

New OSHA HazCom Standard

**What it means for Product Labeling,
Safety Data Sheets and Employee
Safety Training**

**Presentation by Mary K. Lynch, Senior Instructor for Con Edison, at
March 17, 2014 Meeting of the Metro New York Section, AIChE**

What is the Hazard Communication Standard (HCS)?

- 29 CFR 1910.1200, Hazard Communication.
- Purpose is to ensure:
 - hazards of all chemicals are understood
 - information about hazards is conveyed to employees.
- Covers 3 Areas:
 - Chemical Labeling
 - Safety Data Sheets
 - Employee Training

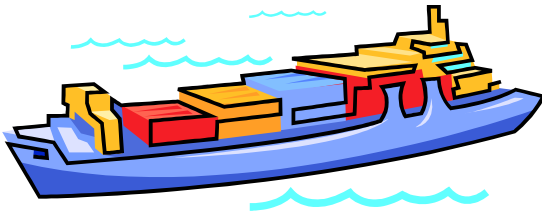


Background: Communicating Hazards

- first OSHA Hazard Communication Standard –11/23/1983
- The **Globally Harmonized System (GHS)** created in 1992 as a result of the United Nations Conference on Environment and Development (UNCED).
- OSHA revised **The Hazard Communication Standard (HCS)**, to conform to the United Nations' **Globally Harmonized System of Classification and Labeling of Chemicals (GHS)** On March 20, 2012.
- OSHA estimates that over **5 million workplaces** in the United States will be affected by the revised HCS, and in those workplaces up to **43 million employees** could be exposed to hazardous chemicals.

Background: Chemical Labels

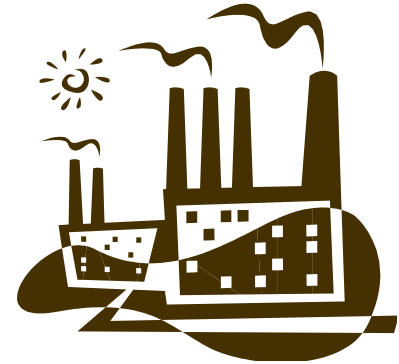
Until recently, Chemical Hazard labeling conformed to these standards:



IMO/UN



DOT/UN



OSHA

Labeling Standards are becoming more uniform

- First the DOT placards evolved into DOT/UN placards which look like The IMO Placards. This occurred in 2008.
- Now OSHA has adopted the GHS, and the GHS Pictograms have a lot of similarity to the IMO Placards

Background

- **International Maritime Organization (IMO)** oversees MARPOL Convention (covering pollution prevention) and has instituted the International Maritime Dangerous Goods (IMDG) Code.

Hazard labels



The 2012 modifications to the OSHA HCS include:

- Revised criteria for classification of chemical hazards;
 - Revised labeling provisions --requirements for use standardized signal words,
 - pictograms,
 - hazard statements, and precautionary statements;
- A specified format for safety data sheets;
- Requirements for employee training on new labels and safety data sheets. **This had to be completed by December 1, 2013.**

HCS Signal Words

- **Signal word** - There are **two signal words** in the GHS system - **Danger** and **Warning**.
- These signal words are used to communicate the level of hazard on both the label and the SDS.

Hazard Classes and Categories

- HCS establishes hazard classes and hazard categories—for most of the physical and health effects.
- The classes are divided into categories that reflect the relative severity of the health effect. Chemical manufacturers and importers are responsible for classifying the hazards of the chemicals.

[OSHA provides guidance for determining Hazard Category and Class](#)

HCS Hazard Categories

Physical Hazards

- Fire Hazards
- Combustible liquid
- Flammable liquid
- Flammable aerosol
- Flammable gas
- Flammable solid
- Oxidizer
- Pyrophoric

Explosion Hazards

- Compressed gas
- Explosive

Reactive Hazards

- Organic peroxide
- Unstable (reactive)
- Water-reactive

Health Hazards

- Systemic Effects
- Carcinogen
- Toxic agent
- Highly toxic agent
- Corrosive
- Irritant
- Sensitizer

Target Organ Effects

- Hepatotoxin
- Nephrotoxin
- Neurotoxin
- Blood/hematopoietic toxin
- Respiratory toxin
- Reproductive toxin
- Cutaneous hazard
- Eye hazard

Other Important Health Hazards

Cardiovascular toxicity

Immuno toxicity

Connective tissue effects

Sensory organ toxicity (sight, hearing, taste)

Gastrointestinal toxicity

Skeletal/muscular effects

Endocrine system toxicity

Where applicable, these hazards must be clearly identified on the new product labels and SDSs. OSHA is requiring Manufacturers and Distributors to perform literature searches and in some cases, testing, to look for these toxic characteristics.

