A Conservator's Guide to Labeling Hazardous Chemicals

A Special Insert By

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Acronyms

ACGIH—American Conference of Governmental and Industrial Hygienists

DOT—Department of Transportation

GHS—Globally Harmonized System for Hazard Communication

HAZMAT—Hazardous Material

HMIG—Hazardous Materials Identification Guide

HMIS®—Hazardous Materials Information System (Registered trademark of JJ Keller & Associates, Inc., in conjunction with the National Paint and Coating Association)

HMLS—Hazardous Materials Labeling System

IUPAC—International Union of Pure and Applied Chemistry

MSDS—Material Safety Data Sheet

NFPA—National Fire Protection Association

NFR—National Fire Rating

NIOSH—National Institute of Occupational Safety and Health

OSHA—Occupational Safety and Health Administration

PPE—Personal Protective Equipment

ULHS—Uniform Laboratory Hazard Signage

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Introduction

All conservation laboratories and studios contain materials which the Occupational Safety and Health Administration (OSHA) considers hazardous. A hazardous material is defined by OSHA as any chemical which poses a physical or health hazard. OSHA requires that all hazardous chemicals be labeled with an appropriate warning. The purpose of these warning labels is to let employees know the identity of the hazardous chemical, what its hazards are, what level of risk it poses, if it has any special hazards, and what personal protective equipment (PPE) is needed when handling the chemical. These warning labels also alert emergency personnel as to what dangerous materials are present in an emergency situation. Of all the OSHA regulations, this requirement is one of the most frequently cited during an OSHA inspection. Since the lack of appropriate labeling of hazardous chemicals can be easy for an OSHA inspector to observe, it is one of the most obvious infractions during an inspection. Labeling is a relatively easy and inexpensive task. Proper labeling of all hazardous chemicals should be among the highest safety priorities in a conservation laboratory.

The OSHA Regulation and Other Laws

The OSHA regulation requiring the use of warning labels for hazardous chemicals is part of the "Hazards Communication," also known as "HazCom" or the "Workers Right to Know (RTK)" law. This law was enacted in 1983 and covers nearly one-fourth of the nation's workforce. It is found in Title 29 (Labor) of the Code of Federal Regulations (CFR) part 1910, section 1200. This law is divided into ten sections, of which labeling of hazardous chemicals is only one part. The law includes the following sections:

- Purpose
- Scope and Application
- Definitions
- Hazard Determination
- Written Hazard Communication Program
- Labels and Other Forms of Warnings
- Material Safety Data Sheets
- Employee Information and Training
- Trade Secrets
- Effective Dates

The Law's subpart f covers "labels and other forms of warning" and is the focus of this guide. Subpart f is divided into eleven parts. Parts one through four, 10, and 11 specify the responsibilities of the chemical manufacturer, importer, or distributor and generally do not apply to the conservator working in his or her studio or laboratory. That said, under this regulation, the conservator is considered to be a distributor when he ships or carries hazardous chemicals to a site. In that case, the conservator must label all chemicals being shipped with the identity of the chemical, its hazards, the target organs affected, and the shipper's address. The conservator must be sure that the information on the label does not conflict with the requirements of the Hazardous Materials Transportation Act and Department of Transportation (DOT) regulations. While DOT regulations are important when transporting hazardous chemicals to a worksite, they are outside the scope of this guide. These regulations can be found at the Department of Transportation website, http://www.dot.gov.

Parts five through nine of subpart f of the RTK law concern the responsibilities of the employer. A museum or institution must ensure that its conservation laboratories are in compliance with these laws. It is also the responsibility of the conservator who has employees working for him or her to comply with these laws.

Part five states that it is the responsibility of the employer to ensure that each container of hazardous chemicals in the workplace is labeled, tagged, or marked with the following:

- Identity of the hazardous chemical in the container
- Appropriate health and physical hazard warnings (can include words, pictures and/or symbols that convey information to the employee about the hazards of the chemical)
- Target organs affected by the chemical

Part six allows the employer some flexibility to use signs, placards, or other written materials instead of affixing labels to stationary containers, but states that these other forms of communication must

convey the same information as required in part five. It also states that this written material must be readily accessible to employees in their work area throughout each work shift.

Part seven allows that when an individual transfers hazardous materials from a properly labeled container into a portable container, such as a bottle or beaker, the portable container does not have to be labeled as long as the chemical will be *used immediately* by the person who made the transfer.

