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Best Practice Guide to:

GHS Labeling

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INTRODUCTION

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS) offers an internationally-standardized way to identify and communicate chemical hazards. This guide will introduce the basics of GHS, explain the hazard classes that it defines, and describe the Safety Data Sheets and container labels that are required to comply with this standard.

The Story of GHS

Around the world, hazardous chemicals are created, traded, and consumed in industry and commerce. As international trade becomes more important, those hazardous chemicals pass from one country to the next more often. When that happens, chemical handling information and warnings that may be perfectly acceptable in one nation may become less helpful in another.

Created and published by the United Nations (UN), GHS is intended to provide a unified and coherent system for dealing with dangerous chemicals, both in domestic usage and in international commerce. To create a consistent and universal approach (a "globally harmonized system") for handling chemical hazards, the UN broke the problems of chemical handling into two parts. These parts are:

- **Classification**: a way to reliably identify the hazards of a material, using standardized and reproducible tests.
- Labeling: a way to reliably communicate that information to others, using specially-designed container labels and Safety Data Sheets (SDSs).

New in GHS Rev.6 (2015)

GHS has been reviewed, revised, and expanded numerous times since its first version was adopted in 2002. The most recent version of GHS, Revision 6, was published in 2015. Like previous revisions, Revision 6 introduced several minor changes without altering the core of the system. The notable changes in this edition included:





GHS-compliant container labels provide easily-recognized information about the hazards of a chemical, as well as details about how to prevent or mitigate the harm of exposure.

INTRODUCTION

Adoption of the System

The UN encourages everyone to adopt GHS. The value of a standardized format increases, and the cost of implementation decreases, as more people use it. However, the UN does not have the power to enforce GHS. This is reserved for national governments and their agencies, like the Occupational Safety and Health Administration (OSHA).

As individual nations adopt GHS, they may choose to adopt the entire system as published by the UN, or they may alter some of its requirements to accommodate their legal structures or local concerns. For example, OSHA regulates issues of workplace safety in the United States. OSHA has adopted most of GHS for container labeling. However, the environmental concerns that are addressed in GHS are beyond OSHA's jurisdiction and are governed by the Environmental Protection Agency (EPA), which uses a different set of rules. As a result, some elements of GHS are effectively "optional" in the US.



International chemical trade is simpler when the same labeling rules apply in multiple nations.

Many nations around the world have already adopted GHS, and more are choosing to follow the standard as time passes. Individual nations currently enforcing or adopting at least part of the GHS standard are:

- Argentina
- Australia
- Austria
- Belgium
- Bolivia
- Brazil
- Brunei
- BulgariaCambodia
- Canada
- Chile
- China
- onina a
- Colombia
- Cyprus
- Czech RepublicDemocratic
- Republic of Congo
- Denmark
- Ecuador
- Estonia
- Finland
- France
- Gambia
- Germany
- Greece
- Additionally, the European Union and European Economic Area have adopted GHS. This effectively expands the above list to include Croatia and Netherlands, even though these areas have not independently adopted the system.



INTERESTED IN HAZCOM 2012?

OSHA's implementation of GHS is the 2012 edition of the Hazard Communication Standard, usually called HazCom 2012. Graphic Products offers a separate Best Practice Guide to cover this set of rules. Please contact us for more information by visiting **GraphicProducts.com**, or by calling **877.534.5157**.

- Peru
- Philippines
- Poland
- Portugal
- Republic of Korea
- Romania
- Russian
 Federation
- Senegal
- Serbia
- Singapore
- Slovakia
- Slovenia
- South Africa
- Spain
- Sweden
- Switzerland
- Thailand
- United Kingdom
- United States
 of America
- Uruguay
- Vietnam
- Zambia

- GuatemalaHungary
- Iceland
- Indonesia
 - Ireland
 - Italy
 - Japan
 - KyrgyzstanLao People's

Democratic

Liechtenstein

Luxembourg

Madagascar

Malaysia

Mauritius

Myanmar

Netherlands

New Zealand

Mexico

Nigeria

Norway

Paraguay

Malta

Lithuania

Republic

Latvia

GHS is a system for classifying and labeling chemicals, and the classification has to come first.

Understanding the Classifications

During the classification part of GHS, hazardous materials are assigned Hazard Classes and Categories. The Hazard Classes (such as "Explosive" or "Carcinogenic") describe the general types of hazards posed by a material. Materials that can explode will require different kinds of worker protection, as compared to materials that can cause cancer.

