Hazcom & Hazardous Material Safety

29 CFR 1910.1200
"Hazardous chemical" means any chemical which is a physical hazard or a health hazard.

"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.

"Health hazard" means a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes.

**Basically four categories; Flammable, Corrosive, Reactive, or Toxic**
"Flammable" means a chemical that falls into one of the following categories:

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

(ii) "Gas, flammable" means: (A) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of thirteen (13) percent by volume or less; or

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

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

(iv) "Solid, flammable" means a solid, other than a blasting agent or explosive as defined in 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.
Class IA Flash point below 73 F, boiling point below 100 F
- acetaldehyde
- ethyl chloride
- petroleum ether
- colloid
- methyl ethyl ether
- propylene oxide
- ethyl ether
- pentane
- dimethyl sulfide

Class IB Flash point below 73 F, boiling point at or above 100 F
- acetone
- ethyl acetate
- methyl alcohol
- benzene
- ethyl alcohol
- methylcyclohexane
- butyl alcohol
- gasoline
- toluene

Class IC Flash point at or above 73 F and below 100 F
- amy acetate
- isopropanol
- turpentine
- amyl alcohol
- methyl alcohol
- xylene
- dibutyl ether
- styrene

"Combustible liquid" refers to any liquid having a flash point at or above 100 F. Combustible liquids are subdivided as follows:

Class II Flash point at or above 100 F and below 140 F
- acetic acid
- fuel oil no. 44
- mineral spirits
- camphor oil
- methyl lactate
- varsel
- cyclohexane
- hydrazine
- kerosene

Class III Flash point at or above 140 F and below 200 F
- aniline
- furfuryl alcohol
- phenol
- carbolic acid
- naphthalenes
- pine oil

### Maximum Capacity of Containers for Flammable and Combustible Liquids

<table>
<thead>
<tr>
<th>Container Liquids Type</th>
<th>Flammable Liquids</th>
<th>Combustible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container Type</td>
<td>Class 1A</td>
<td>Class 1B</td>
</tr>
<tr>
<td>Glass or approved plastic</td>
<td>1 pt</td>
<td>1 qt</td>
</tr>
<tr>
<td>Metal</td>
<td>1.1 gal</td>
<td>5 gal</td>
</tr>
<tr>
<td>Safety Cans</td>
<td>2.6 gal</td>
<td>5 gal</td>
</tr>
</tbody>
</table>
"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.
"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.

"Organic peroxide" means an organic compound that contains the bivalent -O-O-structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

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

"Explosive" means a chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.
<table>
<thead>
<tr>
<th>Shock Sensitive Explosive Chemicals</th>
<th>Organic Peroxide forming chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetyl peroxide</td>
<td>Acetal</td>
</tr>
<tr>
<td>Benzoyl peroxide</td>
<td>Anisole</td>
</tr>
<tr>
<td>Diethyl azodicarboxylate</td>
<td>N-butyl ether</td>
</tr>
<tr>
<td>2,4-Dinitrophenol</td>
<td>Cellosolve</td>
</tr>
<tr>
<td>2,4-Dinitrophenylhydrazine</td>
<td>Cumene</td>
</tr>
<tr>
<td>Mercury Fulminate</td>
<td>Cyclohexene</td>
</tr>
<tr>
<td>Methyl ethyl ketone peroxide</td>
<td>Cyclopentadiene</td>
</tr>
<tr>
<td>Nitromethane</td>
<td>Cyclopentene</td>
</tr>
<tr>
<td>Peracetic acid</td>
<td>Decalin</td>
</tr>
<tr>
<td>Picric acid</td>
<td>Dicyclopentadiene</td>
</tr>
<tr>
<td>Picryl chloride</td>
<td>1,1-Diethoxyethane</td>
</tr>
<tr>
<td>Picryl sulphuric acid</td>
<td>Diethyl ether</td>
</tr>
<tr>
<td>Potassium amide</td>
<td>Diglyme</td>
</tr>
<tr>
<td>Propargyl bromide</td>
<td>1,2-Dimethoxyethane</td>
</tr>
<tr>
<td>Propargyl chloride</td>
<td>1,4-Dioxane</td>
</tr>
<tr>
<td>Silvering solution</td>
<td>Ether</td>
</tr>
<tr>
<td>Sodamide</td>
<td>Ethyl cellosolve</td>
</tr>
<tr>
<td>Sodium amide</td>
<td>Ethyl ether</td>
</tr>
<tr>
<td>Trinitrobenzene</td>
<td>Furan</td>
</tr>
<tr>
<td>Trinitrobenzene sulphonic acid</td>
<td>Isopropyl benzene</td>
</tr>
<tr>
<td>Trinitro-you name it</td>
<td>Styrene</td>
</tr>
<tr>
<td>Vinylidene chloride</td>
<td>Tetrahydrofuran</td>
</tr>
</tbody>
</table>
"Compressed gas" means:

