

# Hazardous Materials Identification System: Ratings Instruction Guide

**Third Edition** 



# Hazardous Materials Identification System (*Third Edition*) Ratings Instruction Guide

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# HMIS<sup>®</sup> RATINGS INSTRUCTION GUIDE, THIRD EDITION

# Printed in the U. S. A.

# Hazardous Materials Identification System (*Third Edition*) Ratings Instruction Guide

#### Preface

Hazard assessment is an important requirement of the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (HCS) and the process of assigning HMIS<sup>®</sup> ratings helps meet that requirement. This document provides guidelines for rating materials using the HMIS<sup>®</sup> criteria.

Hazard ratings are an integral part of the complete HMIS<sup>®</sup>. They serve as a summary of the hazard assessment process and allow employers to communicate information on workplace hazards to their employees who handle hazardous chemical products.

As with many HCS-related activities, employers need the cooperation and assistance of product manufacturers to complete the hazard assessment process and produce HMIS<sup>®</sup> ratings.

The supplier, who manufactures and/or distributes a product used in an employer's facility, is the one who is the most knowledgeable about the inherent properties of the product. This makes a supplier the best qualified to:

- Assign ratings based on these properties, or
- Supply data with which such ratings can be developed.

This means that the supplier has the option of either providing sufficient information with which an employer can assign HMIS<sup>®</sup> Health, Flammability, and Physical Hazard ratings, or providing such ratings.

#### **Health Ratings**

While HMIS<sup>®</sup> Health ratings are based upon recognized rating systems, each of these systems serves a slightly different purpose and therefore, the Health rating criteria (and resulting ratings) are not interchangeable.

#### **Flammability Ratings**

The HMIS<sup>®</sup> Flammability rating parameters are identical to those contained in OSHA's 29 CFR 1910.106, Flammable and Combustible Liquids Standard. Definitions of flammable and combustible materials are located in Attachment 1.E of this guide.

#### **Physical Hazards Ratings**

The HMIS<sup>®</sup> Physical Hazards ratings parameters are derived from the basic definition of "Physical Hazard" contained in the HCS:

29 CFR 1910.1200(c) "Physical hazard" means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

The HMIS<sup>®</sup> "Physical Hazard" category consists of seven elements: water reactivity, organic peroxides, explosives, compressed gasses, pyrophorics, oxidizers, and unstable reactives. For simplicity purposes, the HMIS<sup>®</sup> "Flammability" category encompasses the rating criteria for "combustible liquids", "flammable liquids", and "pyrophorics" as defined by OSHA.

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#### **Chapter 1 Developing HMIS® Ratings**

#### **1.0 Chapter Overview**

Hazard assessment is an important requirement of the OSHA's HCS and the process of assigning  $\rm HMIS^{\ensuremath{\circledast}}$  ratings helps meet that requirement. This document provides guidelines for rating materials using the  $\rm HMIS^{\ensuremath{\circledast}}$  criteria.

#### 1.1 HMIS<sup>®</sup> Ratings

Hazard ratings are an integral part of the complete HMIS<sup>®</sup>. They serve as a summary of the hazard assessment process and allow employers to communicate information on workplace hazards to their employees who handle hazardous chemical products.

As with many HCS-related activities, employers need the cooperation and assistance of product manufacturers to complete the hazard assessment process and produce  $\rm HMIS^{\circledast}$  ratings.

#### 1.2 The Roles of Employers and Their Suppliers

#### 1.2(A) Health, Flammability, and Physical Hazards Ratings

The supplier, who manufactures and/or distributes a product used in an employer's facility, is the one who is the most knowledgeable about the inherent properties of the product. This makes a supplier the best qualified to:

- Assign ratings based on these properties; or
- Supply data with which such ratings can be developed.

This means that the supplier has the option of either providing sufficient information with which an employer can assign HMIS<sup>®</sup> health, flammability, and physical hazard ratings, or providing such ratings.

