

### Which Chemicals Are Considered Hazardous?

It is the policy of the Practice to develop as comprehensive a list of chemicals and MSDS sheets as possible, erring on the side of over-inclusiveness—in an effort to promote a safe workplace. In layman's terms—if at a minimum the chemical would irritate the eye or skin, or should not be ingested, it should be catalogued. The following OSHA Regulations have guided this policy:

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The Hazard Communication Standard (HCS) requires information to be prepared and transmitted regarding all hazardous chemicals. The HCS covers both physical hazards (such as flammability), and health hazards (such as irritation, lung damage, and cancer). Most chemicals used in the workplace have some hazard potential, and thus will be covered by the rule.

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For purposes of this section, any chemicals which meet any of the following definitions, ...are health hazards. However, this is not intended to be an exclusive categorization scheme. If there are available scientific data that involve other animal species or test methods, they must also be evaluated to determine the applicability of the HCS.

1. "Carcinogen:" A chemical is considered to be a carcinogen if:

- (a) It has been evaluated by the International Agency for Research on Cancer (IARC), and found to be a carcinogen or potential carcinogen; or
- (b) It is listed as a carcinogen or potential carcinogen in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or,
- (c) It is regulated by OSHA as a carcinogen.

2. "Corrosive:" A chemical that causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the site of contact. For example, a chemical is considered to be corrosive if, when tested on the intact skin of albino rabbits by the method described by the U.S. Department of Transportation in Appendix A to 49 CFR part 173, it destroys or changes irreversibly the structure of the tissue at the site of contact following an exposure period of four hours. This term shall not refer to action on inanimate surfaces.

3. "Highly toxic:" A chemical falling within any of the following categories:

- (a) A chemical that has a median lethal dose (LD(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 two and three kilograms each.
- (c) A chemical that has a median lethal concentration (LC(50)) in air of 200 parts per million by volume or less of gas or vapor, or 2 milligrams per liter or less of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.

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

5. "Sensitizer:" A chemical that causes a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical.

6. "Toxic." A chemical falling within any of the following categories:

(a) A chemical that has a median lethal dose (LD(50)) of more than 50 milligrams per kilogram but not more than 500 milligrams per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.

(b) A chemical that has a median lethal dose (LD(50)) of more than 200 milligrams per kilogram but not more than 1,000 milligrams per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each.

(c) A chemical that has a median lethal concentration (LC(50)) in air of more than 200 parts per million but not more than 2,000 parts per million by volume of gas or vapor, or more than two milligrams per liter but not more than 20 milligrams per liter of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.

7. "Target organ effects."

The following is a target organ categorization of effects which may occur, including examples of signs and symptoms and chemicals which have been found to cause such effects. These examples are presented to illustrate the range and diversity of effects and hazards found in the workplace, and the broad scope employers must consider in this area, but are not intended to be all-inclusive.

- a. Hepatotoxins: Chemicals which produce liver damage
  - Signs & Symptoms: Jaundice; liver enlargement
  - Chemicals: Carbon tetrachloride; nitrosamines
- b. Nephrotoxins: Chemicals which produce kidney damage
  - Signs & Symptoms: Edema; proteinuria
  - Chemicals: Halogenated hydrocarbons; uranium
- c. Neurotoxins: Chemicals which produce their primary toxic effects on the nervous system
  - Signs & Symptoms: Narcosis; behavioral changes; decrease in motor functions
  - Chemicals: Mercury; carbon disulfide
- d. Agents which act on the blood or hemato-poietic system: Decrease hemoglobin function; deprive the body tissues of oxygen
  - Signs & Symptoms: Cyanosis; loss of consciousness
  - Chemicals: Carbon monoxide; cyanides

