

# OSHA Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

*A safety resource from the National Science Teachers Association*

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The manner in which safety information is provided on chemical labels and in Safety Data Sheets (SDS) changed as of March 2012. At that time, the Occupational Safety and Health Administration (OSHA) announced the adoption of the United Nations Globally Harmonized System of Classification and Labeling of Chemicals (GHS). The adoption of GHS was a revision to the Hazard Communication Standard (29 CFR 1910.1200) and by extension the Laboratory Standard. OSHA's Occupational Exposure to Hazardous Chemicals in Laboratories standard (29 CFR 1910.1450) or Laboratory Standard. These standards outline the rights of teachers and other employees to understand the hazards of the chemicals that they work with.

Manufacturers had until June 2015 to update the hazards of the chemicals they provide and update to the GHS labels and Safety Data Sheets. All chemicals purchased and shipped after December 2015 need to have the new labels and be accompanied by new Safety Data Sheets (SDS). There may be some older chemicals that are still fit for use in your storage room that will contain the old labels and have a Material Safety Data Sheet (MSDS). By 2018, all employees should be trained in the new labeling system and employers should have updated their hazard communications programs, signage, and training. *OSHA's goal is to ensure that employees have the information that they need to protect themselves from chemical hazards.*

## Highlights of the Hazard Communications Standard

- **Hazard classification:** Provides specific criteria for classification of health and physical hazards, as well as classification of mixtures.
- **Labels:** Chemical manufacturers and importers are required to provide a label that includes a harmonized signal word, hazard pictogram, manufacturer information, precautionary statements/first aid, hazard statement and product name or identifiers for each hazard class and category. Precautionary statements must also be provided.
- **Safety Data Sheets:** Have a GHS specified 16-section format.
- **Information and training:** Employers are required to train workers on the label elements and Safety Data Sheets format to facilitate recognition and understanding.

## Label Elements

The Hazard Communications Standards requires the following information to appear on every chemical label:

- The supplier identifier including name, address and telephone number of the chemical manufacturer, importer or other responsible party.
- The product identifier is how the hazardous chemical is identified. This can include the chemical name, code number, or batch number. This same information must be on both the label and the safety data sheet.
- Symbols (GHS hazard pictograms) convey health, physical, and environmental hazard information assigned to a GHS hazard class and category. Pictograms include the harmonized hazard symbols plus other graphic elements, such as borders, background patterns, and substances that have target organ toxicity.
- Signal Words—these are words that are used to describe the severity of the hazard. Only two words are used as signal words, “Danger” and “Warning”. “Danger” is used for more severe hazards.
- Hazard Statements—these statements include the nature of the hazard(s) of a chemical and the degree of the hazard.
- Precautionary Statements—these statements describe measures that are recommended to minimize or prevent adverse effects resulting from exposure to the hazardous chemical or improper storage and handling. There are four types of precautionary statements: prevention, response, storage, and disposal.
- Supplementary Information—the manufacturer may provide additional information that it deems helpful.
- Employer Responsibilities—employers are responsible for maintaining labels on containers.
- Workplace Labels—employers continue to have the option to create their own chemical labels, these labels must have all of the information that is on the manufacturer’s label.

### GHS Label Sample:

**The Basic Parts of A GHS-Compliant Label**

**1** → **n-Propyl Alcohol**

UN No. 1274  
CAS No. 71-23-8

**2** → **DANGER**

**3** → Highly flammable liquid and vapor. Causes serious eye damage.  
May cause drowsiness and dizziness.

**4** → Keep away from heat/sparks/open flames/hot surfaces. No smoking. Avoid breathing fumes/mist/vapours/spray. Wear protective gloves/protective clothing/eye protection/face protection. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present. Continue rinsing.

Fill Weight: 18.65 lbs. Lot Number: B56754434  
Gross Weight: 20 lbs. Fill Date: 6/21/2013  
Expiration Date: 6/21/2020 See SDS for further information.

**5** → Acme Chemical Company • 711 Roadrunner St. • Chicago, IL 60601 USA • www.acmechem.com • 123-444-5567

**6** →

1. **Product Identifier** - Should match the product identifier on the Safety Data Sheet.
2. **Signal Word** - Either use “Danger” (severe) or “Warning” (less severe)
3. **Hazard Statements** - A phrase assigned to a hazard class that describes the nature of the product’s hazards
4. **Precautionary Statements** - Describes recommended measures to minimize or prevent adverse effects resulting from exposure.
5. **Supplier Identification** - The name, address and telephone number of the manufacturer or supplier.
6. **Pictograms** - Graphical symbols intended to convey specific hazard information visually.