Implementation Deadlines in the US

Who	Requirement	Date
Employers	Train employees on the new label elements and safety data sheet (SDS) format.	Dec. 1, 2013
Chemical manufacturers, importers, distributors, and employers	Compliance with all modified provisions of the OSHA HazCom Standard	June 1, 2015
Chemical manufacturers, importers, distributors, and employers	Shall not ship containers labeled by the chemical manufacturer or importer unless it has a GHS label	Dec. 1, 2015
Employers	Update alternative workplace labeling and hazard communication program as necessary, and provide additional employee training for newly identified physical or health hazards.	June 1, 2016

Implementation Deadlines in Europe

2009 EU regulations require that new product labels be used on

- Pure substances by **December 1, 2010.**
- Mixtures by June 1, 2015.

GHS Pictograms



Corrosives

- Acids and bases are opposite in the way that they react in chemical solutions; **they are the same in the way that they burn skin.** They are both in the Corrosive category.



DOT/UN



GHS

Flame

Fire is a Physical Hazard

Materials in this category include:

- Fuels
- Lubricants
- Solvents
- Adhesives

Pictogram is also used with:

- Pyrophorics
- Self-Heating
- Emits Flammable Gas
- Self-Reactives
- Organic Peroxides



DOT/UN



DOT/UN



GHS

Signal Word = Danger for Highly Flammable

Signal Word = Warning for Flammable or Combustible

Flame

Review of fire hazard definitions:

- Flashpoint < 300F but > 100 F = **Combustible**
- Flashpoint < 100 F = **Flammable**
- Easily ignited by heat, sparks or Flames = **Highly Flammable**



Organic Solvents have Multiple Hazards & Multiple Pictograms



- Present an eye hazard. They can cause temporary vision problems by dissolving the fats in the cornea [Eye Hazards](#)
- Some target specific organs such as the kidneys, heart or liver.
- Solvents frequently affect the nervous system.
- Benzene is known to cause cancer in humans.
- Solvents can cause a skin disease called dermatitis.
- Many solvents are flammable.



Exclamation Mark

- ***Irritant*** is any substance that causes a reversible inflammatory effect on living tissue.
- **Skin Sensitizer** can cause an allergic reaction on a second, third or later exposure
- **Acute Toxicity (harmful)**
[Toxic and Highly Toxic](#)
- **Narcotic Effects**
- **Respiratory Tract Irritant**
- **Hazardous to Ozone Layer**



GHS

Health Hazard Serious Illness

- Carcinogen
- Mutagenicity
- Reproductive Toxicity
- Respiratory Sensitizer
- Target Organ Toxicity
- Aspiration Toxicity



GHS

Signal Word = Danger



Existing OSHA

Compressed Gases

Signal Word = Danger or Warning depending on hazard

Compressed gas applies to chemical vapors that are stored under pressure in 3 forms:

Compressed = a gas that will not liquefy at ordinary temperature even when stored at 2000-2500 psig. Some examples are air, argon, carbon monoxide, helium, hydrogen, nitrogen, silane.

Liquefied = a gas that becomes mostly liquid at ordinary temperatures with elevated pressures ranging from 25-2500 psig. Some examples are ammonia, chlorine, propane and sulfur dioxide.

Dissolved = a gas that is dissolved in a liquid or solid. There is only one: Acetylene.



GHS

Same GHS pictogram is used for Flammable and Non-flammable.



DOT/UN



Oxidizers

- Oxidizers are substances that support a fire.
- They are not flammable themselves, but they can promote and worsen a fire.
- These compounds generate oxygen when they are heated and therefore will cause a fire to burn hotter.
- Bottled oxygen is considered an oxidizer.
- All oxidizers must be stored away from solvents and fuels.

Example Products

- Chlorine gas
- Peroxide gas
- Ozone



GHS

Signal Word = Danger

Exploding Bomb

- Explosives
- Self-Reactives
- Organic Peroxides

An explosion is defined as the sudden release of energy that occurs when an explosive material is ignited, shocked, struck or otherwise stimulated.