Part eight tells the employer that he should not remove or deface existing labels on incoming containers and part nine requires that labels and other written warnings be legible, in English, and prominently displayed. Part nine also allows the employer to include information in other languages, but the information must be presented in English as well.

Conspicuously absent from the OSHA regulation is *the specification as to what type of labels are required or a standard method for communicating the hazard of a chemical*. The RTK law merely states that the employer is responsible for ensuring that every container of hazardous chemicals in the workplace is labeled, tagged, or marked with pertinent information. It is important to note that some states may require additional information on labels of hazardous chemicals. Thus, it is important to check with the local governing OSHA office to find out what is needed to be in compliance. (See http://www.osha.gov/html/oshdir.html for a directory of OSHA offices.)

Labeling Systems—NFPA or NPCA?

There are two independent bodies that have developed standard labeling systems. They are the National Fire Prevention Association (NFPA) (http://www.nfpa.org), and the National Paint and Coatings Association (NPCA) (http://www.paint.org). The NFPA developed the NFPA (or NFR—National Fire Rating) labeling system and the NPCA developed the HMIS® (Hazardous Materials Identification System) labeling system. The HMIS® standard is a registered trademark of the NPCA and only one vendor, JJ Keller & Associates, Inc. is authorized to sell these labels. There are a variety of other systems that are closely related to the HMIS® labeling system including the Hazards Identification System (HIS), Hazardous Materials Labeling System (HMLS) and the Hazardous Materials Information Guide (HMIG).

Although hazard labels from the NFPA and the NOCA share some general characteristics, the specific purpose of each label is different. The NFPA label is intended to inform firefighters or other emergency responders. The HMIS® label attempts to provide full health information and is not intended for use in an emergency situation. Thus, the information that must appear on the label differs according to the choice of labeling system. (http://www.ilpi.com/msds/ref/hmis.html)

The characteristic shared by the NFPA and HMIS® labels is four colored areas: blue (health); red (flammability); yellow (HMIS® II) or orange (HMIS® III) (instability or physical hazard [formerly reactivity]); white (special notice or information key).

The hazard labels specified by the NFPA are diamond-shaped, while the HMIS® labels are rectangular. An example of each label is shown in Figures 1and 2, respectively.

On each of the label types, there is room for indicating the degree of hazard in the categories of health, flammability, and instability (physical hazard). The scale for designating degree of hazard is 0–4, with 4 being the most severe hazard and 0 the least. Tables 1–3 describe in detail the hazard for each of the five degrees from 0–4 for the HMIS® system. A summary of the ratings for these same categories is given in tables 4-6.

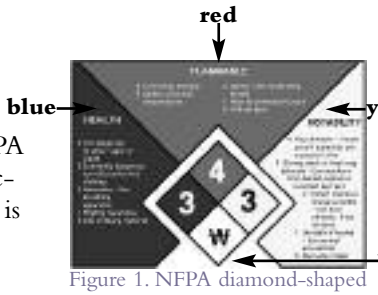

Figure 1. NFPA diamond-shaped label showing hazard codes 3, 4, 3 and water-reactive for health, flammability, instability (reactivity) and special hazard, respectively. Detailed descriptions are shown in the corresponding colored boxes, but are not part of the label.


Figure 2. HMIS® labels with target organ information.

Key to HMIS® Label Numerical Ratings

Rating Summary

Chemicals are considered physical hazards if they are explosive, compressed gases, pyrophoric materials, unstable, water-reactive, organic peroxides, or oxidizers. Some chemicals may be perfectly safe alone, but when mixed with other materials they present a physical hazard. A good example would be sodium bicarbonate and acetic acid solution. The two chemicals can sit on your laboratory shelf by themselves, but if you mix them, they evolve carbon dioxide. If there is no way to vent the carbon dioxide gas being produced, the container can explode. Any of you who made baking soda and vinegar "bombs" (or volcanoes) as youngsters know the reaction well.

The following types of chemicals are considered health hazards: chemicals that can cause cancer, harm your skin, internal

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Table 1. HEALTH (blue)	
4	Deadly: Even the slightest exposure to this substance is life threatening. Specialized protective clothing should be worn.
3	Extreme Danger: Exposure to this substance causes serious injury. Do not expose any body surface to this substance. Full protective measures should be taken.
2	Dangerous: Exposure to this substance is hazardous to health. Protective measures are indicated.
1	Slight Hazard: Exposure to this substance causes irritation or minor injury. Protective measures are indicated.
0	No Hazard: Exposure to this substance carries no significant health risk.