Sample label courtesy of Weber Packaging Solutions • www.weberpackaging.com

- Pictograms – these are symbols used to communicate information about the hazards of a product.

<p><b>Health Hazard</b></p>  <ul style="list-style-type: none"> <li>• Carcinogen</li> <li>• Mutagenicity</li> <li>• Reproductive Toxicity</li> <li>• Respiratory Sensitizer</li> <li>• Target Organ Toxicity</li> <li>• Aspiration Toxicity</li> </ul>	<p><b>Flame</b></p>  <ul style="list-style-type: none"> <li>• Flammables</li> <li>• Pyrophorics</li> <li>• Self-Heating</li> <li>• Emits Flammable Gas</li> <li>• Self-Reactives</li> <li>• Organic Peroxides</li> </ul>	<p><b>Exclamation Mark</b></p>  <ul style="list-style-type: none"> <li>• Irritant (skin and eye)</li> <li>• Skin Sensitizer</li> <li>• Acute Toxicity (harmful)</li> <li>• Narcotic Effects</li> <li>• Respiratory Tract Irritant</li> <li>• Hazardous to Ozone Layer (Non-Mandatory)</li> </ul>
<p><b>Gas Cylinder</b></p>  <ul style="list-style-type: none"> <li>• Gases Under Pressure</li> </ul>	<p><b>Corrosion</b></p>  <ul style="list-style-type: none"> <li>• Skin Corrosion/ Burns</li> <li>• Eye Damage</li> <li>• Corrosive to Metals</li> </ul>	<p><b>Exploding Bomb</b></p>  <ul style="list-style-type: none"> <li>• Explosives</li> <li>• Self-Reactives</li> <li>• Organic Peroxides</li> </ul>
<p><b>Flame Over Circle</b></p>  <ul style="list-style-type: none"> <li>• Oxidizers</li> </ul>	<p><b>Environment (Non-Mandatory)</b></p>  <ul style="list-style-type: none"> <li>• Aquatic Toxicity</li> </ul>	<p><b>Skull and Crossbones</b></p>  <ul style="list-style-type: none"> <li>• Acute Toxicity (fatal or toxic)</li> </ul>

## Safety Data Sheets

The Hazard Communication Standard requires that chemical manufacturers and distributors provide Safety Data Sheets (SDSs) for each hazardous chemical that they sell. The information in the SDS is generally the same as the information previously found in Material Safety Data Sheets (MSDS) but is presented in a consistent 16 section format that is designed to be user-friendly. Below is a description of each of the 16 sections.

### Section 1—Identification

This information includes the product identifier and common names or synonyms; the name, address, and phone number of the manufacturer and an emergency phone number; and recommended uses of the chemical including any restrictions on use.

### Section 2—Hazard(s) Identification

This section identifies the hazards of the chemical and warning information. The required information in this section includes:

- Hazard classification
- Signal word
- Hazard statement(s)
- Pictograms
- Precautionary statement(s)
- Description of hazards not otherwise classified
- For a mixture, the percentage of the mixture of unknown toxicity

### Section 3—Composition/Information on Ingredients

This section includes all ingredients contained in a product including impurities and stabilizing additives. Included in this section is information on substances, mixtures, and all chemicals where a trade secret is claimed.

Required information:

#### Substances

- Chemical name
- Common name and synonyms
- Chemical Abstract Services (CAS) number and other unique identifiers
- Impurities and stabilizing agents

#### Mixtures

- Same information as required for substances
- Chemical name and concentration of all ingredient that are classified as health hazards and:
  - are present above their cut-off/concentration limits, or
  - present a health risk below the cut-off/concentration limits.

- The concentration of each ingredient must be specified except concentration ranges may be used in the following situations:
  - a trade secret claim is made,
  - there is batch-to-batch variation or
  - the SDS is used for a group of substantially similar mixtures.

#### **Chemical where a trade secret is claimed**

- A statement that the specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret is required.

#### **Section 4—First-Aid Measures**

This section discusses the initial care that should be provided by untrained responders to an individual who has been exposed to a chemical. The required information includes:

- First-aid instruction based upon routes of exposure.
- Description of the most important symptoms or effects, including any symptoms that are acute or delayed.
- Recommendations for immediate medical care and special treatment when needed.

#### **Section 5—Fire-Fighting Measures**

This section contains information for fighting a fire caused by a chemical. The recommendations consist of:

- Recommendations of suitable extinguishing equipment.
- Information on specific hazards that develop from the chemical during a fire, such as combustion products that develop as the chemical burns.
- Information on protective equipment or precautions for firefighters.

