

Identifying Chemical Hazards

What is a Hazardous Chemical?

A hazardous chemical is any chemical that poses health, physical, and/or environmental hazards.

A chemical is considered a *health hazard* if acute or chronic health effects can result from an exposure. The GHS lists the following health hazards:

- ***Acutely toxic:*** Adverse health effects occur from an exposure within a short period of time, typically less than 24 hours.
- ***Corrosive:*** Characterized by a very low (acids) or a very high (alkalis) pH. Cause irreversible damage or destruction of tissue when in contact with skin, eyes, and/or respiratory system.
- ***Irritants:*** Cause reversible inflammation of the skin, eyes, and/or respiratory system.
- ***Sensitizers:*** Cause a person to develop an allergy to the chemical. The chemical may cause little or no reaction on the first exposure but will cause a skin and/or respiratory reaction from subsequent exposures. The reaction can range from mild to life-threatening.
- ***Mutagens:*** Cause a change in genetic material that can affect the exposed individual (i.e. carcinogen) or be passed on to offspring (i.e. teratogen).
- ***Carcinogens:*** Can cause cancer, typically from repeated or long-term exposures.
- ***Reproductive hazards:*** Cause adverse effects on sexual function or the ability to conceive or maintain a normal pregnancy. Reproductive hazards can affect both males and females. Under GHS, the reproductive hazard classification also includes teratogens, which cause adverse effects on the developing embryo.
- ***Toxic to specific organs:*** Cause damage to specific body organs, such as the liver (hepatotoxins), the kidneys (nephrotoxins), the nervous system (neurotoxins), etc.
- ***Aspiration hazards:*** Cause pulmonary injury, such as chemical pneumonia, from liquid or solid chemical entering the lower respiratory system, such as the lungs, from breathing it in through the nose or mouth.

A chemical is considered a *physical hazard* if a physical property of the chemical can result in harm or damage to people or materials, including chemicals that are:

- ***Flammable:*** Liquid, gas, or solid that ignites and burns readily.
 - ***Flammable Liquids:*** Defined as having a flash point, the temperature at which the chemical vapors ignite, below 100°F. The lower the flash point, the higher the hazard.
- ***Explosive:*** Materials that are susceptible to instantaneous release of pressure, gas, and/or heat when subjected to shock pressure, or high temperature.
- ***Oxidizers:*** Materials that can intensify a fire by causing other materials to combust more easily and burn more intensely. Oxidizers are not themselves flammable.
- ***Self-reactive:*** Materials that are unstable and can undergo a strong decomposition reaction, even without air.
- ***Pyrophoric:*** Materials that ignite when in contact with air.
- ***Organic peroxides:*** Specific type of materials that are highly reactive and sensitive to shock.

- **Corrosive to metal:** Materials that can damage or destroy metal.
- **Gases under pressure:** Gases contained in a cylinder or other receptacle under pressure.
- **Reactive when in contact with water:** Materials that release a hazardous gas (flammable, toxic) when in contact with water.

There are three primary ways of identifying chemical hazards in the workplace, chemical labels, safety data sheets (SDSs), and warning signs.

Chemical manufacturers are required to provide hazard information on the chemical label and in an SDS, which is a document that provides detailed information about the chemical properties, hazards, and protective measures and precautions for handling and storing the chemical.

Beginning in 2015, chemical manufacturers and distributors were required to ensure all labels and SDS comply with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS). GHS defines hazard classifications and uses standardized pictograms, signal words, hazard statements, and precautionary statements to ensure consistent information regarding the hazards posed by a chemical regardless of the manufacturer or country of origin. Prior to GHS, there were several different classification systems in use throughout the world.

GHS Elements

Hazard Class

There are 28 GHS hazard classes, 16 under physical hazards, 10 under health hazards, and 2 under environmental hazards. Each hazard class is further divided into hazard categories based on the severity of the hazard. For example, the hazard class “Flammable Liquids” is divided into 4 categories based on the flash point and boiling point of the liquid.