- e. Agents which damage the lung: Chemicals which irritate or damage pulmonary tissue
    - Signs & Symptoms: Cough; tightness in chest; shortness of breath
    - Chemicals: Silica; asbestos
  - f. Reproductive toxins: Chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis)
    - Signs & Symptoms: Birth defects; sterility
    - Chemicals: Lead; DBCP
  - g. Cutaneous hazards: Chemicals which affect the dermal layer of the body
    - Signs & Symptoms: Defatting of the skin; rashes; irritation
    - Chemicals: Ketones; chlorinated compounds
  - h. Eye hazards: Chemicals which affect the eye or visual capacity
    - Signs & Symptoms: Conjunctivitis; corneal damage
    - Chemicals: Organic solvents; acids
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## UNDERSTANDING MSDS AND NFPA LABELS

A Material Safety Data Sheet (MSDS) is designed to tell you everything you need to know about a chemical and how to use it safely. Suppliers are required to have MSDS available for all chemicals, free of charge. A MSDS consist of eight sections listed below.

### Chemical Name

- The name on the label
- Date the MSDS was prepared
- Name and address of the manufacturer
- Emergency phone number

### Hazardous Ingredients and Chemical Identity

- Names of dangerous substances in the chemical
- The safe limits of exposure (PEL) or (TVL)
- Common names for the chemical

### Physical Characteristics

- How it looks and smells
- The boiling and melting temperatures
- Evaporation rate
- How easily it dissolves
- How heavy it is (will it sink, float or dissolve in water)

### Fire and Explosion Data

- The flash point (the lowest temperature when it could catch fire)
- Whether it is flammable or combustible
- The best way to extinguish a fire involving the chemical

### Reactivity

- What are the conditions that could cause it to burn, explode, or release dangerous vapors
- Substances that react with it

### Health Hazards

- The dangers associated with inhaling or touching the chemical
- The first aid procedures
- Dangers for people with medical conditions

### Usage, Handling and Storage

- How to clean up a spill
- How to handle, store and dispose of the chemical

### **Special Protection and Precautions**

- Personal protection equipment that should be used
- Other equipment needed when working with the chemical
- Special procedures
- Signs that should be posted
- Miscellaneous information

The most important thing about using a MSDS is reading it before you are exposed to the chemical. These sheets are required to be on the job site and available for view by everyone. An employer shall provide a copy of a MSDS to an employee upon request. The following website offers a complete library of MSDS sheets. <http://hazard.com/msds/>.

Source: <http://www.agcetn.org/pdf/safety/Articles/Understanding%20MSDS.pdf>, used with permission.

### Understanding the NFPA Labeling System

One may see these signs on any building that contains hazardous chemicals. The sign is called an NFPA panel. NFPA stands for National Fire Protection Association. These signs give firefighters some sort of advanced notice on what they are getting themselves into when they arrive at the scene of a fire. When there is a house fire, firefighters have a pretty good idea of what they are in for, but if there is a fire at a warehouse in an industrial park, it is very hard to know what chemicals might be stored inside. The NFPA panel is a clear indication of what sort of dangers might lie inside.

The panel has four areas:

**Red** - Fire hazard

**Blue** - Health hazard

**Yellow** - Reactivity

**White** - Specific hazard

The numbers in the first three areas range from 0 to 4, with 0 signifying no hazard and 4 signifying a severe hazard. For example,

In the **Instability area (Yellow)**:

0 = Stable

1 = Unstable if heated

2 = Violent chemical

3 = Shock or heat may detonate

4 = May detonate

In the **Fire hazard area (Red)**, the numbers indicate the flash point:

0 = Will not burn

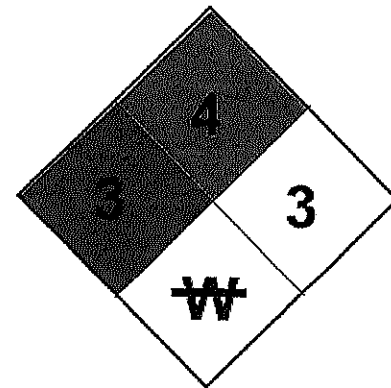
1 = Will burn above 200 degrees F (93 C)

2 = Will burn below 200 degrees F (93 C)

3 = Will burn below 100 degrees F (38 C)

4 = Will burn below 73 degrees F (23 C)

Concrete is an example of a class 0 fire hazard. Paper and wood are class 1.