An **explosive material** is a material that is chemically unstable. It can be expected to react with air and combust in a way that causes a violent exothermic reaction. Nitrocellulose is an example of an explosive material. It is a raw material used in ammunitions production.

A **Self-Reactive materials** are materials that are thermally unstable and that can undergo a strongly exothermic decomposition even without participation of oxygen



GHS

Signal Word = Danger



Skull and Crossbones

The HCS classifies chemical agents as **toxic** or **highly toxic** based on the number of deaths that occur following brief (acute) exposure of rodents.

The difference in the two categories is strictly the dose at which the toxicity (death) occurs.



GHS

Signal Word = Danger

- A poisoning is an emergency! Medical attention must be given immediately. You should call 911 and the Poison Hotline (800-222-1222).
- Product descriptions and SDSs must be brought with the patient to the hospital.

Environment

Marine pollutants are defined according to the International Maritime Dangerous Goods Code (IMDG Code) and US Coast Guard Regulations: U.S. Hazardous Materials Regulations (49 CFR Parts 100-180)

List of Marine Pollutants in appendix B to 49 CFR 172.101 or meets the definition of MP as contained in 49 CFR 171.8



OLD




GHS

Signal Word = Warning

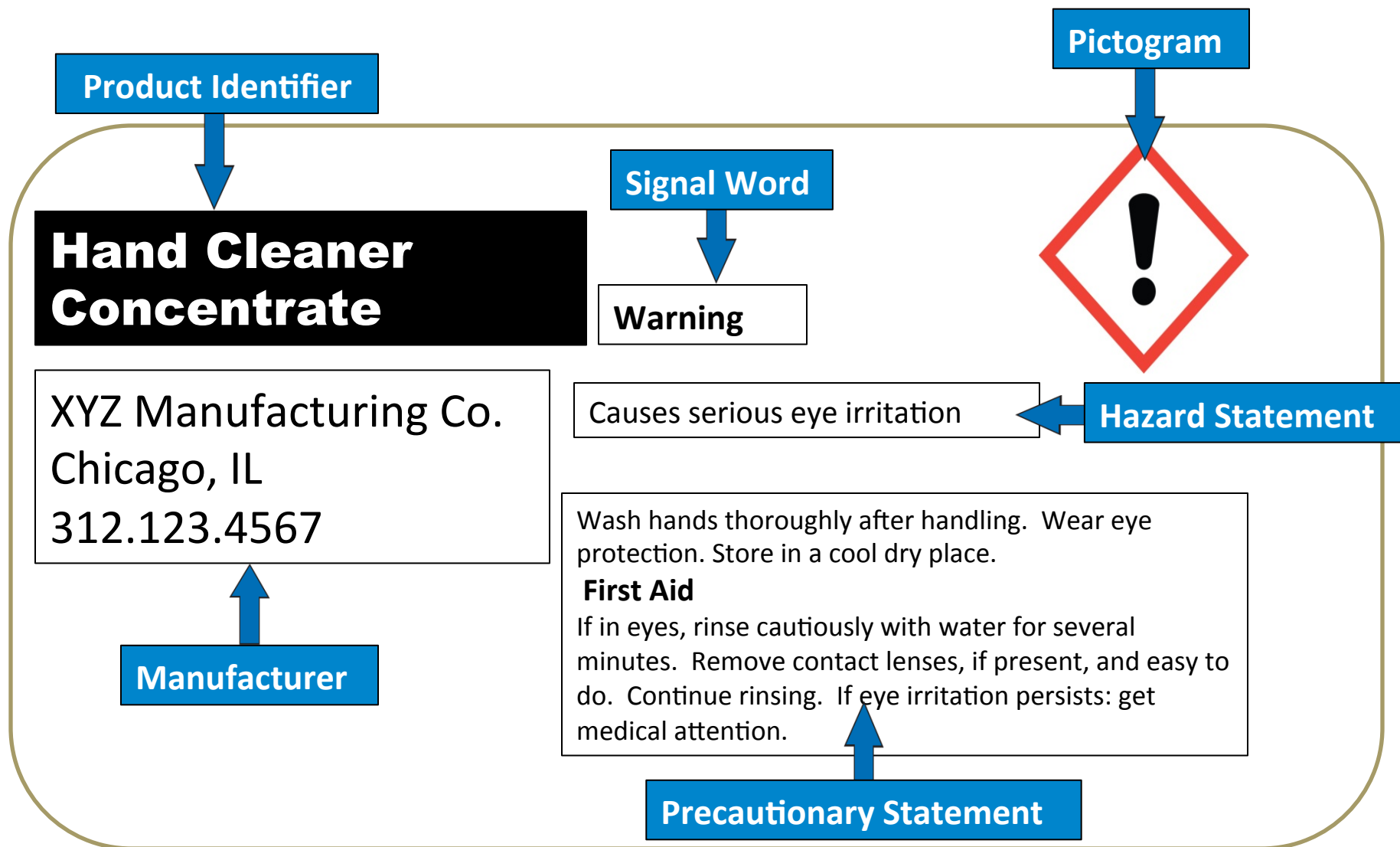
Chemical Product labeling

- Immediate visual reminder of the hazards presented by a chemical product.
- labels are required to include all appropriate physical and health hazard warnings.

SAMPLE LABEL	
PRODUCT IDENTIFIER CODE _____ Product Name _____	HAZARD PICTOGRAMS 
SUPPLIER IDENTIFICATION Company Name _____ Street Address _____ City _____ State _____ Postal Code _____ Country _____ Emergency Phone Number _____	SIGNAL WORD Danger
PRECAUTIONARY STATEMENTS Keep container tightly closed. Store in cool, well ventilated place that is locked. Keep away from heat/sparks/open flame. No smoking. Only use non-sparking tools. Use explosion-proof electrical equipment. Take precautionary measure against static discharge. Ground and bond container and receiving equipment. Do not breathe vapors. Wear Protective gloves. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling. Dispose of in accordance with local, regional, national, international regulations as specified.	HAZARD STATEMENT Highly flammable liquid and vapor. May cause liver and kidney damage.
In Case of Fire: use dry chemical (BC) or Carbon dioxide (CO ₂) fire extinguisher to extinguish.	SUPPLEMENTAL INFORMATION Directions for use _____ _____ _____ Fill weight: _____ Lot Number _____ Gross weight: _____ Fill Date: _____ Expiration Date: _____