Table 2. FLAMMABILITY (red)	
4	Flash Point Below 73°F and Boiling Point Below 100°F: This substance is very flammable, volatile, or explosive, depending on its state. Extreme caution should be used when handling and storing this substance.
3	Flash Point Below 100°F: This substance is flammable, volatile, or explosive under almost all normal temperature conditions. Exercise great caution when handling and storing this substance.
2	Flash Point Below 200°F: Moderately heated conditions may ignite this substance. Caution procedures should be employed when handling this substance.
1	Flash Point Above 200°F: This substance must be preheated to ignite. (Most combustible solids are in this category.)
0	Will Not Burn: This substance will not burn.

Table 3. INSTABILITY or PHYSICAL HAZARD (yellow or orange)	
4	May Detonate: This substance is readily capable of detonation or explosion at normal temperatures and pressures. Evacuate area if this substance is exposed to heat or fire.
3	Explosive: This substances is readily capable of detonation or explosion by a strong initiating source, such as heat, shock, or water. Monitor from behind explosion-resistant barriers.
2	Unstable: With this substance, violent chemical changes are possible at normal or elevated temperatures and pressures. Potentially violent or explosive reaction may occur when mixed with water. Monitor from a safe distance.
1	Normally stable: This substance may become unstable at elevated temperatures and pressures or when mixed with water. Approach with caution.
0	Stable: This substance will remain stable when exposed to heat, pressure, or water.

Table 4. HEALTH (Blue)		
4	Danger	May be fatal on short exposure. Specialized protective equipment required.
3	Warning	Corrosive or toxic. Avoid skin contact or inhalation.
2	Warning	May be harmful if inhaled or absorbed.
1	Caution	May be irritating.
0		No unusual hazard.

Table 5. FLAMMABILITY (Red)		
4	Danger	Flammable gas or extremely flammable liquid.
3	Warning	Flammable liquid flash point below 100°F.
2	Caution	Combustible liquid flash point of 100°F to 200°F.
1		Combustible if heated.
0		Not combustible.

organs, or nervous system, are poisonous, cause allergic reactions after repeated exposure, are corrosive (such as acids or alkalis), or cause birth defects.

Some chemicals can cause damage to specific organs of the human body. Table 7 gives some examples of agents, their target organ(s), signs, and symptoms and examples of the hazardous chemical affecting those organs. (These data were taken from http://www.rtklabels.com/rtk_how_to/target_organs.htm.) Although not specifically required by 29 CFR 1910.1200 (f), OSHA now takes the position that a chemical's target organ should be included on the hazard label. Target organs include the liver, kidneys, nervous system, blood, lungs, reproductive organs, heart, skin and eyes.

Although NFPA and HMIS® labels are similar in the health, flammability, and instability (reactivity) categories, they differ in the information that goes in the white section. The white section of an NFPA label is used to indicate a particular type of hazard, such as a chemical oxidizer, corrosive, water-reactive, or explosive. The codes for these special hazards are given in table 8. A detailed description of the special information rating can be found at http://www.ehs.neu.edu/nfpa.htm.

The white section of an HMIS® label is used to indicate the type of personal protective equipment (PPE) required when handling the chemical. The best way to indicate the PPE required is to use icons, as shown in Figure 3. Several suppliers offer stickers of the various icons, which can be attached to hazard labels or containers of hazardous chemicals.

PPE for HMIS® labels can also be designated using the following codes:

- A—safety glasses
- B—safety glasses + gloves
- C—safety glasses + gloves + synthetic apron
- D—face shield + gloves + synthetic apron

Figure 3. Icons for PPE used in HMIS® labeling.

Table 6. INSTABILITY (Reactivity) (Yellow)

4	Danger	Explosive material at room temperature.
3	Danger	May be explosive if shocked, heated, under confinement, or mixed with water.
2	Warning	Unstable or may react violently if mixed with water.
1	Caution	May react if heated or mixed with water, but not violently.
0	Stable	Not reactive when mixed with water.