In the **Health hazard area (Blue)**:

0 = No hazard

1 = Slightly hazardous

2 = Hazardous

3 = Extremely hazardous

4 = Deadly

In the **Specific hazard area (White)**, you will see things like:

OXY - Oxidizer

ACID




ALK - Alkali

COR - Corrosive

You may also see a "W" with a bar through it (meaning "use no water"), or the radiation hazard symbol for radioactive materials.

Source: "What do the big diamond-shaped signs with red yellow and blue diamonds mean?." 01 April 2000. HowStuffWorks.com. <<http://people.howstuffworks.com/question327.htm>> 16 April 2008.

Permission granted so long as citation given.

	<p style="text-align: center;"><b>Health Hazard</b></p> <p><b>4</b> Very short exposure could cause death or serious residual injury even though prompt medical attention was given.</p> <p><b>3</b> Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.</p> <p><b>2</b> Intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical attention is given.</p> <p><b>1</b> Exposure could cause irritation, but only minor residual injury even if no treatment is given.</p> <p><b>0</b> Exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials.</p>
	<p style="text-align: center;"><b>Flammability</b></p> <p><b>4</b> Will rapidly or completely vaporize at normal pressure and temperature, or is readily dispersed in air and will burn readily.</p> <p><b>3</b> Liquids and solids that can be ignited under almost all ambient conditions.</p> <p><b>2</b> Must be moderately heated or exposed to relatively high temperature before ignition can occur.</p> <p><b>1</b> Must be preheated before ignition can occur.</p> <p><b>0</b> Materials that will not burn.</p>
	<p style="text-align: center;"><b>Instability<sup>1</sup></b></p> <p><b>4</b> Readily capable of detonation or of explosive decomposition or reaction at normal temperatures and pressures.</p> <p><b>3</b> Capable of detonation or explosive reaction, but requires a strong initiating source or must be heated under confinement before initiation, or reacts explosively with water.</p> <p><b>2</b> Normally unstable and readily undergoes violent decomposition, but does not detonate. Also, may react violently with water or may form potentially explosive mixtures with water.</p> <p><b>1</b> Normally stable, but can become unstable at elevated temperatures and pressures or may react with water with some release of energy, but not violently.</p>

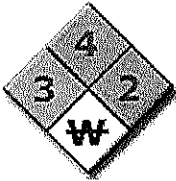
**0**

Normally stable, even under fire exposure conditions, and is not reactive with water.

<sup>1</sup> Prior to 1996, this section was titled "Reactivity". The name was changed because many people did not understand the distinction between a "reactive hazard" and the "chemical reactivity" of the material. The numeric ratings and their meanings remain unchanged.

**Special Hazards**

This section is used to denote special hazards. There are only three NFPA 704 **approved** symbols:



**OX**

This denotes an oxidizer, a chemical which can greatly increase the rate of combustion/fire.

**SA**

This denotes gases which are simple asphyxiants. The only gases for which this symbol is permitted are nitrogen, helium, neon, argon, krypton, and xenon. The use of this hazard symbol is optional.

**W**

Unusual reactivity with water. This indicates a potential hazard using water to fight a fire involving this material. When a compound is both water-reactive and an oxidizer, the W/bar symbol should go in this quadrant and the OX warning is placed immediately below the NFPA diamond.

**ACID**

This indicates that the material is an acid, a corrosive material that has a pH lower than 7.0

**ALK**

This denotes an alkaline material, also called a base. These caustic materials have a pH greater than 7.0

**COR**

This denotes a material that is corrosive (it could be either an acid or a base).





This is another symbol used for corrosive.



The skull and crossbones are used to denote a poison or highly toxic material. See also: CHIP Danger symbols.



	<p>The international symbol for radioactivity is used to denote radioactive hazards; radioactive materials are extremely hazardous when inhaled.</p>
	<p>Indicates an explosive material. This symbol is somewhat redundant because explosives are easily recognized by their Instability Rating.</p>