First Aid If exposed call Poison Center. If on skin (on hair): Take off immediately any contaminated clothing. Rinse skin with water.	

Chemical manufacturer or distributor determines the hazards. OSHA has a guidance document for hazard determination

New Chemical Labeling Elements



Example Product Label for Paint



Safety data sheets (SDS)

- Source for hazard information
- Must be readily accessible to workers.
- Created by Chemical manufacturer or Distributor. The manufacturer or Distributor performs the Hazards determination.
- SDSs contain:
 - Physical and health hazards
 - Exposure limits
 - Precautions
 - Applicable control measures
 - PPE requirements.

SDSs are now Standardized

<u>Section 1:</u>	Identification
<u>Section 2:</u>	Hazard(s) Identification
<u>Section 3:</u>	Composition/Information on Ingredients
<u>Section 4:</u>	First-Aid Measures
<u>Section 5:</u>	Fire-Fighting Measures
<u>Section 6:</u>	Accidental Release Measures
<u>Section 7:</u>	Handling and Storage
<u>Section 8:</u>	Exposure Controls/Personal Protection
<u>Section 9:</u>	Physical and Chemical Properties
<u>Section 10:</u>	Stability and Reactivity
<u>Section 11:</u>	Toxicological Information
<u>Section 12:</u>	Ecological Information (non-mandatory)
<u>Section 13:</u>	Disposal Considerations (non-mandatory)
<u>Section 14:</u>	Transport Information (non-mandatory)
<u>Section 15:</u>	Regulatory Information (non-mandatory)
<u>Section 16:</u>	Other Information

Effective employee Hazard Communication Standard (HCS) training

- Employers are required to provide workers information and training for the chemicals they work with.
- Training must be provided prior to exposure to a hazardous chemical.
- Existing employees needed to be trained on new HCS by December 1, 2013

Effective employee Hazard Communication Standard (HCS) training

- Employers need to make sure that hazard information is fully understood by employees.
- Employers must take into account language barriers, illiteracy and other factors affecting understanding of all hazards associated with chemicals.
- Employers must develop and implement an updated ***written hazard communication program***.

Effective employee Hazard Communication Standard (HCS) training

- Training on label elements must include information on the type of information the employee would expect to see on the new labels, including the:
 - Product identifier
 - Signal word
 - Pictogram;
 - Hazard statement(s)
 - Precautionary statement(s)
 - Name, address and phone number of the chemical manufacturer, distributor, or importer.