Table 7. Agent Types with Examples of Hazardous Chemicals, Target Organs, and Signs/Symptoms of Exposure

Agent Type	Examples of Hazardous Chemicals	Target Organ(s)	Signs and Symptoms
hepatotoxins	carbon tetrachloride; nitrosamines	liver	jaundice; liver enlargement
nephrotoxins	halogenated hydrocarbons; uranium	kidneys	edema; proteinuria
neurotoxins	mercury; carbon disulfide	nervous system	narcosis; behavioral changes; decrease in motor functions
blood hazards	carbon monoxide; cyanides	decreased hemoglobin function; body tissues deprived of oxygen	cyanosis; loss of consciousness
pulmonary hazards	silica; asbestos	lungs	cough; tightness in chest; shortness of breath
reproductive toxins	lead; DBCP	chromosomes (mutagenesis); fetuses (teratogenesis)	birth defects; sterility
cutaneous hazards	ketones; chlorinated compounds	skin	defatting of skin; rashes; irritation
eye hazards	organic solvents; acids; bases	eyes or visual capacity	conjunctivitis; corneal damage

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- E—safety glasses + gloves + dust respirator
- F—safety glasses + gloves + synthetic apron + dust respirator
- G—safety glasses + gloves + vapor respirator
- H—splash goggles + gloves + synthetic apron + vapor respirator
- I—safety glasses + gloves + combination dust/vapor respirator
- J—splash goggles + gloves + synthetic apron + combination dust/vapor respirator
- K—airline hood or mask + gloves + full protection suit + boots
- L–Z—custom PPE specified by employer

The use of codes can be quite confusing unless the key to the codes is clearly posted. To add to the confusion, firefighters and other emergency personnel use codes A-E, where A is the greatest hazard and E is the least. It is clearly better to use icons or words to designate the PPE needed so that employees and emergency personnel have an unambiguous understanding of the information on the warning labels.

While it is tempting to use a hybrid of the two labels, the NFPA and the NPCA discourage mixing information on the labels. If a hybrid is used, it is very important that employees be properly trained on the use of the chosen labeling system and be made aware of the potential conflicts between the two. It would also be wise to share this information with local fire and emergency personnel or have an explanation of the labeling system in a conspicuous place in the event of an emergency. There is always the option of using both systems, though the practice is redundant, costly, and time consuming.

Table 8. Letters and Symbols of Some Special Hazards for Use on NFPA Labels

W	water reactive
Oxy	oxidizing agent
G	compressed gas
LN_2	liquid nitrogen
LHE	liquid helium
ACID	acid
ALK	alkali (base)
COR	corrosive
P	polymerizes
	radioactive
—	no special hazard

Table 9. Labels for Special Non-chemical Hazards

Symbol	Special Non-chemical Hazard
LAS	laser
RAD	radioactive material
MAG	magnetic fields
HVO	high voltage

Although these two systems are well-established in the U.S., there are some activities underway to establish an international labeling system. These efforts are referred to as the "Globally Harmonized System for Hazard Communication" (GHS) (http://www.osha.gov/SLTC/hazardcommunications/global.html). These new global classification and labeling systems are not yet in place, but are designed to merge some of the good habits now practiced outside the U.S. with the existing U.S. systems. The new GHS will include a compatible labeling system, though this might be a few years away.

Other Labeling Systems

In addition to labeling chemicals, any extreme hazards must also be indicated by placards bearing the appropriate pictograph. For example, objects having harmful concentrations of biological organisms such as viruses or fungi, should be stored separately with a biohazard warning sign, as shown in Figure 4a. Radiation hazards from radioisotopes should be indicated with the sign shown in Figure 4b, while sources of X-ray—such as when a portable XRF or X-ray diffraction analyzer is in use—should have the signage shown in figure 4c. This type of placard signage has been designated as the Uniform Laboratory Hazard Signage (ULHS) system by the University of Oklahoma. (http://www.pp.okstate.edu/ehs/)

In addition to the above placards and hazard labels, other warnings must be posted when appropriate and are shown in table 9. These are signs that must be posted in addition to the NFPA diamonds or HMIS® rectangles.

Labeling Hazardous Chemicals

Given the above information, how does one properly label all of the hazardous chemicals in the conservation lab or studio? There are three basic steps in the process of labeling hazardous chemicals. They are:

- Conducting an inventory of all hazardous chemicals (commercial products and mixtures prepared in the lab)

- Acquiring material safety data sheets for all hazardous chemicals
- Labeling containers

As required by the OSHA regulation, the conservator or the employer is responsible for ensuring that every container of hazardous chemicals in the workplace is labeled, tagged, or marked with pertinent information. The items that must be included on the label of in-house hazardous chemicals are:

- Identity of the hazardous chemical(s) contained therein (Chemical name, e.g.; common or International Union of Pure and Applied Chemistry [IUPAC])
- Appropriate hazard warnings (health, flammability, instability or physical hazard (formerly "reactivity) [hazard rating 0-4] and special notice key)
- Target organ(s) affected

For any materials that are shipped or carried to another site, the name and address of the person shipping the item(s) must be included. Although the OSHA regulation does not require a mixture's preparation date, it is a good idea to date the items you prepare.