Within those Classes, the Hazard Categories (such as "Category 1" or "Category 3") describe how severe the hazards are. In any class, the most severe or extreme danger is assigned to Category 1. For example, a Category 1 Explosive is more dangerous than a Category 3 Explosive.

Each Class and Category is defined by the results of standardized and empirical tests, which can be repeated in any well-equipped laboratory. As a result, a given chemical can be reliably classified wherever it is in the world.

The different Hazard Classes are divided into three general groups: Physical Hazards, Health Hazards, and Environmental Hazards.



GHS Wallet Cards

Card gives an overview of GHS

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Physical Hazards

Physical Hazards typically involve chemical reactions that can cause property damage or physical injury.





Flammable Liquids	This Class refers to liquids that have a flash point of 199°F (93°C) or lower. (The flash point of a liquid is the lowest temperature at which the vapors of that liquid can be ignited in the air.) Because the temperature cut-off is different, materials that were not considered "flammable" under another standard may qualify as "flammable" under GHS.
Flammable Solids	These are solid materials that can be easily ignited, or which may start a fire or contribute to a fire simply through friction.
Self- Reactive Substances and Mixtures	These may be liquids, solids, or mixtures that can decompose and give off heat even without air or oxygen. Materials that might fit here, but also qualify as Explosives, Organic Peroxides, or Oxidizers (Liquid or Solid) should be handled under those categories instead.
Pyrophoric Liquids and Pyrophoric Solids	These Classes refer to liquids and solids that will ignite on their own if exposed to air for five minutes or less. The tests use only a small amount of the materials; if larger amounts or longer time periods are needed for the effect to occur, the material may qualify as "Self- Heating," the next Class.

Self-Heating Substances and Mixtures	Materials in this Class are like pyrophoric substances, in that they will react with air to chemically degrade and produce heat. However, larger amounts of the material, or longer waiting periods, are needed before the substance will ignite.
Substances & Mixtures Which, in Contact with Water, Emit Flammable Gases	This Class covers solids or liquids that may not be flammable on their own, but react with water to produce flammable gases. These gases may even auto-ignite at normal room temperatures, so qualifying materials typically require special precautions during accident response.
Oxidizing Liquids and Oxidizing Solids	These Classes refer to liquids and solids that may not burn, but will contribute to the combustion of other materials.
Organic Peroxides	Organic Peroxides are a Class of materials that have a distinctive chemical structure. While useful in many industries, these chemicals are intrinsically unstable. Some are self-reactive, explosive, or sensitive to impact or friction. Within the Class, organic peroxides are assigned Types A through G, with Type A requiring the most care in handling.
Corrosive to Metals	These materials will materially damage or destroy metallic surfaces that they contact. Both steel and aluminum surfaces should be tested, and the material is considered Corrosive if either surface is significantly damaged.
Desensitized Explosives	Some explosives can have other materials added to make them safer to handle and transport. This Class, introduced in the 2015 revision of GHS, allows for clarified warnings and instructions that apply to these materials.

Health Hazards

The Health Hazards include poisons and other materials that cause biological harm. Classifying these kinds of hazards can involve observing the effects of a harmful material on a living thing, which has ethical implications. As a result, the standard emphasizes the importance of relying on existing human data first, then existing animal data, then "in vitro" (laboratory) data, and only then other sources of information.

Acute Toxicity	This Class covers pronounced negative effects on health that result from a single exposure to the material, multiple exposures over a 24-hour period, or (for inhalation) a total exposure of 4 hours or less. The most serious effects include death, so this category deserves careful attention.
Skin Corrosion/ Irritation	Materials with these effects will cause either permanent or reversible damage to skin, from an exposure of 4 hours or less. Permanent effects are considered "Corrosion" and are listed as Category 1; reversible effects are considered "Irritation" and fall under Categories 2 and 3.
Serious Eye Damage/ Eye Irritation	These effects are much like the skin corrosion or irritation effect from the previous Class, but affect the eye or vision. Permanent effects are considered "Serious Eye Damage" and are listed as Category 1; reversible effects are considered "Eye Irritation" and fall under Category 2.
Respiratory or Skin Sensitization	This Class refers to physiological harm that results from the body's reaction to a material, rather than the material's direct chemical effect on the body. Materials in this category induce something like an allergic reaction or asthma attack.



Health Hazards often require workers to wear protective equipment, such as face shields and respirators.