Effective employee Hazard Communication Standard (HCS) training

- Training must also include how an employee might use the labels in the workplace.
 - Explain how information on the label can be used to ensure proper storage of hazardous chemicals.
 - Explain how the information on the label might be used to quickly locate information on first aid when needed by employees or emergency personnel.

Summary



- New HazCom Standard went into effect in 2012.
- New Product Labels comply with UN standards.
- GHS is a world wide and uses standardized Pictograms
- SDSs must be standardized. Must have the required sections in the required order.
- Training on the new HazCom standard and on GHS must be in place already.

Excellent Resources

OSHA

<https://www.osha.gov/dsg/hazcom/index.html>

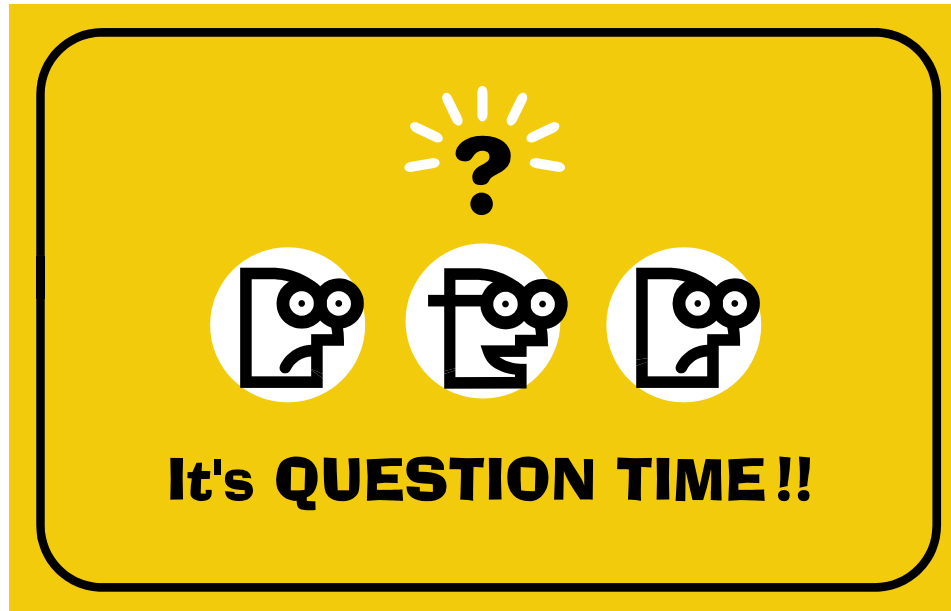
Sigma Aldrich

<http://www.sigmaaldrich.com/safety-center/globally-harmonized.html>

Oregon OSHA

<http://www.orosha.org/pdf/pubs/4960.pdf>

Questions



SDS Section 1

Identification

- includes product identifier; manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use.
- The specific chemical identity should include:
 - the chemical name along with common name and synonyms;
 - the Chemical Abstracts Services (CAS) Registry Number (if available)

SDS Section 2

Hazard(s) identification

- includes all hazards regarding the chemical; required label elements.
- To complete the hazard identification, information is needed in three categories:
 - chemical identity;
 - chemical and physical properties; and
 - health effects.



SDS Section 3

Composition/information on ingredients

- includes information on chemical ingredients; trade secret claims.
- Requires for pure substances:
 - Chemical name;
 - Common name and synonyms;
 - CAS number and other unique identifiers;
- Requires for mixtures:
 - The chemical name and concentration (exact percentage) or concentration ranges of all ingredients which are classified as health hazards
 - (1) Are present above their cut-off/concentration limits; or
 - (2) Present a health risk below the cut-off/concentration limits.

SDS Section 4

First-aid measures

- Provides necessary measures, subdivided according to the different routes of exposure, i.e., inhalation, skin and eye contact, and ingestion
- includes important symptoms/ effects, acute, delayed; required treatment.
- First Aid measures

SDS Section 5

Fire-fighting measures

- lists suitable extinguishing techniques, equipment; chemical hazards from fire.
- Gives nature of any hazardous combustion products
- List specialized equipment and precautions for fire-fighters

SDS Section 6

Accidental Release Measures

- lists emergency procedures; protective equipment;
- Gives methods and materials recommend for containment and cleanup of spills.

SDS Section 7

Handling and Storage

- lists precautions for safe handling and storage, including incompatibilities and precautions to take during maintenance.