The first step in identifying which hazardous chemicals are present in a studio or laboratory is to carry out an inventory of all chemicals. The inventory should include all commercial materials (e.g., acetone, toluene, Acryloid B-72, etc.), as well as any mixtures that have been prepared, such as adhesive and consolidant mixtures, varnishes, and other coating materials. Although not required for labeling, it is best to indicate in the inventory the location of the item and quantity on hand.

The next step in the process is to acquire Material Safety Data Sheets (MSDS) from the manufacturer or distributor for each of the chemicals in the inventory. Although it is beyond the scope of this guide to discuss MSDS in detail, and the information is covered in White's AIC News health and safety insert on hazards communication (White 2000), the RTK law requires that each hazardous chemical have an MSDS readily available to employees. The MSDS contains information that can be used to help identify health, flammability, and instability hazards, as well as the PPE required for handling the chemical. Unfortunately, quite frequently these codes are not indicated on the MSDS; however, a careful reading of the MSDS can often help you ascertain the degree of hazard. The MSDS frequently specifies appropriate PPE.

In the case of mixtures, the hazard label must contain the hazard rating of the most dangerous substance in the mixture, regardless of the concentration of that chemical. For example, a preparation of Agatine used as a coating for silver, must have the code for cellulose nitrate on the label, even if the percentage composition of cellulose nitrate in acetone is low. The hazard label must contain hazard warnings for the most hazardous chemical of the components of the mixture.

An extremely helpful, and much more useful, reference for ascertaining the degree of hazard for health, flammability, and instability is the NFPA's *Fire Protection Guide to Hazardous Materials* (NFPA 2002). In addition to the hazard codes, this reference contains an extensive list of chemicals with their corresponding incompatibilities. This information is critical for determining storage of chemicals once inventory has been carried out. The hazard codes can be used to fill in NFPA labels.

A word of caution is necessary here. The hazard codes for the NFPA labels are often different from those for the HMIS® hazard designations. The HMIS® ratings are proprietary and must be purchased from the sole vendor, JJ Keller & Associates (http://www.jjkeller.com). Alternatively, the vendor from whom the chemical was purchased can be contacted to obtain both the MSDS and the HMIS® hazard ratings. It is unfortunate that these codes are not readily available, because they are of greater interest to the conservation professional than are the ratings provided by the NFPA. In the absence of HMIS® hazard rating codes, it is best to use the NFPA ratings and their labeling system.

In addition to hazard ratings, the NFPA has made recommendations for the minimum height of lettering on labels depending on the distance from which a label will be read. Table 10 gives the minimum height of the lettering required for various distances at which a label or placard is to be legibly viewed. This information is important only

Table 10. Distance of Legibility and Lettering Size Required by the NFPA for Hazard Labels

Distance at which lettering must be legible	Minimum height of lettering required
50 ft	1 in
75 ft	2 in
100 ft	3 in
200 ft	4 in
300 ft	6 in

Figure 4. Placards with pictographs for
(a) biohazard such as mold contamination;
(b) radioisotopes; and
(c) X-ray source.