#### 1.2(B) PPE Codes

OSHA's PPE standards (contained in 29 CFR 1910, Subpart I) require that employers determine the proper PPE needed in their workplaces. Additionally, employers are the ones who are most knowledgeable about the PPE necessary for the actual conditions under which products and materials are used in their facilities. Thus, the designation of the proper PPE is the responsibility of the employer.

The information provided by suppliers on product MSDSs will be used by employers to determine the proper PPE for their employees who work with the products. To provide protection for all routes of entry for a hazardous material, the supplier should be sure that the following protective equipment is considered on the MSDS:

- Eye Contact: safety glasses, splash goggles, face shield, etc.;
- Skin Contact: gloves, apron, boots, or full protective suit, etc.; and
- Inhalation and Possible Ingestion: appropriate NIOSH approved respirators and filter/cartridge types.

The employer will review the recommendations made by the supplier and, based on an assessment of product use and control procedures (quantity, aerosolization, ventilation, etc.), will assign a PPE designation, following the procedures outlined in Part I of the HMIS<sup>®</sup> Implementation Manual.

An employer who encounters a PPE code from an outside source must carefully evaluate the designated PPE to ensure that the code is suitable for the actual conditions of use in his/her facility.

#### **1.3 System Compatibility**

The criteria for assigning ratings are generally compatible with similar schemes and definitions developed by ANSI, NIOSH, OSHA, U.S. EPA, the NFPA<sup>®</sup>, and other rating systems. Sections 6 through 8 discuss the specific rating criteria and their basis.

#### **1.3(A) Health Ratings**

While HMIS<sup>®</sup> health ratings are based upon recognized rating systems, each of these systems serves a slightly different purpose and therefore, the health rating criteria (and resulting ratings) are not interchangeable.

#### 1.3(B) Flammability Ratings

The HMIS<sup>®</sup> flammability rating parameters are identical to those contained in OSHA's 29 CFR 1910.106, Flammable and Combustible Liquids Standard. Definitions of flammable and combustible materials are located in Attachment 1.E of this section.

#### 1.3(C) Physical Hazards Ratings

The HMIS<sup>®</sup> physical hazards ratings parameters are derived from the basic definition of "Physical Hazard" contained in the HCS at paragraph (c):

29 CFR 1910.1200(c) "Physical hazard" means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

The HMIS<sup>®</sup> "physical hazard" category consists of seven elements: water reactivity, organic peroxides, explosives, compressed gasses, pyrophorics, oxidizers, and unstable reactives. For simplicity purposes, the HMIS<sup>®</sup> "Flammability" category encompasses the rating criteria for "combustible liquids", "flammable liquids", and "pyrophorics" as defined by OSHA.

#### 1.4 General Considerations

#### 1.4(A) Information for Generating the Rating

Before assigning a rating to a material, assemble acute toxicity and chronic health hazard data, either from internal company data or published information. Also collect data on the chemical and physical properties of the material, such as the flash point, boiling point, reactivity hazards, and chemical incompatibilities. MSDSs will be a valuable resource and aid in generating the HMIS<sup>®</sup> ratings.

#### 1.4(B) Using Professional Judgment

The basis for a rating should be objective data available on the inherent properties of the material itself. However, because HMIS<sup>®</sup> ratings often distill numerous details into single numbers for "health," "reactivity," and "physical hazard," it may occasionally be necessary to use professional judgment in assigning the final HMIS<sup>®</sup> ratings. This would be appropriate for reconciling conflicting data or ensuring that the relative hazards of materials are represented in the ratings. However, an effort should be made to guard against unduly inflating ratings. A rating should not be raised (or conversely, a hazard de-emphasized) without a clearly documented reason.

Any HMIS<sup>®</sup> ratings developed by a supplier should relate to the product, as it will be supplied to the employer. The employer may accept the ratings as provided or make an adjustment, if appropriate. For example, an adjustment would be appropriate if the employer processes a material in a way that alters its inherent hazardous properties.

#### 1.4(C) Normal Conditions of Use Apply

The HMIS<sup>®</sup> ratings are meant to apply to the product under normal conditions of use. HMIS<sup>®</sup> ratings are not intended to apply to the hazards posed by the chemical in emergency or misuse situations.