Germ Cell Mutagenicity	Materials in this class cause genetic defects, or are suspected to cause them, in the offspring of an exposed human. Due to the difficulty of obtaining conclusive evidence for this kind of harm, the standard specifies how to deal with suspected hazards on the basis of different kinds of human and animal information.
Carcinogenicity	This Class is for materials known or suspected to cause cancer, or to increase the incidence of cancer. As with germ cell mutagenicity, the standard specifies how to deal with suspected hazards on the basis of different kinds of human and animal information. The standard does not consider the intended use of the material, only the material's intrinsic properties.
Reproductive Toxicity	These effects cause problems in sexual function or fertility in exposed adults, and/or developmental toxicity in their offspring. As with germ cell mutagenicity, the standard specifies how to deal with suspected hazards on the basis of different kinds of human and animal information.

Specific Target Organ Toxicity, Single Exposure This Class identifies all specific, nonlethal effects on specific organs that arise from a single exposure. This includes permanent and reversible effects, whether immediate or delayed; in short, any specific health hazard not otherwise addressed that results from a single dosage.

Specific Target Organ Toxicity, Repeated Exposure As with the Single Exposure Class, above, this Class is the catch-all for specific health hazards that result from repeated or chronic exposure to a material.

Aspiration Hazard



"Aspiration" is the entrance of a solid or liquid material into the lungs or trachea. Materials that pose a special hazard in this situation may feature a warning along the lines of "If ingested, do not induce vomiting," because of the increased risk of accidental aspiration.

Environmental Hazards

The Environmental Hazards are the ones that damage the environment as a whole, usually on a long-term basis.

Hazardous to the Aquatic Environment This Class combines several elements to assess a general, overall risk posed by the material to marine ecology. Acute toxicity, chronic toxicity, potential for bioaccumulation (buildup in organisms over time), and rate of degradation or decomposition are all considered.

Hazardous to the Ozone Layer This Class identifies materials listed in the Montreal Protocol as depleting the ozone layer. Mixtures that include any of those substances at a concentration of 0.1% or more are also covered.



Many different types of hazards may be present in a modern industrial facility. GHS labels can help clear the confusion, and ensure that workers stay safe.

SAFETY DATA SHEETS

Once a material has been classified as hazardous under GHS, the information about that material needs to be compiled into a document called a Safety Data Sheet (SDS). This document lists information about the material that may be important to a user, following a standardized sequence of sections, with specified details in each section.

Sections of an SDS

The sections of an SDS are listed in the standard, and each section must appear for the SDS to comply with the requirements. There is no required length for the document; it should be as long as necessary to include the information called for. The first two sections tend to be the longest and the most important.

1. Identification

This section identifies the material, using the same name that will be found on the container label. If there are alternative names that may be used to identify the material, they should also be listed here. The intended use of the material, such as "flame retardant," and any restrictions on its use should also be provided in this section. Finally, the name, full address, and phone number of the supplier should appear, along with any emergency contact information.

2. Hazard Identification

This section should provide the Hazard Class and Category (or Classes and Categories) as determined for the material. The SDS should also include the Signal Word, Hazard Statement(s), Pictogram(s), and Precautionary



Statement(s), histogram(s), and recodutionary Statement(s) that will appear on the label, all of which are based on the classification of the material. The Pictograms may be shown as images, or simply named (such as "flame" or "skull and crossbones"). Additionally, if the material poses any hazards that are not covered in the GHS classifications, they should be described here as well.

3. Composition / Ingredient Information

Any technical or chemical names for the material should be specified here. If the material is a mixture, any ingredients that contribute to the mixture's hazards should be identified.



4. First-Aid Measures

Provide basic procedures that an untrained responder should follow to provide initial care in the event of an accident. Depending on the



material and the nature of the exposure, this may include steps like contacting a poison control center, or moving the victim to an area of fresh air.

5. Fire-Fighting Measures

Identify appropriate extinguishing media for a fire that involves the material, and any special hazards that might arise as the material burns.

6. Accidental Release Measures

This section should identify appropriate responses to spills, leaks, or other releases of the material, with the goal of minimizing



adverse effects. If protective equipment would be needed for responders, specify the equipment here.

7. Handling and Storage

If any instructions are needed for safe handling or storage, they should be noted here.

8. Exposure Controls / Personal Protection

This section is for protective equipment and controls that are needed during the intended use of the material.



9. Physical and Chemical Properties

This section includes technical and descriptive information about the material's properties, such as color, odor, flammability, boiling point, and so on. Depending on the nature of the material, different details will be relevant, and should be included here.

10. Stability and Reactivity

If the material poses any reactivity or chemical instability hazards, identify them and whatever steps and conditions would be needed to mitigate them.

11. Toxicological Information

This section should include information about each of the potential health hazards posed by the material, as the material is provided. This may include test results, symptoms of exposure, and other information.