Example:

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT:

Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Collect all rinsates and dispose of according to applicable Federal, State, or local procedures.

SDS Section 8

Exposure controls/personal protection

- lists OSHA's Permissible Exposure Limits (PELs); Threshold Limit Values (TLVs);
- lists appropriate engineering controls
- lists personal protective equipment (PPE).



SDS Section 9

Physical and chemical properties

Lists Physical and chemical properties, including

Appearance (physical state, color, etc.);	Vapor pressure & Vapor density	pH
Upper/lower flammability or explosive limits	Relative density	Melting point/freezing point
Odor & Odor threshold	Solubility(ies);	Initial boiling point and boiling range;
Partition coefficient: n-octanol/water	Flash point;	Auto-ignition temperature
Flammability (solid, gas);	Evaporation rate;	Decomposition temperature
Viscosity		

SDS Section 10

Stability and reactivity

- lists chemical stability and possibility of hazardous reactions.

Example:

STABILITY

Stable but Reacts with most metals producing hydrogen which is extremely flammable & may explode.

CONDITIONS TO AVOID

Avoid alkalis. When diluting, always add acid to diluent. DON'T add diluent to acid.

MATERIALS TO AVOID

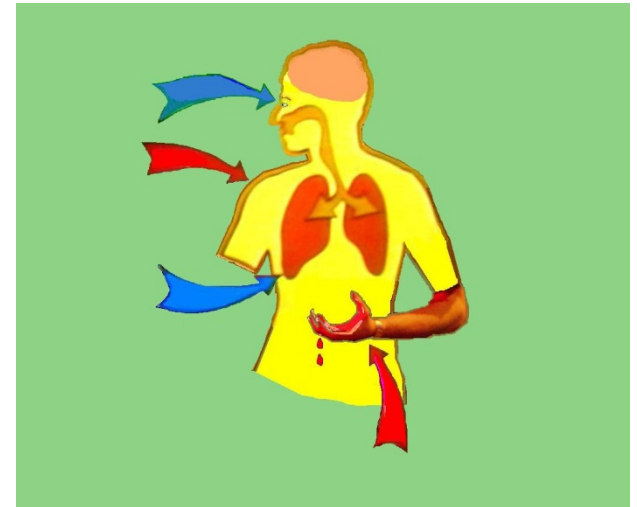
The substance is a strong acid, reacts violently with bases and is corrosive. Upon heating, irritating and toxic fumes are formed including sulfur oxides, The substance is a strong oxidant & reacts violently with combustible & reducing materials. Corrosive to most common metals forming flammable/explosive gas (hydrogen).

Sulfuric acid reacts violently with water & organic materials with much heat. Isolate from organics, chlorates, carbides, fulminates, picrates, metals. Fire risk on contact with organic materials and chemicals such as nitrates, carbides, and chlorates.

SDS Section 11

Toxicological information

- includes routes of exposure
- related symptoms, acute and chronic effects
- numerical measures of toxicity
- description of exposure effects



- Adsorption
- Ingestion
- Inhalation
- Injection

SDS Section 12

Ecological information

Gives information for evaluating the environmental impact of the chemical(s) if released to the environment.

Includes:

- **Ecotoxicity** --Data from toxicity tests performed on aquatic and/or terrestrial organisms, where available (e.g., acute or chronic aquatic toxicity data for fish, algae, crustaceans, and other plants; toxicity data on birds, bees, plants).
- **Persistence and degradability** --Whether there is a potential for the chemical to persist and degrade in the environment either through biodegradation or other processes, such as oxidation or hydrolysis.
- **Bioaccumulative potential** -- Results of tests of bioaccumulation potential, making reference to the octanol-water partition coefficient (Kow) and the bioconcentration factor (BCF), where available.
- **Mobility in soil** -- The potential for a substance to move from the soil to the groundwater (indicate results from adsorption studies or leaching studies).
- **Other adverse effects** (e.g., environmental fate, ozone layer depletion potential, photochemical ozone creation potential, endocrine disrupting potential, and/or global warming potential).

SDS Section 13

Disposal considerations

Gives proper disposal practices, and safe handling practices. To minimize exposure, this section should also refer the reader to Section 8 (Exposure Controls/Personal Protection) of the SDS.

The information may include:

- Description of appropriate disposal containers to use.
- Recommendations of appropriate disposal methods to employ.
- Description of the physical and chemical properties that may affect disposal activities.
- Language discouraging sewage disposal.
- Any special precautions for landfills or incineration activities.