#### 1.4(D) Special Considerations for Mixtures

Many materials are mixtures. The components of these mixtures often have different chemical properties and, therefore, possibly different hazards. The HMIS<sup>®</sup> rating for a mixture should acknowledge the significant components of the mixture. Unless the characteristics of the mixture as a whole are known, the ratings should take into consideration the properties of the ingredients.

As a general rule, a weight limit of one percent of the various components can be used for assigning a rating. Unless a component produces a significant hazardous effect when it comprises less than one percent of the mixture, do not consider it when assigning a rating. Each component present in a quantity greater than one percent of the total weight should be assessed separately. The component with the most significant potential in each category should be used.

The major exception to the one percent rule is when a constituent is a carcinogen. Under the HCS, materials that have been shown to cause cancer must be considered if they constitute more than one tenth percent of the mixture.

#### 1.5 The Health Hazard Rating

#### 1.5(A) Basis for the Health Hazard Rating

The HMIS<sup>®</sup> health hazard rating is based on both the chronic (long term, from repeated overexposure) and the acute health effects of the material.

(1) **Chronic Hazards.** OSHA has placed an increased emphasis on employers' obligations to inform their employees of the health effects that can result from repeated exposure. Thus, hazard warnings are required for materials that are carcinogens (cancer-causing agents) or that may cause injury to specific organs of the body (target organs) with

repeated contact. This includes chemicals that can, with chronic overexposure, injure the liver, kidneys, nervous system, heart, blood/circulatory system, eyes, lungs, reproductive system, etc. It also includes chemicals that can cause respiratory allergies (pulmonary sensitization) after any period or quantity of exposure.

To address the need to warn employees of these hazards,  $HMIS^{\text{(*)}}$  uses an asterisk (\*), which becomes part of the health rating for materials that are associated with a chronic hazard. When no chronic hazard is included, a single slash should be placed across the box to indicate that no chronic hazards are present. The process of assigning the (\*) is discussed below in Section 1.5(B) and presented in Table 1.1a.

Explanatory Note: Pulmonary sensitizers should be included with chronic hazards, which result in flagging the HMIS<sup>®</sup> health rating with an asterisk (\*). The Oversight Committee for this document concluded this would adequately convey the potential severity of the effect of these compounds. All other "sensitizers" should be treated as acute hazards as stated in the OSHA Hazard Communication Standard, Appendix A, and defined by the ANSI standard for Precautionary Labeling of Hazardous Industrial Chemicals (Z129.1-1988). Each acute rating should be assigned by applying the available information to Table 1.1b: HMIS<sup>®</sup> Acute Toxicity Rating Criteria.

(2) **Acute Hazards.** The acute toxicity of a chemical is another important indicator of its relative hazard and serves as the basis for the health hazard numerical rating. The HMIS<sup>®</sup> includes acute toxicity rating criteria for use in determining the numerical rating. The criteria appear in Table 1.1b.

While many businesses have staff toxicology expertise available and are capable of generating health ratings without guidance, the rating criteria have been provided to help standardize the process for the sake of uniformity and should be used whenever possible.

The HMIS<sup>®</sup> health criteria have been designed to be as compatible as possible with the definitions contained in ANSI Z129.176. They also reflect certain criteria accepted by NIOSH, U.S. EPA, and the Organization for Economic Cooperation and Development (OECD). To the extent feasible, the triggers for rating levels "2" and "3" are identical to those for the "toxic" or "highly toxic" designations of ANSI. Acute oral, dermal, and inhalation toxicity are rated on a five-tiered scale (0–4), generally with a tenfold difference between the levels. Skin and eye irritation are rated on a scale of 0–3 using descriptive terminology and, when available, Draize and Primary Irritation Index (PII) scores, based on criteria set in applicable U.S. EPA documents<sup>1</sup>. Tables showing the Draize and PII scoring are located in Attachment 1.A.

The process of assigning the acute health hazard numerical rating is discussed in Section 1.5(C).

