of such nature that a ver small amount of the gas, or vapor of the liquid, mixed with air is dangerous to life. This class includes the following: (1) Bromacetone. (2) Cyanogen. (3) Cyanogen chloride containing less than 0.9 percent water. (4) Diphosgene. (5) Ethyldichlorarsine. (6) Hydrocyanic acid (>5%). (7) Methyldichlorarsine. (8) Nitrogen peroxide (tetroxide). (9) Phosgene (diphosgene). (10) Nitrogen tetroxide-nitric oxide mixtures containing up to 33.2 percent weight nitric oxide. (4)
Poison B-DOT	Class B poisons are those substances, liquid or solid (including pastes and semisolids), other than Class A poisons or irritating materials, which are known to be so toxic to man as to afford a hazard to health during transportation; or which, in the absence of adequate data on human toxicity, are presumed to be toxic to man because they fall within any one of the following categories when tested on laboratory animals: (1) Oral toxicity. Those which produce death within 48 hours in half or more than half of a group of 10 or more white laboratory rats weighing 200 to 300 grams at a single dose of 50 milligrams or less per kilogram of body weight, when administered orally. (2) Toxicity on inhalation. Those which produce death within 48 hours in half or more than half of a group of 10 or more white laboratory rats weighing 200 to 300 grams, when inhaled continuously for a period of one hour or less at a concentration of 2 milligrams or less per liter of vapor, mist, or dust, provided such concentration is likely to be encountered by man when the chemical product is used in any reasonable forseeable manner. (3) Toxicity by skin absorption. Those which produce death within 48 hours in half or more than half of a group of 10 or more rabbits tested at a dosage of 200 milligrams or less per kilogram body weight, when administered by continuous contact with the bare skin for 24 hours or less. The foregoing categories shall not apply if the physical characteristics or the

TERM	DEFINITION
	probable hazards in humans as shown by experience indicate that the substances will not cause serious sickness or death. (4)
Poison inhalation-DOT	A liquid having a saturated vapor concentration at 20°C (68°F) equal to or greater than ten times its LC_50 (vapor) value if the LC_50 value is 100 parts per million (ppm) or less. LC_50 for this definition is the concentration of vapor that, when administered by continuous inhalation of both male and female young albino rats for one hour, is most likely to cause death within 14 days to one half of the animals tested. The result is expressed in milliliters per cubic meter of air (ppm). If LC_50 data are available based on other than a one hour exposure, a factor may be used to determine an acceptable one hour value for the purposes of this section. If the only value available is for a 4 hour exposure, that value is multiplied by 2. This method of estimating a LC_50 value may not be used when a material causes death by direct pulmonary effect, i.e., by destruction of lung tissue as opposed to systemic poisoning. For these corrosive poisons, the exposure period must be one hour. (4)
Polymer	A high molecular weight molecule of repeating units. [1]
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. [2]
Pressure-generating	A chemical that falls within any of the following categories: (1) A chemical that generates pressure by spontaneous polymerization unless protected by the addition of an inhibitor, by refrigeration, or by other thermal control. (2) A chemical that may decompose to release gas in its container. (3) A chemical that pressurizes the contents of a self-pressurized container. [3]
Product name	The trade name of the manufacturer; some commodity chemicals are sold by their common name. [1]
Pulmonary edema	A build up of fluid in lungs. [1] LAY LANGUAGE DESCRIPTION: <u>fluid in the lungs</u>
Pyrophoric	A chemical that will ignite spontaneously in air at a temperature of 130°F (54.4°C) or below. (5) LAY LANGUAGE DESCRIPTION: <u>ignites in air with external heat source</u>
Pyrolysis	Transformation of a compound into one or more other substances by heat alone, i.e., without oxidation. Though the term implies decomposition into smaller fragments, pyrolytic change may also involve isomerization and formation of higher molecular weight compounds. [4]
RCRA	Resource Conservation and Recovery Act is environmental legislation aimed at controlling the generation, treating, storage, transportation and disposal of

TERM	DEFINITION
	hazardous wastes. It is administered by EPA. (1)
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 byproduct - 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. [2]
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. [2]
Registry number	See CAS number.
RQ	Reportable quantity. The quantity of a substance designated under CERCLA as hazardous the release of which requires notification to the National Response Center. (800) 424-8802. (9) For the purposes of the Department of Transportation, reportable quantity means the quantity specified for a substance in the Appendix to the Hazardous Materials Table. [9] For the purposes of SARA Title III, reportable quantity means, for any cercla hazardous substance the reportable quantity established therein for such substance, for any other substance the reportable quantity is one pound. (9)
Residue	As a part of the DOT regulations residue refers to the material remaining in a packaging, including a tank car, after its contents have been unloaded to the maximum extent practicable and before the packaging is either refilled or cleaned of hazardous material and purged to remove any hazardous vapors. [9]
Respiratory	Pertaining to respiration, including inspiration and expiration, diffusion of gases (oxygen and carbon dioxide) from alveoli to the blood and their transport from the body cells. [11]
RTECS	Registry of Toxic Effects of Chemical Substances. Published by NIOSH, RTECS is a compendium of the known toxic and biological effects of chemical substances. See NIOSH. (2)
Routes of exposure	The means by which material may gain access to the body, for example, breathing, eating or through the skin or eyes. [1]
SARA Title III	Title III of the Superfund Amendments and Reauthorization Act of 1986 also known as the Emergency Planning and Community Right-to-Know Act. It requires extensive submission of information about hazardous chemicals to EPA, States and local communities and establishes a national program of emergency planning. Administered by EPA.

