The Nature of Chemical Hazards & Implications of GHS Applied to Industry

7.5 Hour

GHS

Globally Harmonized System

Of Classification and Labeling of Chemicals

Created for: University of Medicine & Dentistry of New Jersey (UMDNJ),
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Today's Goals & Objectives

Introduction

The two primary goals of this training :

1. **Introduce the newly revised Hazard Communication Standard (HCS) aligning it with the Globally Harmonized System (GHS) of Classification and Labeling of Chemicals.**

2. **Provide a basic awareness training emphasizing the nature of chemicals.**

Note: The Hazard Communication Standard (HCS) is now aligned with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Section One: Rights and Responsibilities

Key elements of an Effective Hazard Communication Program

- Company Policy
- Container Labeling (HCS 2012 Compliant)
- Safety Data Sheet (HCS 2012 Compliant)
- Employee Training and Information
- Procedures and Communication for Non Routine Tasks
- Procedures and Communication for third party contractors
- Hazardous Materials Inventory/Lists
- Chemicals in Unlabeled Pipes
- Program documentation and availability
- Periodic regular program maintenance

Section Two: Global Harmonization and Hazard Communication

The GHS provides a standardized approach, including detailed criteria for determining what hazardous effects a chemical poses, as well as standardized label elements assigned by hazard class and category

OSHA's Hazard Communication Standard (HCS) requires the development and dissemination of such information:

Chemical manufacturers and importers are required to evaluate the hazards of the chemicals they produce or import, and prepare labels and safety data sheets to convey the hazard information to their downstream customers;

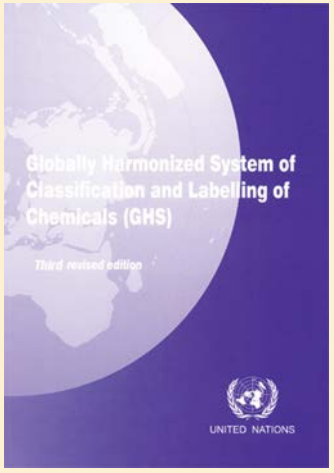
All employers with hazardous chemicals in their workplaces must have labels and safety data sheets for their exposed workers, and train them to handle the chemicals appropriately.

Reasons For A GHS

- Growing international trade
- Different requirements for labeling of chemicals
- Different classifications of identical products in different countries
- Need for an international safety standard

GHS History – The UN Mandate

"A globally-harmonized hazard classification and compatible labeling system, including material safety data sheets and easily understandable symbols, should be available, if feasible, by the year 2000."



The Purple Book

Section Two: Global Harmonization and Hazard Communication

Major changes to the Hazard Communication Standard

Hazard classification: Provides specific criteria for classification of health and physical hazards, as well as classification of mixtures. The revised HCS has specific criteria for each health and physical hazard, along with detailed instructions for hazard evaluation and determinations as to whether mixtures or substances are covered. It also establishes both hazard classes and hazard categories—for most of the effects; the classes are divided into categories that reflect the relative severity of the effect. The current HCS does not include categories so this new approach provides additional information that can be related to the appropriate response to address the hazard.

Labels: Chemical manufacturers and importers will be required to provide a label that includes a harmonized signal word, pictogram, and hazard statement for each hazard class and category.

Precautionary statements must also be provided.

Safety Data Sheets: Will now have a specified 16-section format.

Information and training: Employers are required to train workers by December 1, 2013 on the new labels elements and safety data sheets format to facilitate recognition and understanding

Harmonization Principles

- Comprehensibility is # 1
- Maintain current Worker/User protection
- Cover all chemical Uses & Modes
- All existing systems must change
- May use a step-by-step “Building Block” approach
- Classifications will be Hazards-based, not Risk-based

Hazard Vs. Risk Basis

Hazards represent intrinsic danger or ability of chemicals to cause adverse effects

Hazards are there despite quantity or use

Risk is the probability of adverse effects occurring

Risk may change depending on use and application of chemicals

Section Two: Global Harmonization and Hazard Communication

Unchanged Parts of the Hazard Communication Standard

The revised Hazard Communication Standard (HCS) is a modification to the existing standard. The parts of the standard that did not relate to the GHS (such as the basic framework, scope, and exemptions) remained largely unchanged.