<sup>&</sup>lt;sup>1</sup> "Pesticide Assessment Guidelines — Subdivision F, Hazard Evaluation: Human and Domestic Animals — Series 81-5, Dermal Irritation, Addendum 3 on Data Reporting," 1988; and "Hazard Evaluation Division, Standard Evaluation Procedure: Eye Irritation Studies," August 1988.

#### 1.5(B) Assigning the Chronic Health Hazard Asterisk (\*)

The procedure used to determine whether a chronic hazard must be indicated by an asterisk (\*) on the HMIS<sup>®</sup> label is the same as that used to determine whether the hazard must be mentioned on the product label. Because the HCS is a "performance-oriented" standard, no specific criteria have been set by OSHA beyond the language in Paragraph (d)(2) of the HCS (presented in Chapter 5 of this manual), which states that, regarding the hazard determination,

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

The term "health hazards" is defined, and the hazard determination process is discussed in Appendices A and B of the HCS, which are reprinted here as Tables 1.2 and 1.3, respectively.

Additionally, OSHA provides the following interpretation regarding what information must be on the label as opposed to what must be on the MSDS:

"It will not necessarily be appropriate to warn on the label about every hazard listed in the MSDS. The data sheet is to address essentially everything that is known about the chemical. The selection of hazards to be highlighted on the label will involve some assessment of the weight of the evidence regarding each hazard reported on the data sheet. Assessing the weight of the evidence prior to including a hazard on a label will also necessarily mean consideration of the exposures to the chemical that will occur to workers under normal conditions of use, or in foreseeable emergencies. However, this does not mean that only acute hazards are to be covered on the label, or that well substantiated hazards can be left off the label because they appear on the data sheet."

[From "Hazard Communication Standard — Interpretive Quips," U.S. Department of Labor-OSHA, May 1994, pg (f)(1)—13.]

A decision tree is provided in Table 1.1a to assist employers and product suppliers in determining whether a chronic hazard must be indicated in the HMIS<sup>®</sup> rating for a given product. Other assistance may be available from trade organizations, OSHA interpretations (as referenced in the quote above), or the chemical supplier or original manufacturer.

Keep in mind that, in an untested mixture, the hazards of any chemical present at a concentration of one percent or more must be considered. Carcinogens must be indicated if they are present in the product at a concentration of one tenth percent or greater. Also note that the "call-outs," or concentrations, at which a hazardous ingredient must be considered vary between countries. The levels indicated by the HCS may not apply in Canada or other countries.

#### 1.5(C) Assigning the Acute Health Numerical Rating

Numerical ratings are based on acute toxicity of the material. Attachment 1.B provides an approximation of the HMIS<sup>®</sup> inhalation  $LC_{_{50}}$  criteria in ppm units. The uniform criteria are presented in Table 1.1b and specify preferable data types:

- Oral LD<sub>50</sub> Species: Rat
  - Material phase: Liquids and solids
- Dermal LD<sub>50</sub> Species: Rat or rabbit

- Material phase: Liquids and solids

- Inhalation  $LC_{50}$  Exposure period: 4 hours
  - Species: Rat
  - Material phase: Dust, mist, fume, vapor, or gas
  - Units: mg/L

If the specified data is not available, other available data should be used; however, the specific information used should be recorded.

To assist in the rating of materials, Attachment 1.C is a HMIS<sup>®</sup> Classification Data Sheet containing conveniently summarized criteria for health, flammability, and physical hazard ratings. (Note: Flammability and other physical hazards are discussed in subsequent sections.)

(1) Using the HMIS<sup>®</sup> Classification Data Sheet: To use the sheet to generate health ratings, mark the proper box for each acute toxic property. The highest numerical rating assigned to any of the acute toxic effects determines the health rating of the whole material. This sheet may be used to record ratings and document the rationale for ratings. Because the Data Sheet contains only summarized criteria information, refer to the complete health rating criteria in Tables 1.1a and 1.1b whenever complete descriptions of each category are necessary.

Some users may find it helpful to follow the guidelines suggested in Attachment 1.D, The HMIS<sup>®</sup> Rating Process, Suggested Guidelines for Classifying Materials.