TERM	DEFINITION
Saturated vapor concentraton	The concentration of vapor at equilibrium with the liquid phase at 20°C (68°F) and standard atmospheric pressure expressed in milliliters per cubic meter (expressed in ppm). This concentration may be calculated from the vapor pressure (VP) of the liquid at 20°C (68°F). The general formula is the vapor pressure divided by the standard atmospheric pressure and multiplied by a million. If the vapor pressure is expressed in millimeters (mm) of mercury the calculation would be $\frac{VP \text{ (in mm Hg)} \times 10^6}{760}$ = SVC (in ppm). [9]
S.C.	Subcutaneous. An administration of material done below the layers of the skin. [1]
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. [2] LAY LANGUAGE DESCRIPTION: allergen, causes allergic reaction, rash
Silicosis	A disease of the lungs (fibrosis) caused by the inhalation of silica dust. See pneumoconiosis. [2]
Slurry	A pourable suspension of a solid in a liquid. [1]
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 extinguishing agents and methods for a material. [2]
Solution	Any homogeneous liquid mixture of two or more chemical compounds or elements that will not undergo any segregation under conditions normal to transportation. [9]
Specific chemical identity	The chemical name, Chemical Abstracts Service (CAS) Registry Number, or any other information that reveals the precise chemical designation of the substance. [6]
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. [2]
Spill or leak	The methods, equipment, and precautions that should be used to control or clean up a leak or spill. [2]
Spontaneously combustible materials	Spontaneously combustible material (solid) means a solid substance (including sludges and pastes) which may undergo spontaneous heating or self-ignition under conditions normally incident transportation or which may upon contact with the atmosphere undergo

TERM	DEFINITION
	an increase in temperature and ignite. See flammable solid. [9]
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. [2]
STEL	Short term exposure limit. See TLV.
Strong oxidizer	A chemical that promotes oxidation readily and, on contact with combustible material, may cause fire. [3]
Subchronic (health effect)	It is the health effect occurring as a result of the repeated daily exposure of experimental animals to a chemical for part (approximately 10 percent) of a life span.
S.U.S.	S.U.S. means Saybolt Universal Seconds as determined by the Standard Method of Test for Saybolt Viscosity (ASTM D88-56) (reapproved 1968) and may be determined by use of the S.U.S. conversion tables specified in the Standard Method for Conversion of Kinematic Viscosity to Saybold Universal Viscosity or to Saybolt Fural Viscosity ASTM D2161-79 following determination of viscosity in accordance with the Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity) (ASTM D445-79). [9]
Synergism	The combined action of agents (chemicals) so that their joint effect is greater than the sum of their individual effect. [11] LAY LANGUAGE DESCRIPTION: _____ and _____ react together to be _____
Systemic toxicity	Adverse effects caused by a substance that affects the body in a general rather than local manner. [2] LAY LANGUAGE DESCRIPTION: Effects distant from contact or application site.
Tachycardia	A very rapid heart rate. [1]
Target organ effect	The effect of a material on an organ or system. Usually predicted from animal toxicology trials or evidenced from actual human exposures. The effects can be a result of direct contact with the organ or through systemic toxicity. OSHA provides examples of the types of target organ effects in Appendix A of the Standard. [1]
TCC	Tagliabue Closed Cup, a standard method of determining flash point.
TOC	Tagliabue Open Cup, a standard method of determining flash point.
Teratogen	A material which has the capability of causing malformations in the offspring as a result of exposure to the pregnant female. [1]

TERM	DEFINITION
	LAY LANGUAGE DESCRIPTION: May cause birth defects
Teratology	The study of birth defects (includes both structural and behavioral) [1]
Tinnitus	Ringing in the ears, or other noises like a buzzing [1]
	LAY LANGUAGE DESCRIPTION: Ringing in ears
TLV	Threshold Limit Value. Developed by ACGIH-recommended limitation for a material at or below which workers should have no health problems. TLV's are expressed as a time-weighted average (TWA) for an 8-hour day, as a short term exposure limit (STEL) maximum 15 minute exposures(no more than 60 minutes/day), or as a ceiling value (CE) which is not to be exceeded under any condition. Some TLVs have a "skin" notation which indicates that the materials readily absorb through the skin and may represent additional exposure by this route. The TLV's are presented in the annual publication, Threshold Limit Values and Biological Exposure Indicies for 19XX. [1]
Toxic chemical	
-OSHA	A chemical that falls within any of the following categories: (1) A chemical that has a median lethal dose (LD_50) or more than 50 milligrams per kilogram, but no more than 500 milligrams per kilogram of body weight, when administered orally to albino rats weighing between 200 and 300 grams each (2) A chemical that has a median lethal dose (LD_50) of more than 200 milligrams per kilogram, but no more than 1000 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 2 and 3 kilograms each (3)A chemical that has a median lethal concentration (LC_50) in air of more than 200 parts per million (ppm), but no more than 2000 parts per million (ppm) of gas or vapor by volume, or more than 2 milligrams per liter, but no more than 20 milligrams per liter, of mist, fume, or dust, when administered by continuous inhalation for 1 hour (or less, if death occurs within 1 hours) to albino rats weighing between 200 and 300 grams each. [6]
-SARA	A chemical so designated under Section 313 of SARA Title III. Its release into the environment must be reported annually to the EPA and to designated State officials. The presence of a toxic chemical in a mixture or trade name product must be notified to customers. This notification must be incorporated into or attached to the MSDS for that product.
Toxicologist	A scientist specializing in the study of the adverse effects of chemicals in animals. [1]
TPQ	Threshold Planning Quantity. The quantity of a SARA extremely hazardous substance that if equaled or exceeded at a facility triggers emergency planning provisions. (9)
Trade secret	
-OSHA	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