(i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70 deg. F (21.1 deg. C); or

(ii) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130 deg. F (54.4 deg. C) regardless of the pressure at 70 deg. F (21.1 deg. C); or

(iii) A liquid having a vapor pressure exceeding 40 psi at 100 deg. F (37.8 deg. C) as determined by ASTM D-323-72.

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

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

"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.
"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.

"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.

"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.
"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.

- **Hepatotoxins**: Chemicals which produce liver damage
  Signs & Symptoms: Jaundice; liver enlargement  **Chemicals**: Carbon tetrachloride; nitrosamines

- **Nephrotoxins**: Chemicals which produce kidney damage
  Signs & Symptoms: Edema; proteinuria  **Chemicals**: Halogenated hydrocarbons; uranium

- **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

- **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

- **Agents which damage the lung**: Chemicals which irritate or damage pulmonary tissue
  Signs & Symptoms: Cough; tightness in chest; shortness of breath  **Chemicals**: Silica; asbestos

- **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

- **Cutaneous hazards**: Chemicals which affect the dermal layer of the body
  Signs & Symptoms: Defatting of the skin; rashes; irritation  **Chemicals**: Ketones; chlorinated compounds

- **Eye hazards**: Chemicals which affect the eye or visual capacity
  Signs & Symptoms: Conjunctivitis; corneal damage  **Chemicals**: Organic solvents; acids
Hazardous Chemical Storage:
Separate by hazard class and functional group before alphabetizing;

**Inorganic Functional Groups**
- Metals, hydrides
- Halides, sulfates, sulfites, thiosulfates
- phosphates, halogens
- Amides, nitrates (except ammonium nitrate),
  nitrites, azides
- Hydroxides, oxides, silicates, carbonates, carbon
- Sulfides, selenides, phosphides, carbides, nitrides
- chlorates, perchlorates, perchloric acid, chlorites,
  hypochlorites, peroxides, hydrogen peroxide
- Arsenates, cyanides, cyanates
- Borates, chromates, manganates, permanganates
- Inorganic acids
  (Nitric acid)
- Sulfur, phosphorus, arsenic, phosphorus pentoxide

**Organic Function Groups**
- Acids, anhydrides, peracids
- Alcohols, glycols, amines, amides, imines, imides
- Hydrocarbons, esters, aldehydes
- Ethers, ketones, ketenes, halogenated hydrocarbons,
  Ethylene oxide
- Epoxy compounds, isocyanates
- Peroxides, hydroperoxides, azides
- Sulfides, polysulfides, sulfoxides, nitrites
- Phenol, cresols
NFPA FIRE DIAMOND

NFPA Rating Explanation Guide

HEALTH HAZARD
4 = Can be lethal
3 = Can cause serious or permanent injury
2 = Can cause temporary incapacitation or residual injury
1 = Can cause significant irritation
0 = No hazard

FLAMMABILITY HAZARD
4 = Will vaporize and readily burn at normal temperatures
3 = Can be ignited under almost all ambient temperatures
2 = Must be heated or high ambient temperature to burn
1 = Must be preheated before ignition can occur
0 = Will not burn

SPECIAL HAZARD
ALK = Alkaline
ACID = Acidic
COR = Corrosive
OX = Oxidizing
⚠️ = Radioactive
℟ = Reacts violently or explosively with water
龙湖 = Reacts violently or explosively with water and oxidizing

INSTABILITY HAZARD
4 = May explode at normal temperatures and pressures
3 = May explode at high temperature or shock
2 = Violent chemical change at high temperatures or pressures
1 = Normally stable. High temperatures make unstable
0 = Stable