- (2) Using Additional Data: When completing the "acute toxic properties" portion of the form, there may be toxicity data that do not conform to the specific criteria delineated. Such data should nevertheless be included in the acute toxicity evaluation and resulting rating. However, when additional data is used, they should be documented, for example, by entering relevant information in the space marked "other" or by attaching additional information pages.
- (3) Unless a component produces a significant effect at lower concentrations, do not consider it when assigning a rating when it comprises less than one percent of the mixture. Some materials may contain small amounts of highly toxic materials that substantially alter the acute toxicity of the total material. The one-percent limitation cited above in Section 1.4(D) is inappropriate in these cases. A highly toxic material should be considered in assigning the Health rating if, at the concentration present, it contributes substantially to the overall toxicity of the product.

#### 1.6 The Flammability Rating

#### 1.6(A) Basis for the Flammability Rating

The HMIS<sup>®</sup> "Flammability" category contains the rating criteria for "combustible liquids", "flammable liquids", and "pyrophorics" as defined by OSHA. The specific criteria for assigning the flammability rating are taken directly from the definitions developed by OSHA and published in 29 CFR 1910.106. Definitions are located in Attachment 1.E.

#### 1.6(B) Assigning the Flammability Rating

The criteria used in assigning flammability ratings are straightforward physical constants, which can usually be measured. To assist with the rating process, Table 1.4 contains the specific criteria. Additionally, the Data Sheet includes the summarized flammability rating criteria information.

#### 1.7 The Physical Hazards Rating

#### 1.7(A) Basis for the Physical Hazards Rating

The HMIS<sup>®</sup> physical hazards ratings parameters are derived from the basic definition of "Physical Hazard" contained in the HCS at paragraph (c):

29 CFR 1910.1200(c) "Physical hazard" means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

The HMIS<sup>®</sup> "physical hazard" category consists of seven subcategories or elements: water reactivity, organic peroxides, explosives, compressed gasses, pyrophorics, oxidizers, and unstable reactives. For simplicity purposes, the HMIS<sup>®</sup> "Flammability" category encompasses the rating criteria for "combustible liquids", "flammable liquids", and "pyrophorics" as defined by OSHA, see paragraph 1.6 above.

#### 1.7(B) Assigning the Physical Hazards Rating

The criteria for determining and assigning ratings for each of the seven identified physical hazards elements are often straightforward physical constants, which can usually be measured or are obvious physical characteristics, e.g. a compressed gas. The substances' Material Safety Data Sheet is the ultimate source for all information used in the rating process for elements in this category. The sources of the criteria for each element of this category are quite variable as follows:

- (1) **Water Reactivity.** This element is a breakout of the OSHA term "unstable (reactive) or water-reactive". The specific criteria come from previous editions of the HMIS<sup>®</sup> and have not changed.
- (2) Organic Peroxides. The Criteria for this element was developed and documented by The Society of the Plastics Industry, Inc., Organic Peroxide Producers Safety Division (Publication #AS-107) www.socplas.org.
- (3) **Explosives**. These criteria are consistent with the definitions found in the Department of Transportation (DOT) 49 CFR 173.50, Div 1.1 through Div 1.6, Explosives.

(4) Compressed Gasses. The criteria for this element were developed and documented by the Compressed Gas Association (Publication CGA Pamphlet C-7) www.cganet.com in conjunction with the OSHA definition 29 CFR 1910.1200: "Compressed gas" means: (i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70°F (21.1°C); or (ii) A gas or mixture of gases having, in a container, an absolute pressure at 70°F (21.1°C); or (iii) A gas or mixture of gases having, in a container, an absolute pressure at 70°F (21.1°C); or (iii) A gas or mixture of gases of the pressure at 70°F (21.1°C); or (iii) A liquid having a vapor pressure exceeding 40 psi at 100°F (37.8°C) as determined by ASTM D-323-72.

There are no "0" or "4" ratings associated with this element.