TERM	DEFINITION
	it. The chemical manufacturer, importer, or employer may withhold the specific chemical identify, including the chemical name and other specific identification of a hazardous chemical, from the material safety data sheet, provided that: (1) The claim that the information withheld is a trade secret can be supported; (2) Information contained in the material safety data sheet concerning the properties and effects of the hazardous chemical is disclosed; (3) The material safety data sheet indicates that the specific chemical identity is being withheld as a trade secret; and, (4) The specific chemical identity is made available to health professional, employees, and designated representatives in accordance with the requirements of 29 CFR 1910.1200. (5)
-SARA	"Trade secret" under SARA, means any confidential formula, pattern, process, device, information or compilation of information that is used in a submitter's business; and that gives the submitter an opportunity to obtain an advantage over competitors who do not know or use it. EPA intends to be guided by the Restatement of Torts, section 757, comment b. (9)
TSCA	Toxic Substances Control Act (administered by EPA) regulates introduction into commerce and the manufacture, handling, [redacted] use of materials. [1]
TSCA Inventory	A list of chemical substances that may be manufactured, imported, processed or used in the United States for commercial purposes. The initial inventory was compiled in 1977; additions to the inventory are made by premanufacturing notifications. [1]
TWA	Time-weighted average. See TLV and PEL. (2)
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 "ruch" to burn. Also see LEL. [2]
UN Number	An identification number assigned by the United Nations to hazardous materials in transportation. They are used to readily identify hazardous materials in transportation emergencies. Those preceded by "NA" are associated with descriptions not recognized for international shipments, except to and from Canada. *(10)*
Unstable (reactive)	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. [6]
Urticaria	An allergic skin condition characterized by hives or blisters. [1] LAY LANGUAGE DESCRIPTION: Rash or hives
UV	Ultraviolet. Radiation in the region of the electromagnetic spectrum including wavelengths from 100 to 3900 A. [4]
Vapor	The gaseous form of a chemical that may diffuse and that is normally in the solid or liquid state. [3]

TERM	DEFINITION
Vapor density	The weight a vapor or gas as compared to a standard, usually air. Heavy vapors may tend to cling to the ground and concentrate, therefore having a potential for health or physical damage. [1]
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 on MSDS's are in millimeters or mercury (mmHg) at 68°F (20°F), unless stated otherwise. Three facts are important to remember: 1. Vapor pressure of a substance at 100°F will always be higher than the vapor pressure of the substance at 68°F (20°C). 2. Vapor pressures reported on MSDS's in mmHg are usually very low pressures; 760 mmHg is equivalent to 14.7 pounds per square inch. 3. The lower the boiling point of a substance, the higher its vapor pressure. [2]
Viscosity	The tendency of a fluid to resist internal flow without regard to its density. [2]
Water reactive material -DOT	Any solid substance (including sludges and pastes) which, by interaction withe water is likely to become spontaneously flammable or to give off flammable or toxic gases in dangerous quantities. (See Flammable solid). [9]
Water reactive chemical -OSHA	A chemical that reacts with water to release a gas that is either flammable or presents a health hazard. [6]
WEEL	Workplace Environmental Exposure Level Guides are established by the AIHA (AAmerican Industrial Hygiene Associateion) WEEL Committee for substances which do not have exposure guidelines established by other organizations (see TLVs). All WEELs are expressed as time-weighted average (TWA) concentrations; however, different time periods are specified depending on the properties of the material.
WHMIS	Workplace Hazardous Materials Information System. A Canadian nationwide system to provide information to workers on hazardous materials used in the workplace through the use of MSDSs. It is the Canadian counterpart of the OSHA Hazard Communication Standard, but has different provisions and interpretations.

TERM DEFINITION

1. Chemical Manufacturer's Association, MSDS Workgroup

2. MSDS Glossary from Hazard Communication - A Compliance Kit. GPO No. 929-022--9; OSHA No. 3104, 1988

3. American National Standard for Hazardous Industrial Chemicals - precautionary Labeling. Z129.1-1988, Copyright 1988 ANSI

4. Hawley, G. G., editor, The Condensed Chemical Dictionary, 11th Edition, Copyright 1987, Van Nostrand Company, Inc.

5. Websters Ninth New Collegiate Dictionary, Copyright 1989, Merriam Webster, Inc.

6. OSHA Hazard Communication Standard, as ammended August 24, 1987, see Code of Federal Regulations. Title 29.

7. Verschueren, K., Handbook of Environmental Data on Organic Chemicals, Second Edition, Van Nostrand Reinhold Company

8. Taylor, E. J., editor, Dorland's Illustrated Medical Dictionary, 27th edition, Copyright 1988, W. B. Saunders Company

9. Code of Federal Regulations, Title 49, Department of Transporation

10. Chemical Manufacturers Associaton. (848) Working Paper, ANSI Product Data Team. 1988

11. Dorland's Pocket Medical Dictionary, 24th Edition, Copyright 1989, W. B. Saunders Company, Philadelphia

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12. National Fire Protection Association, NFPA-49, 9th Edition, Copyright 1975 by National Fire Protection Association.

13. Provisional OECD Data Interpretation Guidelines, 1984

health hazard evaluation. For the purposes of this labeling standard, a health hazard evaluation is the process of using professional judgment to determine if an exposure to a material could cause adverse human health effects under customary or reasonably foreseeable use or misuse, and thus if it is appropriate to provide a a warning on a label about such hazard. This process consists of two steps.