Hazard Statements

GHS uses standardized hazard statements, which are phrases that describe the nature and severity of the hazard. Each hazard statement is assigned a unique code consisting of a letter “H” followed by three numbers. Examples of hazard statements include:

- H225 Highly flammable liquid and vapor and
- H331 Toxic if inhaled

Precautionary Statements

GHS uses precautionary statements, which are phrases that describe measures to minimize or prevent adverse effects from a chemical, including preventing exposure, proper storage, emergency response, and proper disposal. Each precautionary statement is assigned a unique code consisting of a letter “P” followed by three numbers. Examples of precautionary statements include:

- P210 Keep away from heat, hot surface, sparks, open flames, and other ignition sources
- P304 If inhaled: *(this will be customized by the manufacturer based on the specific chemical)*
- P341 If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing
- P403 Store in a well-ventilated place.

Pictograms

Pictograms are a standardized element of GHS and are intended to convey health, physical, and environmental hazards associated with the chemical. There are 9 pictograms, which are matched to GHS hazard classes and categories. A single pictogram may be matched to more than one hazard class and category. It is important to read the hazard statements to understand the specific hazard indicated by the pictogram.

For example, the exclamation mark pictogram may be used for acutely toxic chemicals that are harmful if swallowed, inhaled, or in contact with skin, chemicals that cause skin or eye irritation, chemicals that cause sensitization of the skin, or chemicals that cause narcotic effects (drowsiness or dizziness). The hazard statement(s) will specify which of these hazards are indicated by the exclamation mark.

Physical Hazards

Pictogram	Pictogram Name	Hazard Class(es)
	Exploding Bomb	Explosives Some self-reactive chemicals Some organic peroxides
	Flame	Flammable gases, liquids, and solids Pyrophoric liquids and solids Some self-reactive chemicals Some organic peroxides
	Flame Over Circle	Oxidizers
	Gas Cylinder	Gases under pressure, including <ul style="list-style-type: none">Compressed gasesLiquified gasesRefrigerated liquified gases
	Corrosion	Corrosive to metals

Health Hazards

Pictogram	Pictogram Name	Hazard Class(es)
	Skull and Crossbones	Some acute toxins
	Exclamation Mark	Some acute toxins Skin and eye irritant Skin sensitizer Some specific organ toxicity
	Health Hazard	Respiratory sensitizers Mutagens Carcinogens Reproductive hazards Some specific organ toxicity Aspiration hazards

Environmental

Pictogram	Pictogram Name	Hazard Class(es)
	Environment	Hazardous to aquatic environment

Chemical Labels

GHS System

The following elements will appear on a GHS compliant chemical label:



1. Product Identifier: This is typically the chemical name.
2. Signal Word (Danger or Warning): Indicates the severity of the hazard. Danger is used for more severe hazards.
3. Hazard Statements: Describes the health and physical hazard(s) the chemical presents. Hazard statements are standardized by the GHS system based on hazard classification.
4. Precautionary Statements: Describes recommended measures that should be taken to minimize or prevent adverse effects from exposure to the chemical or improper storage or handling. The GHS system provides standardized precautionary statements based on the hazard classification, but there may be additional, non-standard statements provided by the manufacturer or importer.
5. Manufacturer or Importer Information: Name, address, and telephone number of manufacturer or importer.
6. Pictograms: Universal symbols identifying the hazard classification(s). Pictograms are standardized by the GHS system based on hazard classification.

Other Hazard Classification Systems

Chemicals manufactured or imported prior to 2015 may use a different hazard classification system on the label. Two of the most common systems are NFPA and HMIS. Both systems follow a similar numerical hazard classification and labels will typically contain the following information:



1. Product Identifier: This is typically the chemical name.
2. Signal Word (Danger or Warning): Indicates the severity of the hazard. Danger is used for more severe hazards.
3. Hazard Summary: Describes the primary health and physical hazard(s) the chemical presents.
4. Precautions: Identifies PPE and other measures needed for safe handling.
5. NFPA Diamond or HMIS Rectangle: Numerical hazard rating system with numbers from 0 to 4, with 0 indicating a minimal hazard and 4 indicating a severe hazard. Each color/position indicates a different hazard classification.