- (5) Pyrophorics. This specific physical hazard is included as an aspect of the "Flammability" category, and when present, produces a Flammability rating of "4". The standard defines "Pyrophoric" as a chemical that will ignite spontaneously in air at a temperature of 130°F (54.4°C) or below (29 CFR 1910.1200).
- (6) **Oxidizers**. An oxidizer is a material that may, generally by yielding oxygen, cause or enhance the combustion of other materials. The criteria for this physical hazard are stated in 49 CFR 173.127 and listed in the table contained in 29 CFR 172.101.

If a material is determined to be an oxidizer, no "0" (zero) rating is possible, and the rating scheme dictates that any material determined to be an Oxidizer must receive a rating of "1" or higher.

As of the publication date of this document, these criteria are consistent with the definitions found in the Department of Transportation (DOT) 49 CFR 173.127, Packing Group I through III, Oxidizers. There is NO "4" rating.

(7) Unstable Reactives. This element, as with "Water Reactivity", is the expression of the OSHA term "unstable (reactive) or water-reactive". The specific criteria are derived from 29 CFR 1910.1200: "Unstable (reactive)" means a chemical which in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature.

To assist with the rating process, Table 1.5 contains the specific rating criteria for each element. Additionally, the HMIS<sup>®</sup> Rating Classification Data Sheet (Attachment 1.C) includes the rating criteria information.

Should a chemical or mixture fall into more than one of the Physical Hazard elements as outlined above, the Physical Hazard (PH) score would reflect the highest of the various element ratings. (For example: a compressed gas which is sold in containers at 400 psig and is also a water reactive chemical which may form an explosive mixture with water.) The HMIS<sup>®</sup> PH rating for the compressed gas from Table 1.5 is "2", while the HMIS<sup>®</sup> PH rating for the water reactive aspect of the chemical is "3". The final PH rating for this material would reflect a "3".

As an additional enhancement of the new HMIS<sup>®</sup>, the above example could be further emphasized and defined to provide still greater information to the employee by placing Physical Hazard Icons for both Compressed Gas and the Water Reactive around the HMIS<sup>®</sup>

label. This would signal the employee at a glance that this chemical or mixture is a "Serious Hazard" and requires the special handling procedures for both compressed gasses and water reactive materials.

Table 1.1a: HMIS<sup>®</sup> Chronic Effect Indicator (\*) Decision Tree - for Determining whether the (\*) Is Required in the Health Rating. (To be used with Table 1.1b to determine the complete HMIS<sup>®</sup> heal The HMIS® PH rating for the compressed gas from Table 1.5 is "2", while the HMIS® PH rating for the water reactive aspect of the chemical is "3". The final PH rating for this material would reflect a "3".th rating.)



Sample Descriptive Language	Minimal hazard: no sig- nificant health risk; no effect anticipated; practically non- toxic; irritation of skin or eyes not anticipated	Slight hazard: minor reversible injury may occur; may irritate the stomach if swallowed; may defat the skin and exacerbate existing dermatitis;	Moderate hazard: temporary or transient injury may occur; prolonged exposure may affect the CNS and lead to apparent intoxication, nausea, headache, dizziness, weakness or fatigue	Serious hazard: major injury likely unless prompt action is taken and medical treatment given; high level of toxicity; corrosive	Severe hazard: life- threatening; major or permanent damage may result from single or repeated exposures; extremely toxic; irreversible injury may result from brief contact		
Inhalation Toxicity LC <sub>60</sub> (4-hour) Rat mg/L <sup>2</sup>	>20	>2 - 20	>0.5 - 2	>0.05 - 0.5	≤0.05		
Dermal Toxicity LD <sub>so</sub> Rabbit or Rat mg/kg	2,000	> 1,000- 2,000	>200-1,000	>20-200	52		
Oral Toxicity LD <sub>so</sub> Rat mg/kg	>5,000	> 500- 5,000	> 50-500	>1-50	₩.		
Eye Irritation	Essentially nonirritating; minimal effects clearing in less than 24 hours; mechanical irritation may occur; Draize = 0	Slight to mildly Irritating, but reversible within 7 days; Draize >0 ≤25	Moderately to severely irritating; reversible corneal opacity; corneal involvement or irritation clearing in 8-21 days; Draize = 26-110, with reversible effects	Corrosive, irreversible destruction of ocular tissue; corneal involvement or irritation persisting for more than 21 days; Draize > 80, with effects irreversible in 21 days	(Not appropriate. Do not rate as a "4" based on eye irritation alone)		
Skin Irritation (4-hour exposure)	Essentially nonirritating; mechanical irritation may occur; PII or Draize = 0	Slightly or mildly irritating; PII or Draize >0 <5	Moderately irritating; primary irritant; sensitizer; PII or Draize ≥5, with no destruction of dermal tissue	Severely irritating and/or corrosive; may cause destruction of dermal tissue, skin burns, dermal necrosis; Pll or Draize >5-8, with destruction of tissue	(Not appropriate. Do not rate as a "4" based on skin irritation alone)		
HMIS <sup>®</sup> RATING	0	1	Ю	ю	4		