The first step involves a careful review of appropriate scientific studies to determine which reported effects are probable human effects. Probable effects include immediate effects reported to occur in animals, well-known human effects (not including isolated case reports*), and well-documented delayed effects reported to occur in animals and that would be expected to occur in humans under comparable conditions. Organ/system effects seen only near death and that are not the primary cause of death should not be considered. Probable human effects may be determined from other scientific data. If available data on human experience establish results different from those obtained on animals, the human data shall take precedence.

There may be materials that cause effects at inordinately high doses, under unusual conditions, or in other unique circumstances. The relative weight of such information should be considered in making a health hazard evaluation.

The second step in this process involves performing an assessment of the potential for exposure in order to determine if a hazard exists under customary and reasonably foreseeable use or misuse. This assessment must take into account the physical properties of the material, reasonably foreseeable conditions of handling, anticipated routes of exposure, and availability for exposure.

The health hazard evaluation should support the decision whether precautionary labeling is or is not to be used.

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*Case reports that do not provide a scientific link between the chemical and the adverse health effect should not be included as part of the health hazard evaluation.

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Appendix 2

APPENDIX B TO CFR 1910.1200
HAZARD DETERMINATION (MANDATORY)

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

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

1. *Carcinogenicity:* As described in paragraph (d)(4) and Appendix A of this section, a determination by the National Toxicology Program, the International Agency for Research on Cancer, or OSHA that a chemical is a carcinogen or potential carcinogen will be considered conclusive evidence for purposes of this section.

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

3. *Animal data:* Human evidence of health effects in exposed populations is generally not available for the majority of chemicals produced or used in the workplace. Therefore, the available results of toxicological testing in animal populations shall be used to predict the health effects that may be experienced by exposed workers. In particular, the definitions of certain acute hazards refer to specific animal testing results (see Appendix A).

4. *Adequacy and reporting of data.* The results of any studies which are designed and conducted according to established scientific principles, and which report statistically significant conclusions regarding the health effects of a chemical, shall be a sufficient basis for a hazard determination and reported on any material safety data sheet. The chemical manufacturer, importer, or employer may also report the results of other scientifically valid studies which tend to refute the findings of hazard.

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Appendix 3

STATE AGENCY RIGHT TO KNOW CONTACTS

ALABAMA
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
Office of General Counsel
1751 Federal Drive
Montgomery, AL 36130
(205) 271-7700
Contact: E. John Wiliford

ALASKA
DEPARTMENT OF LABOR
Division of Labor Standards and Safety
P. O. Box 1149
Juneau, AK 99802
(907) 465-4855
Contact: Edith Brand

CONNECTICUT
STATE OFFICES:
DEPARTMENT OF LABOR
OSHA Division
200 Folly Brook Blvd.
Wethersfield, CT 06109
(203) 566-4550
Contact: Emil Caruso

DEPARTMENT OF ENVIRONMENTAL PROTECTION
165 Capitol Avenue
Hartford, CT 06106
(203) 566-8604
Contact: Laurie Boynton
(203) 566-5524
Contact: William Delaney

BUREAU OF THE STATE FIRE MARSHAL
294 Colony Street
Meridan, CT 06450
(203) 238-6046
Contact: Robert Rakauskaus

LOCAL OFFICES
DANBURY
City Clerk's Office
155 Deer Hill Avenue
Danbury, CT 06810
(203) 797-4515

DELAWARE
DIVISION OF PUBLIC HEALTH
Bureau of Environmental Health
Jesse S. Cooper Building
Federal and Water Streets
Dover, DE 19901
(302) 736-3839
(800) 554-INFO (in Delaware)
Contact: Randall Hair

FLORIDA
STATE OFFICES:
DEPARTMENT OF LABOR AND EMPLOYMENT SECURITY
204 Lafayette Building
2551 Executive Center Circle W.
Tallahessee, FL 32301
(904) 488-3044
(800) 367-4378 (in Florida)
Contact: Reinaldo Manzo

LOCAL OFFICES:
PALM BEACH COUNTY
County Health Department
901 Evernia Street
West Palm Beach, FL 33402
Attention: Environmental Sciences and Engineering
(305) 820-3070

HAWAII
DEPARTMENT OF LABOR
Education and Implementation Branch
677 Ala Moana Blvd., Suite 910
Honolulu, HI 96813
(808) 548-7510
Contact: Ellen Kondo

ILLINOIS
TOXIC SUBSTANCES DIVISION
Alzina Building
Fifth Floor North
100 North First Street
Springfield, IL 62706
(217) 782-4102
Contact: Thomas R. Wallin
Public Safety Div. Administrator

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INDIANA
DIVISION OF LABOR
100 North Senate
1013 State Office Building
Indianapolis, IN 46204
(317) 232-4135
Contact: Vick Hoberty

IOWA
BUREAU OF LABOR
307 East Seventh Street
Des Moines, IA 50319
(515) 281-3606
Contact: Donald Petty

KENTUCKY
STANDARDS COMMISSION
Department of Labor
The 127 Building
Frankfort, KY 40601
(502) 564-6895
Contact: Guy Schoolfield

LOUISIANA
DEPARTMENT OF PUBLIC SAFETY AND CORRECTION
Office of State Police
Hazardous Materials Section
P. O. Box 66614
Baton Rouge, LA 70896
(504) 925-6113
Contact: Kendall Fellon

MAINE
BUREAU OF LABOR STANDARDS
Station 45
State Office BUilding
Augusta, ME 04333
(207) 289-2591
Contact: Lance Gurney