This chart for reference only - For complete specifications consult the NFPA 704 Standard
Hazard Communication
“Right to Know”

Employer’s Responsibility;

**1910.1200(b)(3)(i)**
Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced;

**1910.1200(b)(3)(ii)**
Employers shall maintain any material safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible during each workshift to laboratory employees when they are in their work areas;

**1910.1200(b)(3)(iii)**
Employers shall ensure that laboratory employees are provided information and training in accordance with paragraph (h) of this section, except for the location and availability of the written hazard communication program under paragraph (h)(2)(iii) of this section;

**1910.1200(b)(5)**
This section does not require labeling of the following chemicals:
Pesticides, food additives, drugs, cosmetics, distilled spirits, hazardous waste, tobacco, wood, food, biological hazards, ionizing radiation
Employer’s responsibilities;

1910.1200(e)(1)
Employers shall develop, implement, and maintain at each workplace, a written hazard communication program which at least describes how the criteria specified in paragraphs (f), (g), and (h) of this section for labels and other forms of warning, material safety data sheets, and employee information and training will be met, and which also includes the following:

1910.1200(e)(2)(i)
The methods the employer will use to provide the other employer(s) on-site access to material safety data sheets for each hazardous chemical the other employer(s)' employees may be exposed to while working;

1910.1200(e)(2)(ii)
The methods the employer will use to inform the other employer(s) of any precautionary measures that need to be taken to protect employees during the workplace's normal operating conditions and in foreseeable emergencies; and,

1910.1200(e)(2)(iii)
The methods the employer will use to inform the other employer(s) of the labeling system used in the workplace.

1910.1200(h)(3)
"Training." Employee training shall include at least:

1910.1200(h)(3)(i)
Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.).
Employer’s Responsibilities continued;

**1910.1200(f)(5)(ii)**
Appropriate hazard warnings, or alternatively, words, pictures, symbols, or combination thereof, which provide at least general information regarding the hazards of the chemicals, and which, in conjunction with the other information immediately available to employees under the hazard communication program, will provide employees with the specific information regarding the physical and health hazards of the hazardous chemical.

**1910.1200(f)(6)**
The employer may use signs, placards, process sheets, batch tickets, operating procedures, or other such written materials in lieu of affixing labels to individual stationary process containers, as long as the alternative method identifies the containers to which it is applicable and conveys the information required by paragraph (f)(5) of this section to be on a label. The written materials shall be readily accessible to the employees in their work area throughout each work shift.

**1910.1200(f)(7)**
The employer is not required to label portable containers into which hazardous chemicals are transferred from labeled containers, and which are intended only for the immediate use of the employee who performs the transfer. For purposes of this section, drugs which are dispensed by a pharmacy to a health care provider for direct administration to a patient are exempted from labeling.

**1910.1200(h)(1)**
Employers shall provide employees with effective information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new physical or health hazard the employees have not previously been trained about is introduced into their work area. Information and training may be designed to cover categories of hazards (e.g., flammability, carcinogenicity) or specific chemicals. Chemical-specific information must always be available through labels and material safety data sheets.
**Manufacturer’s responsibilities;**

**1910.1200(f)(1)**
The chemical manufacturer, importer, or distributor shall ensure that each container of hazardous chemicals leaving the workplace is labeled, tagged or marked with the following information:

**1910.1200(f)(1)(i)**
Identity of the hazardous chemical(s);

**1910.1200(f)(1)(ii)**
Appropriate hazard warnings; and

**1910.1200(f)(1)(iii)**
Name and address of the chemical manufacturer, importer, or other responsible party.

**1910.1200(f)(11)**
Chemical manufacturers, importers, distributors, or employers who become newly aware of any significant information regarding the hazards of a chemical shall revise the labels for the chemical within three months of becoming aware of the new information. Labels on containers of hazardous chemicals shipped after that time shall contain the new information. If the chemical is not currently produced or imported, the chemical manufacturer, importers, distributor, or employer shall add the information to the label before the chemical is shipped or introduced into the workplace again.

**1910.1200(g)(1)**
Chemical manufacturers and importers shall obtain or develop a material safety data sheet for each hazardous chemical they produce or import. Employers shall have a material safety data sheet in the workplace for each hazardous chemical which they use.
Questions?