Comparison of NFPA and HMIS Hazard Rating Systems

The NFPA and HMIS systems were developed for different purposes and provide slightly different information. The NFPA system was developed to provide firefighters and other emergency responders with hazard information about the chemicals they may encounter in a fire or other emergency. The HMIS system was developed to provide workers with hazard information about the chemicals they work with.

The NFPA diamond provides the following information:

- Blue/Left diamond indicates the health hazard rating. The NFPA health hazard rating is based on acute health hazards.
- Red/Top diamond indicates the flammability hazard rating.
- Yellow/Right diamond indicates the reactivity hazard rating.
- White/Bottom diamond provides information about special hazards associated with the chemical, such as COR for corrosive, OXY for oxidizer, or W for “use no water.”

HMIS System:

- Blue/Top row indicates the health hazard rating. The HMIS health hazard rating is based on both chronic and acute health hazards.
- Red/Second row indicates the flammability hazard rating.
- Yellow/Third row indicates the reactivity hazard rating.
- White/Bottom row identifies the personal protective equipment (PPE) required to safely handle the chemical.

Safety Data Sheets (SDSs)

A Safety Data Sheet (SDS), formerly called a Material Safety Data Sheet (MSDS), provides detailed information about the chemical, including the properties of the chemical, the hazards associated with the chemical, safe handling practices, and emergency information. Prior to the GHS, there was no required format for SDSs. The GHS standardized SDSs into 16 sections:

- Section 1: Identification of the substance or mixture and of the supplier
- Section 2: Hazard identification
- Section 3: Composition/information on ingredients
- Section 4: First-aid measures
- Section 5: Fire-fighting measures
- Section 6: Accidental release measures
- Section 7: Handling and storage
- Section 8: Exposure controls/personal protection
- Section 9: Physical and chemical properties
- Section 10: Stability and reactivity
- Section 11: Toxicological information
- Section 12: Ecological information
- Section 13: Disposal consideration
- Section 14: Transport information
- Section 15: Regulatory information
- Section 16: Other information

SDSs can be long documents, but several sections can provide useful information when trying to identify the hazards associated with the chemical and how to protect yourself. Please note that SDS produced by different companies for the same product may not include the same information. Contact EHS if you have any questions regarding the SDS.

Section 1: The following example is from the SDS for the chemical WD-40.

Section 2: Is one of the most important sections of the SDS. This section contains a summary of the hazards using the GHS pictograms, hazard statements, and precautionary statements.

2 – Hazards Identification

Hazcom 2012/GHS Classification:

Flammable Aerosol Category 1

Gas Under Pressure: Compressed Gas

Aspiration Toxicity Category 1

Specific Target Organ Toxicity Single Exposure Category 3 (nervous system effects)

Note: This product is a consumer product and is labeled in accordance with the US Consumer Product Safety Commission regulations which take precedence over OSHA Hazard Communication labeling. The actual container label will not include the label elements below. The labeling below applies to industrial/professional products.

Label Elements:



DANGER!

Extremely Flammable Aerosol.

Contains gas under pressure; may explode if heated.

May be fatal if swallowed and enters airways.

May cause drowsiness or dizziness.

Prevention

Keep away from heat, sparks, open flames, hot surfaces. – No smoking.

Do not spray on an open flame or other ignition source.

Pressurized container: Do not pierce or burn, even after use.

Avoid breathing vapors or mists.

Use only outdoors or in a well-ventilated area.

Response

IF SWALLOWED: Immediately call a POISON CENTER or physician. Do NOT induce vomiting.

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician if you feel unwell.

Storage

Store locked up.

Protect from sunlight. Do not expose to temperatures exceeding 50°C/122°F. Store in a well-ventilated place.