MARYLAND
DIVISION OF LABOR AND INDUSTRY
501 St. Paul Place
Baltimore, MD 21202
(301) 333-4182
Contact: Illiana O'Brien

SUBMIT LISTS AND MSDSs TO:
MARYLAND DEPARTMENT OF HEALTH AND MENTAL HYGIENE
Divisions of Environmental Science and Technology
Office of Environmental Programs
201 West Preston Street
Baltimore, MD 21201
(301) 225-6493/6499
Contact: Anita Meros

MASSACHUSETTS
DEPARTMENT OF LABOR AND INDUSTRIES
Right-To-Know Office
100 Cambridge Street, Room 1107
Boston, MA 02202
(617) 727-5816
Contact: Joe Belloli

DEPARTMENT OF PUBLIC HEALTH
Right-To-Know Office
150 Tremont Street
Boston, MA 02111
(617) 727-2660
Contact: Dr. Marybeth Smuts

DEPARTMENT OF ENVIRONMENTAL PROTECTION
1 Winter Street
Eighth Floor
Boston, MA 02108
(617) 292-5810
Contact: Arnold Sapenter

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MICHIGAN
DIVISION OF OCCUPATIONAL HEALTH
Department of Public Health
P. O. Box 30035
Lansing, MI 48909
(517) 335-8250
Contact: Flint Watt

SAFETY, EDUCATION AND TRAINING DIVISION
Bureau of Safety and Regulation
Department of Labor
7150 Harris Drive
P. O. Box 30015
Lansing, MI 48909
(517) 322-1809
Contact: Edward Fredericks

FIRE MARSHAL DIVISION
Hazardous Materials Section
State Police
7150 Harris Drive
Lansing, MI 48913
(517) 322-1924
Contact: Art Nash

MINNESOTA
DEPARTMENT OF LABOR AND INDUSTRY
444 Lafayette Road
St. Paul, MN 55101
(612) 296-2116 or 297-3254
Contact: Patty Lorenez

DEPARTMENT OF HEALTH
717 Delaware Street, SE
Minneapolis
St. Paul, MN 55440
(612) 623-5352
Contact: Dave Gray

DEPARTMENT OF PUBLIC SAFETY
Transportation Building, 2nd Floor
St. Paul, MN 55155
(612) 643-3000
Contact: Lee Tischler

MISSOURI
NATURAL RESOURCES
DEPARTMENT OF LABOR AND INDUSTRIAL RELATIONS
P. O. Box 59
Jefferson City, MO 65104
(314) 751-7929
Contact: Dean Martin

MONTANA
DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES
Cogswell Building
Helena, MT 59620
(406) 444-2630
Contact: Ellie Parker

NEVADA
DIVISION OF OCCUPATIONAL SAFETY AND HEALTH
1370 South Curry Street
Carson City, NV 89710
(702) 885-5240
Contact: David Going

NEW HAMPSHIRE
DEPARTMENT OF LABOR
Inspection Division
19 Pillsbury Street
Concord, NH 03301
(603) 271-3176
Contact: James McDonough

NEW MEXICO
OCCUPATIONAL HEALTH AND SAFETY BUREAU
Environment Improvement Division
P. O. Box 968
Santa Fe, NM 87504
(505) 827-2873
Contact: Warren Slade

NEW YORK
FOR WORKPLACE ENFORCEMENT:
DEPARTMENT OF LABOR
OSH Intergovernmental Relations
Room 579
State Office Building Campus
Albany, NY 12240
(518) 457-3518
Contact: Robert Gollnick

FOR PUBLIC EMPLOYEES ONLY:
DEPARTMENT OF HEALTH
New York State Department of Health
Bureau of Occupational Health
2 University Place, Room 155
Albany, NY 12203-3313
(518) 458-6228
Contact: John Bintz

NORTH CAROLINA
STATE OFFICES:
DEPARTMENT OF LABOR
Occupational Safety and Health
214 West Jones Street
Raleigh, NC 27603
(919) 733-2658
Contact: Ann Wall

LOCAL OFFICES:
DURHAM
Office of the City Clerk
P. O. Box 1086
Durham, NC 27702
(919) 560-4166

NORTH DAKOTA
WORKMAN'S COMPENSATION BUREAU
Russell Building
Highway 83 North
4007 North State Street
Bismark, ND 52505
(701) 224-3886
Contact: Roger Rohrer

OFFICE OF THE STATE FIRE MARSHAL
Box 1292
Bismarck, ND 58502
(701) 224-2435
Contact: Bob Allen

OREGON
DEPARTMENT OF INSURANCE & FINANCE
Oregon OSHA
Salem Central Office
Labor and Industries BUilding
Salem, OR 97310
(503) 378-3272
Contact: Jay Flack-Pennington

FOR COMMUNITY PROVISIONS:
State Fire Marshal
3000 Market Street, N.E.
Suite 534
Salem, OR 97310
(503) 373-1276
Contact: Ray Stroud

PENNSYLVANIA
STATE OFFICES:
DEPARTMENT OF LABOR AND INDUSTRY
Room 1404
Labor and Industry Building
Harrisburg, PA 17120
(717) 783-2071
Contact: Jeanette Blackstone

LOCAL OFFICES:
PHILADELPHIA
Department of Public Health
Air Management Services
500 South Broad Street
Philadelphia, PA 19146
(212) 875-5623 ??