There have been some modifications to terminology in order to align the revised HCS with language used in the GHS. For example, the term "hazard determination" has been changed to "hazard classification" and "material safety data sheet" was changed to "safety data sheet."

In regards to labeling, the current standard provides employers with flexibility regarding the type of system to be used in their workplaces and OSHA has retained that flexibility in the revised Hazard Communication Standard (HCS). Employers may choose to label workplace containers either with the same label that would be on shipped containers for the chemical under the revised rule, or with label alternatives that meet the requirements for the standard. Alternative labeling systems such as the National Fire Protection Association (NFPA) 704 Hazard Rating and the Hazardous Material Information System (HMIS) are permitted for workplace containers. However, the information supplied on these labels must be consistent with the revised HCS, e.g., no conflicting hazard warnings or pictograms.

Benefits Of The GHS

- Enhances human health, safety and environmental protection
- Promotes sound management of chemicals worldwide
- Reduces barriers and Facilitates Trade
- Reduces costs involved in developing, manufacturing, distributing, and transporting hazardous chemicals

Governments Benefit

- Fewer chemical accidents and incidents
- Lower health care costs
- Improved protection of workers and public from chemical hazards
- Reduce costs and ease coordination for legislation, implementation and monitoring,
- Supports improved inter-agency coordination and cooperation

Companies & Workers Benefit

- Safer work environment and transport of chemicals
- Improved employee relations
- Increased compliance with HazCom regs
- Minimizing labor and costs
- Fewer accidents and illnesses
- Improved corporate image and credibility

Section Two: Global Harmonization and Hazard Communication

Practical Advantages of Global Harmonized System (GHS) to Industry

- More efficient dissemination of information: Since SDS are arranged in uniform order, an employer can choose to training by categories comparing “apples to apples” and more effectively train right-to-know details. Easier means of training results in more compliance and less exposures in the workplace. Categorical training modules by similar hazard groupings, hence flammables, corrosives, caustics with each grouping side-by-side.

- Hazard grouping of category matrix: An inventory of chemical product SDS’s can translate to an employer creating a cross-matrix according to hazards that shortens retrieval and response times.

- International uniformity allows companies that work in the global economy to work with less lose of vital information due to errors in translation.

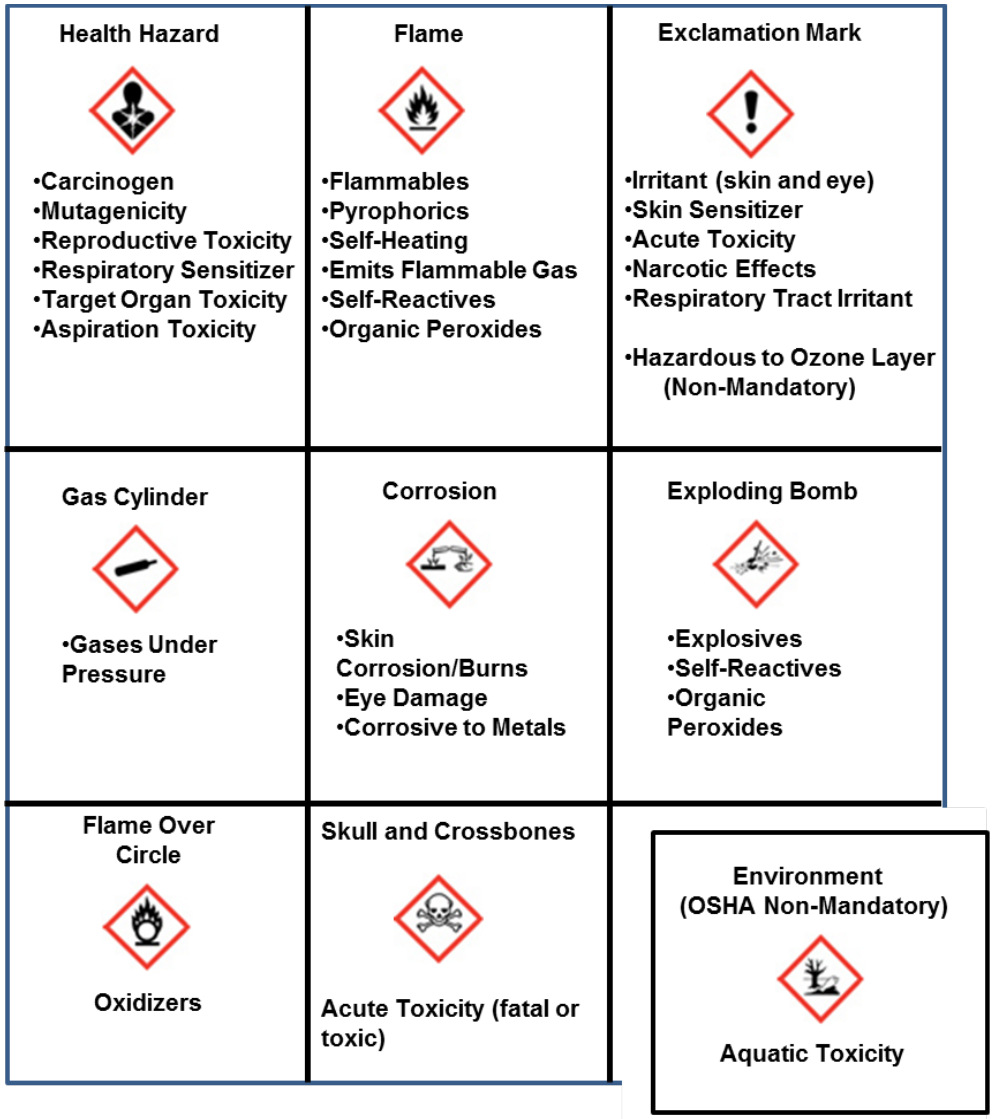
- Easier selection of hazards controls such as personal protection equipment.