#### **Section 6—Accidental Release Measures**

This section provides recommendations for the appropriate response to spills, leaks, or releases, including containment and clean-up practices to prevent or minimize exposure to people, property, or the environment. The recommendations distinguish between large and small spills, where spill volume has a significant impact on the hazard. The required information includes:

- Use of personal precautions and protective equipment to prevent contamination.
- Emergency procedures.
- Methods and materials used for containment.
- Clean-up procedures and/or equipment required for clean-up.

**Section 7—Handling and Storage** – This section provides information on the safe handling and storage of chemicals. The required information includes:

- Precautions for safe handling, including recommendations for handling incompatible chemicals.
- Recommendations on the safe storage of chemicals including advice on safe storage requirements.

### Section 8—Exposure Controls/Personal Protection

This section outlines the engineering controls, personal protective equipment, and exposure limits needed to ensure that worker exposure to hazardous chemicals is minimized. The required information includes:

- OSHA Permissible Exposure Limits (PELs) and Threshold Limit Values (TLVs).
- Appropriate engineering controls.
- Recommendations for personal protective measures (PPE).
- Special requirements for PPE, such as respirators, when necessary.

### Section 9—Physical and Chemical Properties

This section identifies the physical and chemical properties of a substance or mixture. The minimum required information consists of:

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

Each SDS may not contain all of the above information; however, a notation must exist to indicate this. Manufacturers may add other relevant information.

### Section 10—Stability and Reactivity

This section outlines the reactivity of a chemical and the chemical stability. The required information consists of:

#### Reactivity

- Description of specific test data for the chemical.

#### Chemical Stability

- Indication of whether the chemical is stable under normal temperature conditions, during storage and when handled.
- Description of stabilizers needed to maintain stability.
- Indication of safety issues that may arise if the physical appearance of the product changes.

## **Other**

- Indication of possibly hazardous reactions, and a description of the conditions under which those reactions occur.
- List of all conditions to be avoided.
- List of all classes of incompatible materials with which the product could react.
- List of any known or anticipated decomposition products that could be produced due to use, storage, or heating.

## **Section 11—Toxicological Information**

This section indicates health information and also indicates if this information is unavailable. The required information consists of:

- Information on the likely routes of exposure.
- Description of immediate, delayed or chronic effects from short and long-term exposure.
- The numerical data on toxicity.
- Description of symptoms.
- Statement as to whether or not the chemical is listed on the National Toxicology Program (NTP) Report on Carcinogens or has been found to be a potential carcinogen.

## **Section 12—Ecological Information (non-mandatory)**

This section allows the environmental impact of releasing a chemical into the environment to be evaluated. The information may include:

- Data from toxicity tests performed on aquatic and/or terrestrial organisms where available.
- Whether or not there is a tendency for a chemical to persist and degrade in the environment.
- Results of tests of bioaccumulation potential.
- The potential for a substance to move from the soil to the groundwater.
- Other adverse effects.

## **Section 13—Disposal Considerations (non-mandatory)**

This section provides information on proper disposal practices, recycling or reclamation of chemicals and their containers, and safe handling practices. The information may include:

- Description of appropriate disposal containers to use.
- Recommendations for proper disposal methods to use.
- Descriptions of physical and chemical properties that may affect disposal methods.
- Language discouraging sewage disposal.
- Special precautions for landfills or incinerators.

## **Section 14—Transport Information (non-mandatory)**

This section provides classification information on shipping and transporting hazardous chemicals. The information pertains to manufacturers and distributors who are shipping their products to users.

### **Section 15—Regulatory Information (non-mandatory)**

This section indicates health and safety information and environmental regulations that are not found elsewhere on the SDS. This would include national or regional regulatory information.

### **Section 16—Other Information**

This section indicates where the SDS was prepared and the date of the latest revision. Any other useful information may also be included in this section.

Employers are responsible for making sure that SDSs are readily available and accessible to all employees. Schools should give a copy of SDSs to the school nurse of each building where chemicals are used and stored, including chemicals used in cleaning the building. Schools should also provide this information to first responders.

### **Resources:**

OSHA Brief, Hazard Communication Standard: Labels and Pictograms,  
<https://www.osha.gov/Publications/OSHA3636.pdf>

OSHA Brief, Hazard Communication Standard: Safety Data Sheets,  
<https://www.osha.gov/Publications/OSHA3514.pdf>

*NSTA would like to thank its Science Safety Advisory Board for developing this resource. Questions or comments about its content should be directed to NSTA at 703-243-7100 or [safety@nsta.org](mailto:safety@nsta.org).*

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