PUERTO RICO
DEPARTMENT OF LABOR AND HUMAN RESOURCES
Prudencie Rivera Martinez Bldg
505 Munoz Rivera Avenue
Hato Rey, PR 00918
(809) 754-2188
Contact: Filiberto Cruz Aguila

RHODE ISLAND
DEPARTMENT OF LABOR
Division of Occupational Safety
220 Elmwood Avenue
Providence, RI 02907
(401) 457-1847
Contact: Anthony DiCicco

TENNESSEE
DEPARTMENT OF LABOR
OSHA Division
501 Union Building
Nashville, TN 37219-5389
(615) 741-7151
Contact: Bob Cooper

TEXAS
BUREAU OF ENVIRONMENTAL HEALTH
Department of Health
1100 West 49th Street
Austin, TX 78756
(512) 458-7410
Contact: Paula McKinney

VERMONT
DIVISION OF OCCUPATIONAL AND RADIOLOGICAL HEALTH
10 Baldwin Street
Montpelier, VT 05602
(802) 828-2886
Contact: Raymond McCanlis

VIRGINIA
OCCUPATIONAL SAFETY AND HEALTH
Department of Labor and Industry
P. O. Box 12064
Richmond, VA 23241
Contact: Eve Byrd

WASHINGTON
DIVISION OF INDUSTRIAL SAFETY AND HEALTH
Department of Labor and Industries
P. O. Box 207
Olympia, WA 98504
(206) 753-6497
Contact: Steve Cant

DEPARTMENT OF ECOLOGY
Mail Stop P.V. 11
Olympia, WA 98504-8711
(206) 459-6322
Contact: Idell Hansen

WEST VIRGINIA
DEPARTMENT OF LABOR
1900 Washington Street East
Building 3, Room 206
Charleston, WV 25306
(304) 348-7890
Contact: William D. Hoffman

FOR COMMUNITY R-T-K ACT:
DEPARTMENT OF HEALTH
Office of Emergency Assistance
State Capital Building
Room EB80
Charleston, WV 25305
(304) 348-5380
Contact: Bill Jopling

FOR MEDICAL INFORMATION REPOSITORY:
DEPARTMENT OF HEALTH
Emergency Medical Services
1800 Washington Street East
Charleston, WV 25305
(304) 348-3956
Contact: Fred Cooley

WISCONSIN
DEPARTMENT OF INDUSTRY, LABOR, AND HUMAN RELATIONS
Safety and Buildings Division
201 East Washington Avenue
P. O. Box 7969
Madison, WI 53707
(608) 266-2780
Contact: Jack Borders

WYOMING
OSHA
Herschler Building
122 W. 25th Street
Cheyenne, WY 82002
(307) 777-7786
Contact: Joe Borghi

TGG: JCL: ERT: MJH: AJO: RF

TO: Nick Semenza - Blane (via Fax)

XF: 471

FROM: T. G. Grumbles
DATE: January 8, 1990

VISTA

Interoffice Communication

SUBJ: **MOHAWK WIRE & CABLE CUSTOMER HEALTH ALLEGATION**

I spoke with Jim Baker on Friday. What he needs is a letter that gives the information on our analysis and conclusions, but stated in terms of investigating a skin rash complaint not an inhalation problem. He understands that we would do the same type of product analysis to investigate potential causes of either type allegation.

He also stated that the employee complaint was from employees handling their product on the "cold side" of the process.

Based on my discussion with him, I would suggest you write him a letter similar to the one you sent previously (I assume you've sent one) but stating we did the analysis to investigate potential product contamination that might result in product differences which could cause skin rash problems described to us.

Give me a call with any questions.

Tom dlj

T. G. Grumbles

dlj

cc: Carl Tomanek - Austin

Fax-3456

TO: N. Semenza - Blane

FROM: C. Tomanek - Austin

DATE: November 29, 1989

SUBJECT: **ANALYSIS OF CABLE FROM MOHAWK W&C**

You recently sent me a sample of cable made by Mohawk Wire & Cable Company jacketed with Blane 34311. You said that the operators terminating the cable in a molding operation, were experiencing an obnoxious odor during the molding cycle and became sick. You asked the laboratory to analyze the cable for anything unusual.

The cable is about 5/8 inch in diameter with a metal braid under the jacket. The jacket is about 63 mils thick. The core is made up of twisted pairs of #24 AWG stranded, tinned, copper conductor insulated with PVC compound. This core is over wrapped with a clear film wrap.

Our investigation found nothing unusual about the PVC compound used to insulate the conductors and jacket the cable core. The cable jacket compound is PVC with a linear phthalate plasticizer. It is filled with aluminum trihydrate and stabilized with a lead stabilizer. An FTIR (Fourier transform infrared) spectra of the jacket material made from a thin film is attached. Analysis of extract of the cable jacket by gas chromatography showed no unexpected components.