Disposal

Dispose of contents and container in accordance with local and national regulations.

Section 4: Provides information on first-aid measures to be taken if exposed.

4 – First Aid Measures

Ingestion (Swallowed): Aspiration Hazard. DO NOT induce vomiting. Call physician, poison control center or the WD-40 Safety Hotline at 1-888-324-7596 immediately.

Eye Contact: Flush thoroughly with water. Remove contact lenses if present after the first 5 minutes and continue flushing for several more minutes. Get medical attention if irritation persists.

Skin Contact: Wash with soap and water. If irritation develops and persists, get medical attention.

Inhalation (Breathing): If irritation is experienced, move to fresh air. Get medical attention if irritation or other symptoms develop and persist.

Signs and Symptoms of Exposure: Harmful or fatal if swallowed. Aspiration of liquid into the lungs during swallowing or vomiting may cause lung damage. May cause eye and respiratory irritation. Inhalation of mists or vapors may cause drowsiness, dizziness and other nervous system effects. Skin contact may cause drying of the skin.

Indication of Immediate Medical Attention/Special Treatment Needed: Immediate medical attention is needed for ingestion.

Section 7: Provides information about safe handling and storage, including incompatibles.

7 – Handling and Storage

Precautions for Safe Handling: Avoid contact with eyes. Avoid prolonged contact with skin. Avoid breathing vapors or aerosols. Use only with adequate ventilation. Keep away from heat, sparks, pilot lights, hot surfaces and open flames. Unplug electrical tools, motors and appliances before spraying or bringing the can near any source of electricity. Electricity can burn a hole in the can and cause contents to burst into flames. To avoid serious burn injury, do not let the can touch battery terminals, electrical connections on motors or appliances or any other source of electricity. Wash thoroughly with soap and water after handling. Keep containers closed when not in use. Keep out of the reach of children. Do not puncture, crush or incinerate containers, even when empty.

Conditions for Safe Storage: Store in a cool, well-ventilated area, away from incompatible materials. Do not store above 120°F or in direct sunlight. U.F.C (NFPA 30B) Level 3 Aerosol. Store away from oxidizers.

Section 8: Provides information about controlling exposures.

8 – Exposure Controls/Personal Protection

Chemical	Occupational Exposure Limits
LVP Aliphatic Hydrocarbon	1200 mg/m ³ TWA (manufacturer recommended)
Petroleum Base Oil	5 mg/m ³ TWA (Inhalable) ACGIH TLV (as Mineral oil) 5 mg/m ³ TWA OSHA PEL (as Oil mist, mineral)
Aliphatic Hydrocarbon	1200 mg/m ³ TWA (manufacturer recommended)
Carbon Dioxide	5000 ppm TWA, 30,000 ppm STEL ACGIH TLV 5000 ppm TWA OSHA PEL

The Following Controls are Recommended for Normal Consumer Use of this Product

Appropriate Engineering Controls: Use in a well-ventilated area.

Personal Protection:

Eye Protection: Avoid eye contact. Always spray away from your face.

Skin Protection: Avoid prolonged skin contact. Chemical resistant gloves recommended for operations where skin contact is likely.

Respiratory Protection: None needed for normal use with adequate ventilation.

For Bulk Processing or Workplace Use the Following Controls are Recommended

Appropriate Engineering Controls: Use adequate general and local exhaust ventilation to maintain exposure levels below that occupational exposure limits.

Personal Protection:

Eye Protection: Safety goggles recommended where eye contact is possible.

Skin Protection: Wear chemical resistant gloves.

Respiratory Protection: None required if ventilation is adequate. If the occupational exposure limits are exceeded, wear a NIOSH approved respirator. Respirator selection and use should be based on contaminant type, form and concentration. Follow OSHA 1910.134, ANSI Z88.2 and good Industrial Hygiene practice.

Work/Hygiene Practices: Wash with soap and water after handling.

Contact EHS- for more information and training on Hazard Communication (x3333)