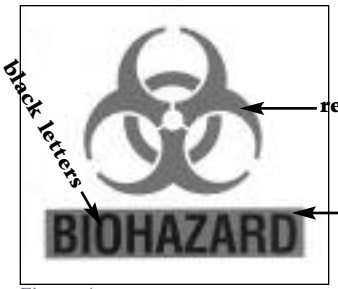

Figure 4a

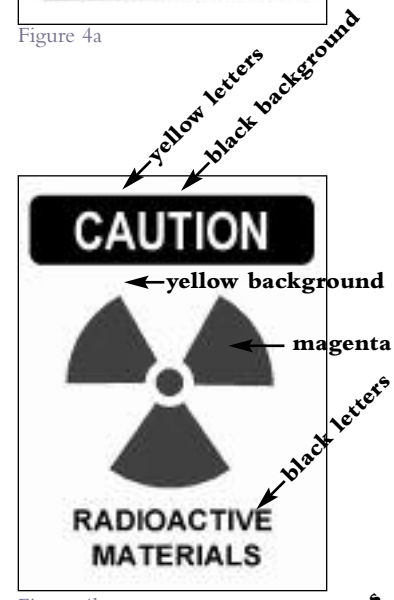

Figure 4b

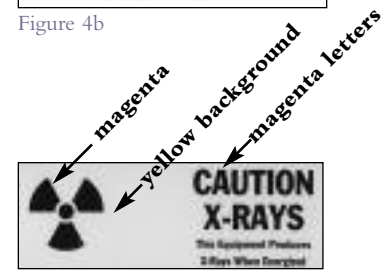

Figure 4c

Figure 5. Legible but unacceptable labeling of hazardous chemicals.

Figure 6. Containers of hazardous chemicals labeled neatly with a label-maker. Labels are unacceptable, even though the containers are labeled neatly.

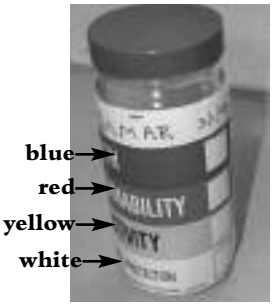

Figure 7. An HMIS®-labeled container of a hazardous chemical that is unacceptable because no hazard information or PPE codes have been indicated.

Figure 8. A properly labeled hazardous chemical container.

Figure 9. Large label center with hazard rating information. (Labels are sold separately).

when it is expected that containers will be viewed from a distance—for example, when stored in a large storage area.

Proper Versus Improper Labeling

The importance of proper labeling of hazardous chemicals cannot be stressed enough. It is not sufficient to merely identify the hazardous chemical. A few examples of improperly labeled hazardous chemicals are given in figures 5–7.

Figure 8 shows an example of a properly labeled container. The container is properly labeled because it identifies the chemical, its hazards, the appropriate PPE for its use, and the target organs affected.

In the end, the choice of labeling system depends on what information you want to convey to your employees. Whichever system you choose, it is important to be consistent with your labeling and to train all employees, including interns, in the proper use of the chosen system.

NFPA Health, Flammability and Instability (Reactivity or Physical Hazard) of Some Materials Commonly Found in the Conservation Lab

See Table 11, page 9

Useful Miscellaneous Items for the Laboratory

The following items are useful in the laboratory and aid in maintaining compliance with the Hazards Communication regulation.

- Clear polyester adhesive-backed protective overlays for labels
- Label center (an example is shown in figure 9)
- Labels of various sizes
- MSDS station with station sign
- Permanent markers
- Pocket guides (Hazards Communication, Right to Know)
- Wall charts (hazard identification system, target organ information, training poster)
- Wallet cards (reference cards with summaries of hazard codes)

Suppliers of Labels, Label Stations, Wall Charts, Label Accessories, and Reference Materials

Fisher Scientific
https://www1.fishersci.com/safety/lab/

JJ Keller & Associates, Inc.
3003 W. Breezewood Lane
P.O. Box 368
Neenah, WI 54957-0368
Phone: (800) 327-6868
Fax: (800) 727-7516
http://www.jjkeller.com

Lab Safety Supply
http://www.lss.com or
http://www.labsafety.com

Safety Emporium
http://www.SafetyEmporium.com

Acknowledgements

The author would like to thank Douglas R. Bischoff, Chemist, National Institute of Standards and Technology, Gaithersburg, MD, for his assistance in reviewing this paper.

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Table 11. Health, Flammability, and Instability (Reactivity) Codes for Hazardous Chemicals That May Be Found in the Conservation Laboratory