SDS Section 14

Transport information

Includes:

- UN number (i.e., four-figure identification number of the substance)
- UN proper shipping name
- Transport hazard class(es)
- Packing group number, if applicable, based on the degree of hazard
- Environmental hazards (e.g., identify if it is a marine pollutant according to the International Maritime Dangerous Goods Code (IMDG Code)).
- Guidance on transport in bulk (according to Annex II of MARPOL 73/78 and the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (International Bulk Chemical Code (IBC Code))).
- Any special precautions which an employee should be aware of or needs to comply with, in connection with transport or conveyance either within or outside their premises (indicate when information is not available).

DOT-UN

DOT/UN number	DOT/UN Classification	Examples
1.0	Explosives	Signals-Flares
2.1	Flammable Gas	Acetylene
2.2	Non-flammable gas	Nitrogen, Freon-22, Compressed Air
2.3	Toxic Gas	Ethylene Oxide
3.0	Flammable Liquid	Gasoline
4.1	Readily Combustible Solid	Silicon powder
4.2	Spontaneously combustible	di-Methyl Zinc
4.3	Dangerous when wet	Calcium Phosphide
5.1	Oxidizer	Calcium Nitrate
5.2	Organic Peroxides	Tert-ButylHydroperoxide
6.0	Toxic Substances	Dimethyl Sulfate
6.1	Poisons	Phosphorus Trichloride
6.2	Infectious Substances	Bio-hazard wastes
7.0	Radioactive Materials	
8.0	Corrosive Substances	Sulfuric Acid, 93% Sodium Hydroxide, 50% Sodium Hypochlorite 5-15%
9.0	Other Hazards	PCBs
NH	Non-hazardous Materials	Water
UNK	Unknown Classification	

SDS Section 15

Regulatory information

Gives safety, health, and environmental regulations specific for the product that is not indicated anywhere else on the SDS.

Includes:

- State regulatory information of the chemical or mixtures
- OSHA, Department of Transportation, Environmental Protection Agency, or Consumer Product Safety Commission regulations

Example:

SARA SECTION 311/312 HAZARDS: Acute Health

All components of this product are on the TSCA list.

SARA Title III Section 313 Supplier Notification

This product contains the indicated <*> toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning & Community

Right-To-Know Act of 1986 & of 40 CFR 372.

This information must be included in all MSDSs that are copied and distributed for this material.

SARA TITLE III INGREDIENTS	CAS#	EINECS#	WT%	(REG.SECTION)	RQ(LBS)
Sulfuric Acid	7664-93-9	231-639-5	85-95	(302,311,312,313)	1000

SDS Section 16

Other information

- Information such as when the SDS was prepared or when a revision was made

Toxic and Highly Toxic

Animal Test	Highly Toxic	Toxic
Oral LD ₅₀	< 50 mg/kg	50-500 mg/kg
Dermal LD ₅₀	< 200 mg/kg	200-1000 mg/kg
Inhalation LC ₅₀ - gases, vapors	< 200 ppm	200-2000 ppm
Inhalation LC ₅₀ - mists, fumes or dust	2 mg/L	2-20 mg/L

Reference: <https://www.osha.gov/dsg/hazcom/ghd053107.html>

Eye Hazards

The HCS definition for eye hazards is "chemicals which affect the eye or visual capacity."

- The primary toxic effects from direct exposure of chemicals to the eye are conjunctivitis or corneal damage.
- Conjunctivitis is inflammation of the conjunctiva, the delicate membrane that lines the eyelids and covers the eyeballs. The cornea is the transparent front surface of the eyeball.

Chemicals that accidentally splash onto the face can directly contact either of these eye structures. Acids and strong alkalis (such as lye) may cause severe corneal corrosion and may result in permanent blindness.

- Organic solvents (such as acetone) and detergents can cause temporary clouding of vision, primarily due to dissolving of fats from the cornea.

Some chemicals can cause toxic effects to the eye even if they do not directly contact the eye. Chemicals that are inhaled or ingested may move to the eye through the blood circulation and produce eye damage.

Eye irritation means changes in the eye following the application of a test substance to the front surface of the eye, which are fully reversible within 21 days of application.

Reference: <https://www.osha.gov/dsg/hazcom/ghd053107.html> & <https://www.osha.gov/dsg/hazcom/ghs.html>