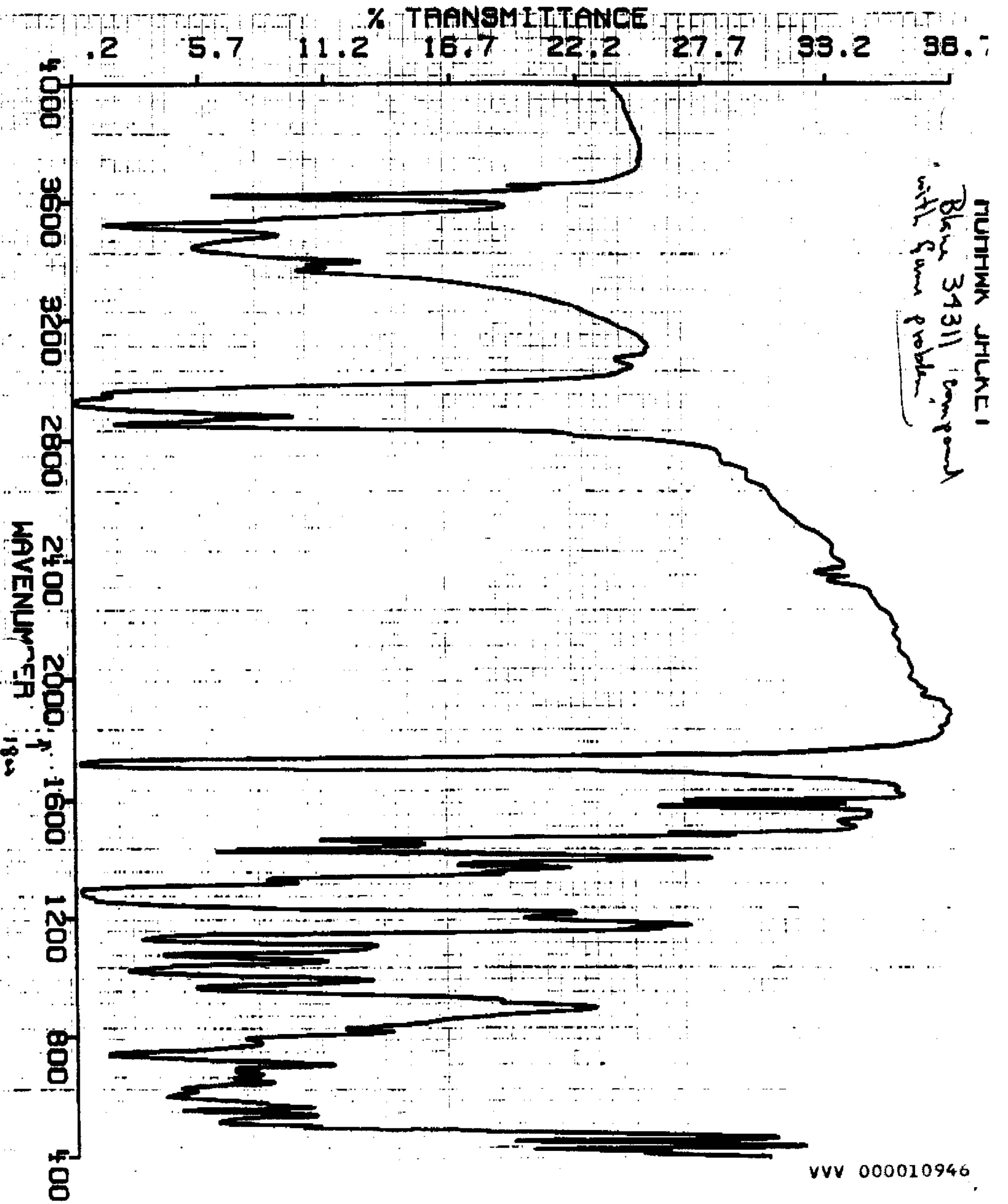
The insulation compound was also analyzed by FTIR. This material is a PVC plasticized with a linear trimellitate plasticizer. There is no evidence of anything out of the ordinary indicated in this spectra. (attached)

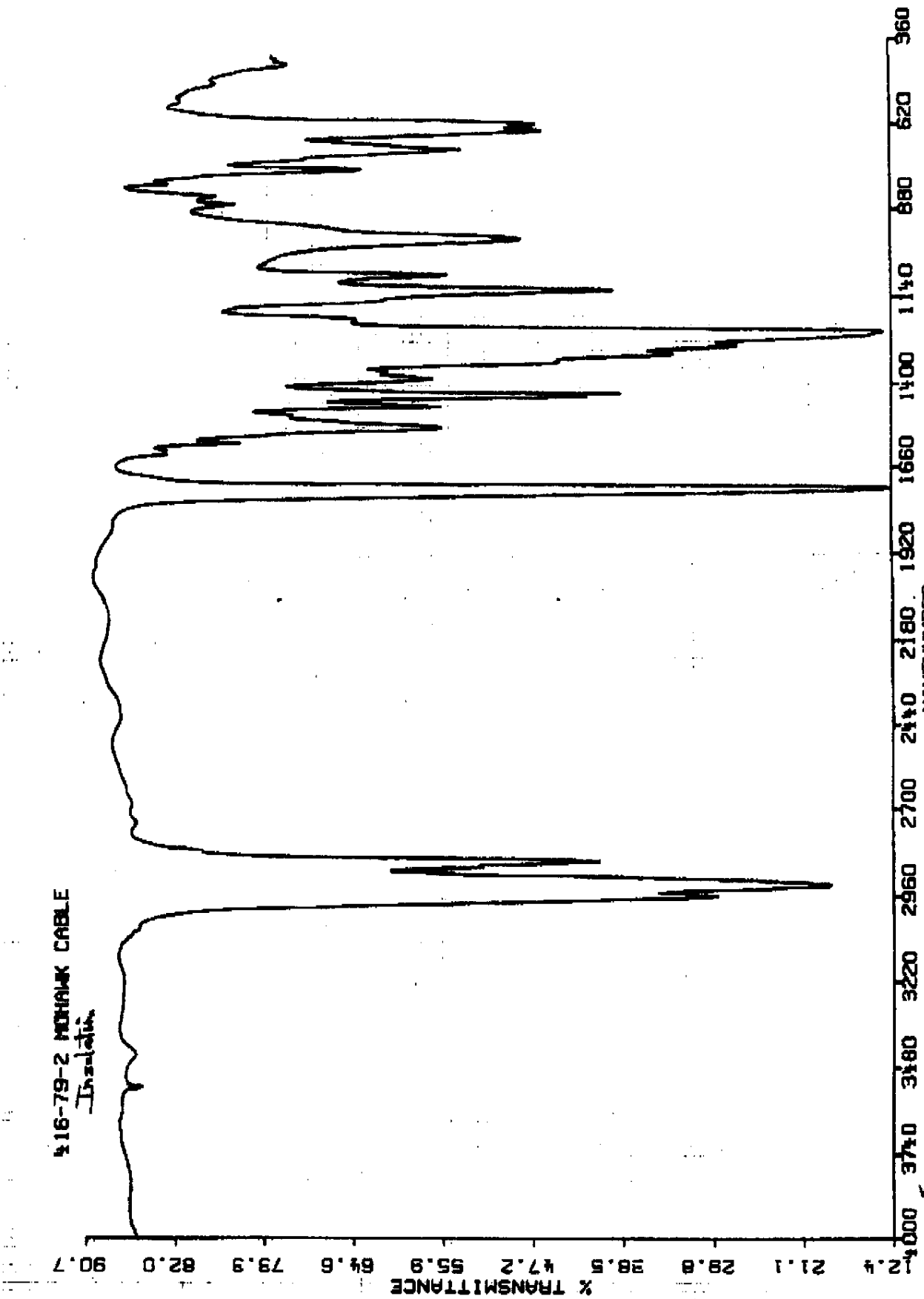
I would suggest that before going any further in attempting to identify the problem by analysis, that some one go in and see if the customer may be experiencing a molding problem causing degradation of the material. Air samples could also be obtained at the same time using draeger tubes. These could then be sent back to the laboratory for analysis. Also to continue investigating this problem, we should be looking at the molding material involved.