12. Ecological Information

Information about the material's potential impact on the environment should be included here, such as its degradability, potential for bioaccumulation, and toxicity.

13. Disposal Considerations

The steps for proper disposal, recycling, or reclamation of the material should be specified in this section.

14. Transport Information

Any special instructions, classifications, or notes that affect the material's transportation should be included here. This may include the UN number and shipping name from the

UN Model Regulations (in the UN's Recommendations on the Transport of Dangerous Goods), along with any special precautions or compatibility concerns.

15. Regulatory Information

If other regulations, domestic or international, are known to apply to the material as it is provided, they should be mentioned here along with the relevant instructions or details. National implementations of GHS need not be mentioned, unless they would require information not already included in the SDS.

16. Other Information

Any other information that may be helpful or important, such as the date of the SDS's last revision, should appear in this section.



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Compiling and Providing SDSs

Each nation implementing GHS is free to choose when a full SDS is required, although the spirit of the system is best served when an SDS is available wherever the material itself is present. The manufacturer or supplier of the material is responsible for compiling the SDS.

In the U.S., the manufacturer or supplier of a hazardous material is required to provide a compliant SDS with the first shipment of the material to a recipient, whenever the information on the SDS is changed, and whenever the recipient requests an SDS. Many suppliers choose to provide an SDS with every shipment of a hazardous chemical, to limit potential problems during transportation. OSHA expects American employers to have updated and correct SDSs readily available to workers at any worksite where those hazardous materials are present.



Labeling

An SDS will offer detailed answers to many safety questions.

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CONTAINER LABELS

A label featuring the basic information in an easy-to-recognize format will also be applied to the material's container. These labels are compiled with a "building blocks" approach, using information from the SDS.

The Building Blocks of a GHS Label

GHS uses a set of required components for its labeling. These elements can appear in a variety of arrangements, but a label that is missing one or more of the elements is incomplete. As a result, these six elements are often called the "building blocks" of a GHS label.

Signal Word

This word quickly indicates the severity of the hazards posed by the material. "Danger" is for the most severe hazards, while "Warning" is for less severe hazards. If the hazard is significant enough to be noted, but not particularly dangerous, then no signal word at all may be required.

Hazard Statements

These standardized phrases describe the nature of a specific hazard. They have been chosen carefully to make them easy to translate consistently, and each statement is assigned a code number for reference. (These code numbers, on their own, don't meet the requirement to have the hazard statements on the label, and they don't need to appear on the label at all.)

Precautionary Statements

These statements describe recommended steps to prevent or minimize the adverse effects of exposure to a hazardous material. As with Hazard Statements, there is a list of standardized Precautionary Statements that are easy to translate and have reference numbers.



Pictograms

GHS-style labels are easiest to recognize by their hazard pictograms, which are symbols representing the kind of hazard that the chemical poses. These black-and-white symbols appear inside eye-catching red diamonds. The symbols needed for a material are determined by that material's Hazard Classes and Categories. Each pictogram should appear in black, on a white background, inside a red diamond-shaped border.

The pictograms are:



Product Identifier

This is the name of the material, including chemical names as appropriate, to match the identifier provided on the SDS. Where a container includes a mixture of chemicals, the label should identify all ingredients that contribute to any of the health hazards that are noted on the label. Adopting nations may require all hazardous ingredients to be noted, instead of only those with health hazards.

Supplier Identification

The name, address, and telephone number of the material's supplier should be included on the label.

Creating a Container Label

These "container labels" are specifically intended for the immediate container of a material. For example, if a box is packed with six bottles of a hazardous material, and the box is then shipped, GHS requires the bottles to be individually labeled. The UN has a separate recommendation for "shipping labels," which (if followed in a given jurisdiction) would specify the labeling on the box.

Precautionary Statements are more open to editing and adjustment than the Hazard Statements, which must appear as specified in the standard.

Many substances pose more than one kind of hazard, so their labels will need more than one pictogram and more than one hazard statement. When creating labels for these substances, include each of the required components, with the following exceptions:

- If the same pictogram or statement would appear more than once, only include it once on the label.
- If the "Danger" Signal Word appears, the "Warning" Signal Word should not appear.
- For Pictograms:
 - If the Skull and Crossbones symbol appears, the Exclamation Point need not appear.
 - If the Corrosion symbol appears, the Exclamation Point need not appear for skin or eye irritation.
 - If the Health Hazard symbol appears for respiratory sensitization, the Exclamation Point need not appear for skin sensitization or for skin or eye irritation.
- For all text:
 - If "[X] with lasting effects" appears, "[X]" on its own need not appear. For example, if the statement "Toxic to aquatic life with long lasting effects" is used, the statement "Toxic to aquatic life" may be left off.
 - If "[X] and [Y]" appears, "[X]" and "[Y]" need not appear separately. For example, if the statement "Causes severe skin burns and eye damage" is used, the separate statements "Causes severe skin burns" and/or "Causes serious eye damage" may be left off.