CHEMICAL	H (Health)	F (Flammability)	I(R) (Instability)
Acetic Acid, glacial	2	2	1
Acetone	1	3	0
Acetonitrile	2	3	0
Acetylene, in cylinder	1	4	3
Amyl acetate	1	3	0
Benzyl alcohol	2	1	0
Butyl alcohol	1	3	0
Cellulose nitrate (wet with alcohol)	2	3	3
Collodion (nitrocellulose in ether-alcohol)	1	4	0
Diacetone alcohol	1	2	0
N,N-Diethylformamide	1	2	0
Ethanol	0	3	0
Ethyl acetate	1	3	0
Ethyl ether	2	4	1
Formic acid, 90% solution	3	2	0
Glycerine	1	1	0
Heptane	1	3	0
Isoamyl acetate (banana oil)	1	3	0
Isopropyl alcohol	1	3	0
Linseed oil, raw	0	1	0
Methyl alcohol	1	3	0
Methylene chloride (dichloromethane)	2	1	0
Methyl ethyl ketone	1	3	0
Mineral oil	0	1	0
Mineral spirits	3	2	0
Morpholine	2	3	0
Naphtha, petroleum (benzine or petroleum ether)	1	4	0
Naphtha VM&P	1	3	0
Naphthalene	2	2	0
Neatsfoot oil	0	1	0
Nitrate negatives	2	3	3
Paraffin oil	0	1	0
Phenol	3	2	0
Stearic acid	1	1	0
Stoddard's solvent	3	2	0
Tannic acid	0	1	0
Tetrahydrofuran	2	3	1
Toluene	2	3	0
1,1,1-Trichloroethane	2	1	0
Triethanolamine	2	1	1
Tung oil (China wood oil)	0	1	0
Turpentine	1	3	0
Varsol	1	3	0
Waxes (carnauba, beeswax, hydrocarbon waxes, etc.)	0	1	0
Xylenes	2	3	0

Glossary (taken from 29 CFR 1910.1200(c))

Chemical—Any element, chemical compound, or mixture of elements and/or compounds.

Chemical manufacturer—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.

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.

Container—Any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical.

Distributor—A business, other than a chemical manufacturer or importer, which supplies hazardous chemicals to other distributors or to employers. (Under 29 CFR 1910.1200(b)(3)(iv), laboratory employers that ship hazardous chemicals are considered to be either a chemical manufacturer or a distributor…and thus must ensure that any containers of hazardous chemicals leaving the laboratory are labeled in accordance with 29 CFR 1910.1200).

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

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

Flammable—A chemical that falls into one of the following categories:

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

b. Gas, flammable:

(i) 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

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

c. Liquid, flammable—Any liquid having a flashpoint below 100 deg. F (37.8 deg. C), except any mixture having components with flashpoints of 100 deg. F (37.8 deg. C) or higher, the total of which make up 99 percent or more of the total volume of the mixture.

d. Solid, flammable—A solid, other than a blasting agent or explosive as defined in 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A 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.

Hazardous chemical—Any chemical which is a physical hazard or a health hazard.

Hazard warning—Any words, pictures, symbols or combination thereof appearing on a label or other appropriate form of warning which convey the specific physical and health hazard, including target organ effects, of the chemical(s) in the containers.

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 effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes. Appendix A [of this standard] provides further definitions and explanations of the scope of health hazards covered by this section, and Appendix B [of this standard] describes the criteria to be used to determine whether or not a chemical is to be considered hazardous for purposes of this standard.

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.

Immediate use—The hazardous chemical will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.

Label—Any written, printed, or graphic material displayed on or affixed to containers of hazardous chemicals.

Material safety data sheet (MSDS)—Written or printed material concerning a hazardous chemical which is prepared in accordance with paragraph (g) of this section.

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

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

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

Produce—To manufacture, process, formulate, blend, extract, generate, emit, or repackage.

Pyrophoric—A chemical that will ignite spontaneously in air at a temperature of 130 deg. F (54.4 deg. C) or below.

Responsible party—Someone who can provide additional information on the hazardous chemical and appropriate emergency procedures, if necessary.

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.

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

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.

Use—To package, handle, react, emit, extract, generate as a byproduct, or transfer.

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

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

Workplace—An establishment, job site, or project, at one geographical location containing one or more work areas.

Websites

ACGIH
http://www.acgih.org

DOT
http://www.dot.gov

GHS
http://www.osha.gov/SLTC/hazardcommunications/global.html

Hazcom EZFacts from Lab Safety Supply
http://www.labsafety.com/refinfo/ezfacts/ezf200.htm

HMIS®
http://www.ilpi.com/msds/ref/ hmis.html

NIOSH
http://www.niosh.gov

NFPA
http://www.nfpa.org

NFPS Special Information Ratings
http://www.ehs.neu.edu/nfpa.htm

NPCA
http://www.paint.org

OSHA
http://www.osha.gov

OSHA Local Offices Directory
http://www.osha.gov/html/oshdir.html

University of Oklahoma ULHS
http://www.pp.okstate.edu/ehs/

Target Organs
http://www.rtklabels.com/rtk_how_to/target_organs.htm

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