- Readily understandable: Since pictograms, once familiarized, are so much easier to recognize at a glance than various texts and non-uniform symbols, employees can have faster warnings.

Section Two: Global Harmonization and Hazard Communication

Hazard Communication Standard Pictogram

As of June 1, 2015, the Hazard Communication Standard (HCS) will require pictograms on labels to alert users of the chemical hazards to which they may be exposed. Each pictogram consists of a symbol on a white background framed within a red border and represents a distinct hazard(s). The pictogram on the label is determined by the chemical hazard classification.



Section Two: Global Harmonization and Hazard Communication

SAMPLE LABEL

PRODUCT IDENTIFIER

CODE _____
Product Name _____

SUPPLIER IDENTIFICATION

Company Name_____
Street Address _____
City _____ State _____
Postal Code _____ Country _____
Emergency Phone Number _____

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.

In Case of Fire: use dry chemical (BC) or Carbon dioxide (CO_2) fire extinguisher to extinguish.

First Aid
If exposed call Poison Center.
If on skin (on hair): Take off immediately any contaminated clothing. Rinse skin with water.

HAZARD PICTOGRAMS

SIGNAL WORD

Danger

HAZARD STATEMENT

Highly flammable liquid and vapor.
May cause liver and kidney damage.

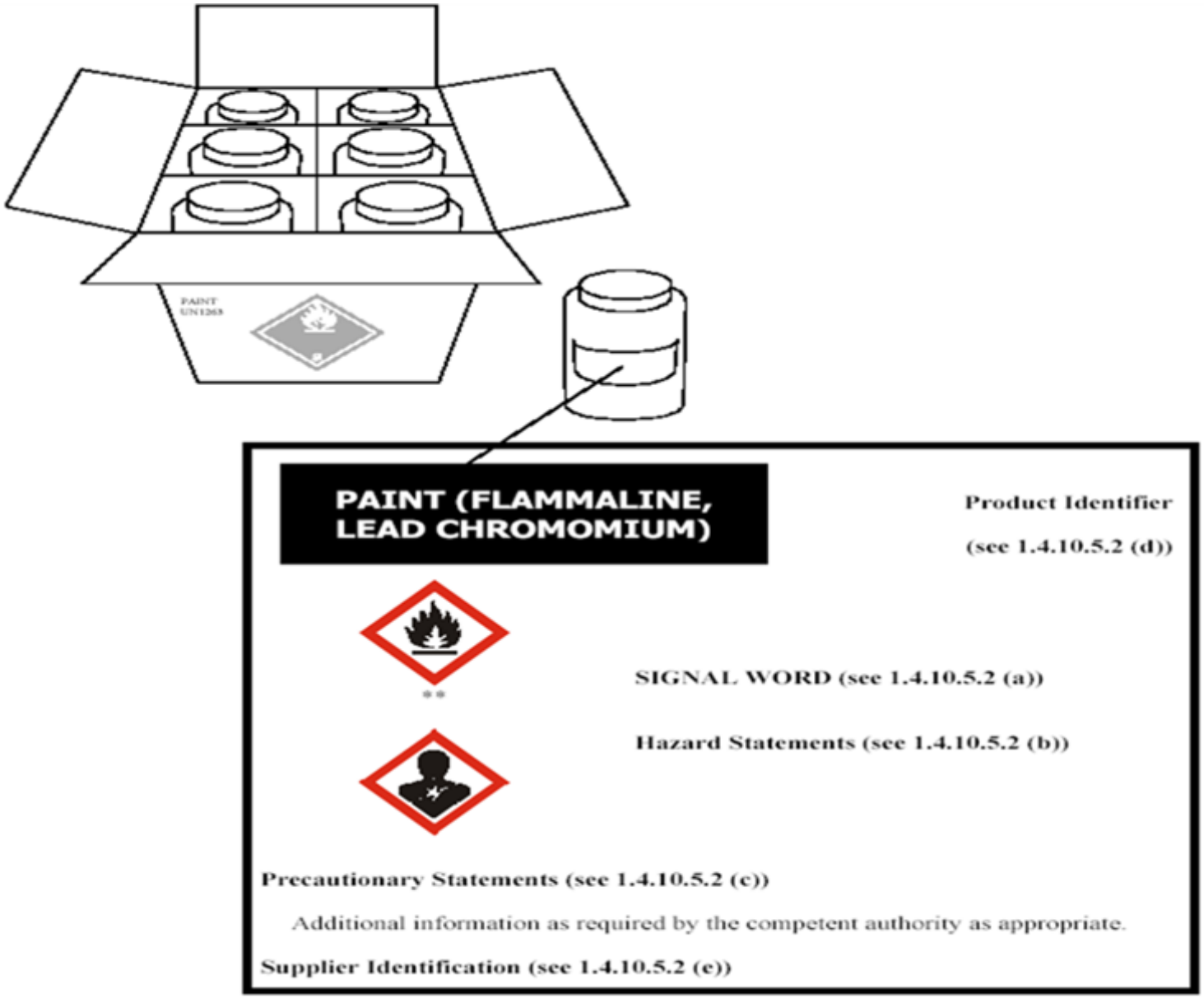
SUPPLEMENTAL INFORMATION

Directions for use

_____
_____
_____

Fill weight: _____ Lot Number _____
Gross weight: _____ Fill Date: _____
Expiration Date: _____