If your labels will be created with a DuraLabel printer from Graphic Products, you will probably create the designs in DuraSuite[™] Labeling Software, our compliance-oriented design program. DuraSuite includes an editable database of over 1,500 chemicals, and allows you to quickly and easily edit that database to match your materials. The program automatically adjusts your label design to suit the label size you choose and the material information you select, creating a compliant label design for printing.

SDS QUICK REFERENCE GUIDE FOR GHS LABELING

This reference guide lists the elements of a GHS-compliant Safety Data Sheet (SDS), and shows how that information should appear on a container label. Because national governments are free to adjust the basic requirements for their jurisdiction, be sure to check the rules that will apply in the material's location.

SDS Format for Chemical Manufacturers

1. Identification

- Product identifier
- Recommended use and any restrictions
- Supplier name, full address, and phone number
- Emergency phone number

2. Hazard(s) identification -

- Classification of the chemical
- Required label elements: signal word, hazard statement(s), precautionary statement(s), and symbol(s)

3. Composition/information on ingredients

- Chemical names and synonyms
- Any ingredients that pose health or environmental hazards

4. First-aid measures

- Necessary measures based on exposure type
- Important symptoms/ effects

5. Fire-fighting measures

- Suitable extinguishing techniques, equipment
- Chemical hazards from fire

6. Accidental release measures

- Emergency procedures
- Protective equipment
- Proper methods of containment and cleanup

		GHS Label
Draduct Identifiers	(Methylcyclopentadienyl)	\wedge
	manganese(I) tricarbonyl	\sim
	UN No. 3281 EC No. 235-166-5 CAS No. 12108-13-3	Leieles)
Signal Word ———		
— Hazard Statement(s) —	Fatal if swallowed or if inhaled. Toxic in contact with skin. Suspected of causing cancer.	\mathbf{X}
— Precautionary Statement(s) ————	Do not breathe dust/fume/gas/mist/vapours/spray. Wash thoroughly after handling. Wear protective gloves/protective clothing/eye protection/face protection. Wear respiratory protection. Immediately call a POISON CENTER or doctor/physician.	
Pictogram(s)		
	In case of exposure follow serious exposure measures and notify supervisor.	
Supplier Information	Captain Chemicals 12345 Here St. Anywhere, OR 98765-4321 US CONSULT SDS FOR ADDITIONAL INFORMATION ON HAZ	A 503-555-5555 ARDS

7. Handling and storage

- Precautions for safe
 handling
- Conditions for safe storage

8. Exposure controls/personal protection

- Exposure limits
- Personal Protective Equipment (PPE)
- Appropriate engineering controls

9. Physical and chemical

- properties
 Descriptive and identifying properties
- Supplemental
- information relevant to hazards

10. Stability and reactivity

Potential for chemical reactions
Conditions to avoid

11. Toxicological information

- Routes of exposure
- Acute and chronic effects

12. Ecological information

- Environmental toxicity information
- Persistence, degradability, and potential for bioaccumulation

13. Disposal considerations

• Information for proper recycling, disposal, or reclamation

14. Transport information

- UN proper shipping name
- Packing group, if applicable
- Special precautions for transportation

15. Regulatory information

 Safety, health, and environmental regulations not referenced elsewhere

16. Other information

- Date of preparation of the SDS
- Key for any abbreviations
 or acronyms used

This guide is for informational purposes only. It is not a substitution for review of applicable standards. Consult SDS for further instruction.

CONCLUSION

GHS was always meant to be a Globally Harmonized System, and it works better as more people use it. Many facilities are choosing to follow the system, even where GHS is not yet required by law.

GHS protects your workers and your customers. It simplifies domestic and international trade. Since the same GHS label is often acceptable in several different nations without changes, or with only simple translations, the system actually saves money for those who follow it. As time goes by, more nations are implementing the requirements of GHS into their own laws, making compliance mandatory. When it comes to labeling your products for GHS compliance, look to the DuraLabel line of printers from Graphic Products. These on-site, on-demand labeling systems feature powerful software solutions and the widest variety of specialized supplies on the market. Our GHS-oriented labeling materials are certified to comply with British Standard (BS) 5609, surviving water, weather, and wear for international shipping.



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