At this point we have no further work planned for this problem.

The analytical work discussed above was conducted by our analytical section: gas chromatograph - E. Sones, FTIR - Dr. Latimer.

cc: HJH, SHH, ELS, TML





Thomas G. Grumbles

VISTA

~~TGG: JCL: ERT: MJH: AJO: RF~~

To Ron Bryan
Joe Ledvina

Date ~~XF:/9~~

Attached, fyi, is the letter we sent to ECOSOL regarding our (CLER's) preference for the LAB fluid to be tested.

TGG

Monsanto

Monsanto Chemical Company
800 N Lindbergh Boulevard
St. Louis, Missouri 63167
Phone: (314) 694-1000

January 5, 1990

Keith Huckle, PhD
Shell International Petroleum Maatschappij B. F.
Health, Safety & Environment Division
P. O. Box 162
2501 AN The Hague
Netherlands

Council for LAS/LAB Environmental Research (CLER)

Dear Keith:

This letter represents CLER's response to your December 22 request for comment on selection of test material for our joint LAB dermal testing program. The position indicated below represents the consensus developed between CLER member companies after several discussions of the scientific issues related to test material selection. Our comments are based on the following premises:

1. The 90-day subchronic test previously conducted by ECOSOL will serve as a pilot for the proposed dermal chronic test regardless of which test substance we choose.

2. The MTD for the dermal chronic will be determined by the skin irritating nature of LAB itself, rather than any property of non-LAB components. Thus the dose level would be the same for HF or $AlCl_3$ material. This combined with the low recommended MTD of 5% from the subchronic, suggests that non-LAB component concentrations on the mouse skin would be so low that no differences in test response are expected.

3. We in the detergent industry draw a greater distinction between HF and $AlCl_3$-based products than do others; the regulatory community views all LAB as the same.

4. An adverse toxicological finding on LAB from either process would also taint the other process, although possibly to a lesser degree.

5. There is sufficient biological variability in chronic tests that replicate tests on one product would not give identical results. Thus if we conduct chronic tests on two materials, even if the results are similar, some regulators or environmentalists can be expected to over-interpret subtle differences and unnecessarily discredit the product with the least favorable results.

6. Our primary objective is to address questions raised about LAB by publication of Iversen's tests at overly-exaggerated dose levels. Of lesser importance is testing non-LAB components, which vary in concentration (and perhaps identity) from the different processes.

7. Many regulatory agencies, including the U.S. EPA, stipulate that industry consortia should test the purest available commercial product.

8. Positive (i.e. adverse) toxicological findings on mixtures are very difficult to interpret, and essentially guarantee the need to conduct more studies.

With these premises in mind, we have commented on the options below.

1. Test HF material only. There is no question the subchronic results would be applicable, and a finding of no adverse effects would clear LAB of concern. Toxicological interpretation would be less complex and selection would comply with regulatory precedent.

Other Options:

Test a representative commercial 50:50 blend of HF and $AlCl_3$ Material. The results would be equally applicable to each process. Toxicological evaluation is more difficult. Humans are not normally exposed to blends.

Test $AlCl_3$ material only. A finding of no adverse results would clear LAB and all non-LAB components, adverse results would be difficult to interpret.

Test both products separately. Provides the clearest toxicological picture but probably not needed because no differences expected (see premise #2). Would add significantly to cost. Most likely to be perceived as unnecessarily differentiating the two processes, as described in premise #5.

CLER strongly favors option #1 and we are ready to proceed. If other companies have compelling reasons why one of the other options is preferable, we would be agreeable to listening to these reasons, although this would undoubtedly delay the project further.

We look forward to resolving this sample selection issue so we can proceed with the testing.

Sincerely,

James P. Mieure

James P. Mieure
CLER Steering Committee