Section Two: Global Harmonization and Hazard Communication



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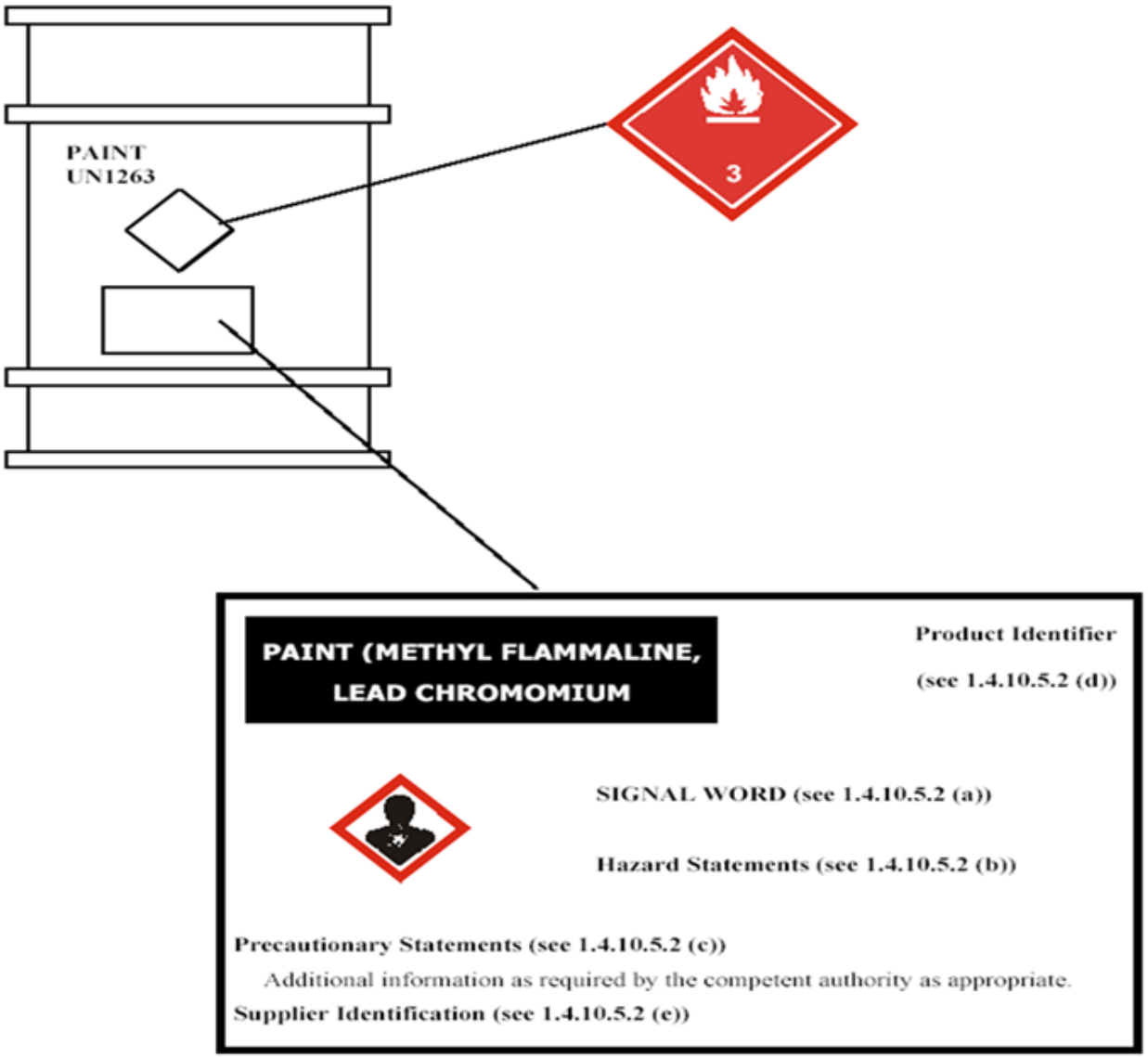


Critical Thinking

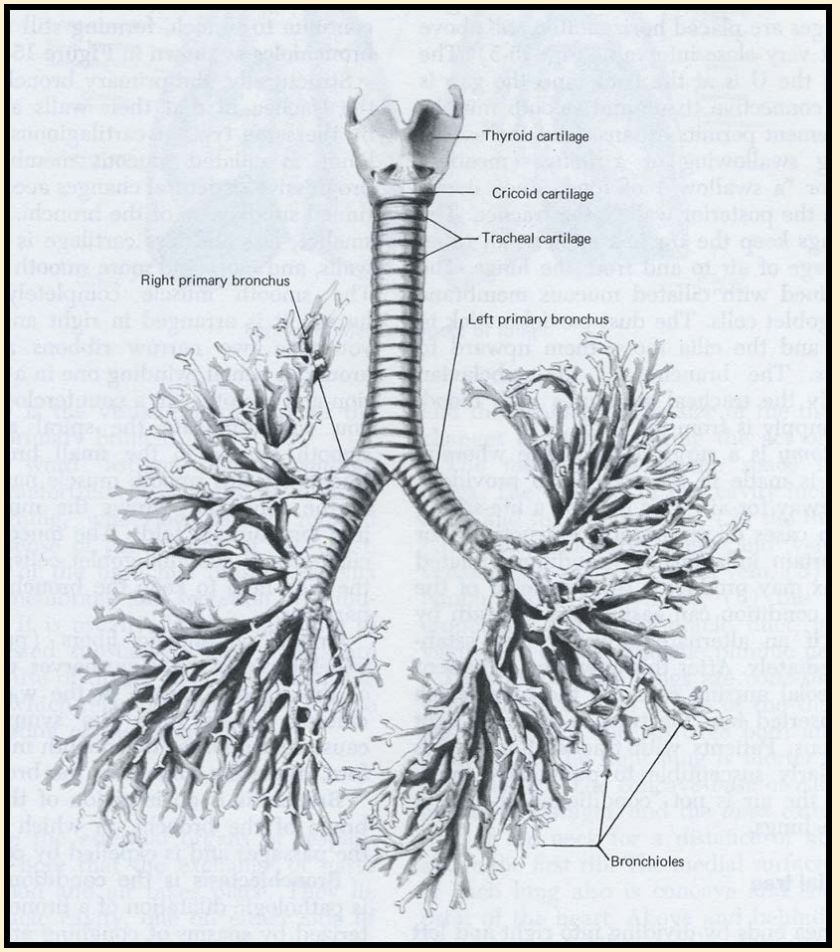
(Good-Better-Best)