#### Table 1.1b: HMIS<sup>®</sup> Acute Toxicity Rating Criteria. To be used with Table 1.1a to determine the complete HMIS<sup>®</sup> health rating

$$\frac{mg}{L} = \frac{(ppm)(MW)}{(24,450)}$$

 $<sup>^{2}</sup>$  If the LC<sub>50</sub> is in parts-per-million (ppm) rather than mg/L, obtain the chemical's molecular weight (MW) and convert the data to mg/L using the following equation (assuming normal temperature and pressure):

# Table 1.2: OSHA Hazard Communication Standard, 29 CFR 1910.1200,Appendix A—Health Hazard Definitions (Mandatory).

Although safety hazards related to the physical characteristics of a chemical can be objectively defined in terms of testing requirements (e.g. flammability), health hazard definitions are less precise and more subjective. Health hazards may cause measurable changes in the body — such as decreased pulmonary function. These changes are generally indicated by the occurrence of signs and symptoms in the exposed employees — such as shortness of breath, a non-measurable, subjective feeling. Employees exposed to such hazards must be apprised of both the changes in body function and the signs and symptoms that may occur to signal that change.

The determination of occupational health hazards is complicated by the fact that many of the effects or signs and symptoms occur commonly in non-occupationally exposed populations, so that effects of exposure are difficult to separate from normally occurring illnesses. Occasionally, a substance causes an effect that is rarely seen in the population at large, such as angio-sarcomas caused by vinyl chloride exposure, thus making it easier to ascertain that the occupational exposure was the primary causative factor. More often, however, the effects nonspecific (e.g., lung cancer). The situation is further complicated by the fact that most chemicals have not been adequately tested to determine their health hazard potential, and data do not exist to substantiate these effects.

There have been many attempts to categorize effects and to define them in various ways. Generally, the terms "acute" and "chronic" are used to delineate between effects on the basis of severity or duration. "Acute" effects usually occur rapidly as a result of short-term exposures and may be of short duration. "Chronic" effects generally occur as a result of long-term exposure and are of long duration.

The acute effects referred to most frequently are those defined by the ANSI standard for Precautionary Labeling of Hazardous Industrial Chemicals (Z129.1-1988) — irritation, corrosiveness, sensitization and lethal dose. Although these are important health effects, they do not adequately cover the entire range of acute effects that may occur as a result of occupational exposure, such as narcosis.

Similarly, the term chronic effect is often used to cover only carcinogenicity, teratogenicity, and mutagenicity. These effects are obviously a concern in the workplace, but again, chronic effect, as defined, does not include all potential chronic effects, such as, for example, blood dyscrasias (anemia), chronic bronchitis, or liver atrophy.

Neither HMIS<sup>®</sup> nor any other single tool realistically can precisely define, in measurable terms, every possible health effect that may occur in the workplace as a result of chemical exposures. This does not negate the requirement that employees be informed of such effects and protected from them. Mandatory Appendix B outlines the principles and procedures of hazard assessment.

For purposes of this section, any chemicals which meet any of the following definitions, as determined by the criteria set forth in Appendix B, are health hazards. However, this is not intended to be an exclusive categorization scheme. If there are available scientific data that