No matter how large or how small a task or job you can apply a logical thought process. It's universal!

1. **ELIMINATE:** Simply ELIMINATE the hazard.
2. **PREVENTION:** prevent accident or exposure from occurring.
3. **PROTECTION:** Mitigate or Minimize effects of hazards i.e.
   - Job Rotation
   - Scheduling
   - Personal Protective Equipment (Mitigation) PPE
   - Work Practices, Training
   - Specialized Training

Routes of exposure

Inhalation The most common type of exposure occurs when you breathe a substance into the lungs. The lungs consist of branching airways (called bronchi) with clusters of tiny air sacs (called alveoli) at the ends of the airways. The alveoli absorb oxygen and other chemicals into the bloodstream.



Sometimes a chemical is present in the air as small particles (dust or mist). Some of these particles, depending on their size, may be deposited in the bronchi and/or alveoli. Many of them may be coughed out, but others may stay in the lungs and may cause lung damage. Some particles may dissolve and be absorbed into the blood stream, and have effects elsewhere in the body

Personal Protective Equipment

Particulate Respirators

Combination Respirators

Gas & Vapor Respirators

Routes of exposure

Skin Contact The skin is a protective barrier that helps keep foreign chemicals out of the body. However, some chemicals can easily pass through the skin and enter the bloodstream. If the skin is cut or cracked, chemicals can penetrate through the skin more easily. Also, some caustic substances, like strong acids and alkalis, can chemically burn the skin. Others can irritate the skin. Many chemicals, particularly organic solvents, dissolve the oils in the skin, leaving it dry, cracked, and susceptible to infection and absorption of other chemicals.

Routes of exposure

Eye Contact Some chemicals may burn or irritate the eye. Occasionally they may be absorbed through the eye and enter the bloodstream. The eyes are easily harmed by chemicals, so any eye contact with chemicals should be taken as a serious incident.

Routes of exposure

I**ngestion** The least common source of exposure in the workplace is swallowing chemicals. Chemicals can be ingested if they are left on hands, clothing or beard, or accidentally contaminate food, drinks or cigarettes. Chemicals present in the workplace as dust, for example, metal dusts such as lead or cadmium, are easily ingested

Routes of exposure

Remember: Your front door could be a Route of Entry for bringing contaminants home from work and exposing family members

The GHS Elements

- Classification Criteria
  - Health and Environmental Hazards
  - Physical Hazards
  - Mixtures
- Hazard Communication
  - Labels
  - Safety Data Sheets

Health & Environmental Hazards

- Acute Toxicity
- Skin Corrosion/Irritation
- Serious Eye Damage/Eye Irritation
- Respiratory or Skin Sensitization
- Germ Cell Mutagenicity
- Carcinogenicity
- Reproductive Toxicity
- Target Organ Systemic Toxicity – Single and Repeated Dose
- Hazardous to the Aquatic Environment (Not OSHA)

Physical Hazards

Explosives
Flammability – gases, aerosols, liquids, solids
Oxidizers – liquid, solid, gases
Self-Reactive
Pyrophoric – liquids, solids
Self-Heating
Organic Peroxides
Corrosive to Metals
Gases Under Pressure
Water-Activated Flammable Gases

Comprehensibility

Guiding principles:

- Information should be conveyed in more than one way.
- The comprehensibility of the components of the system should take account of existing studies and evidence gained from testing.
- The phrases used to indicate the degree (severity) of hazard should be consistent across different hazard types.

Key Label Elements

Product identifier

Supplier identifier

Chemical identity

Hazard pictograms*

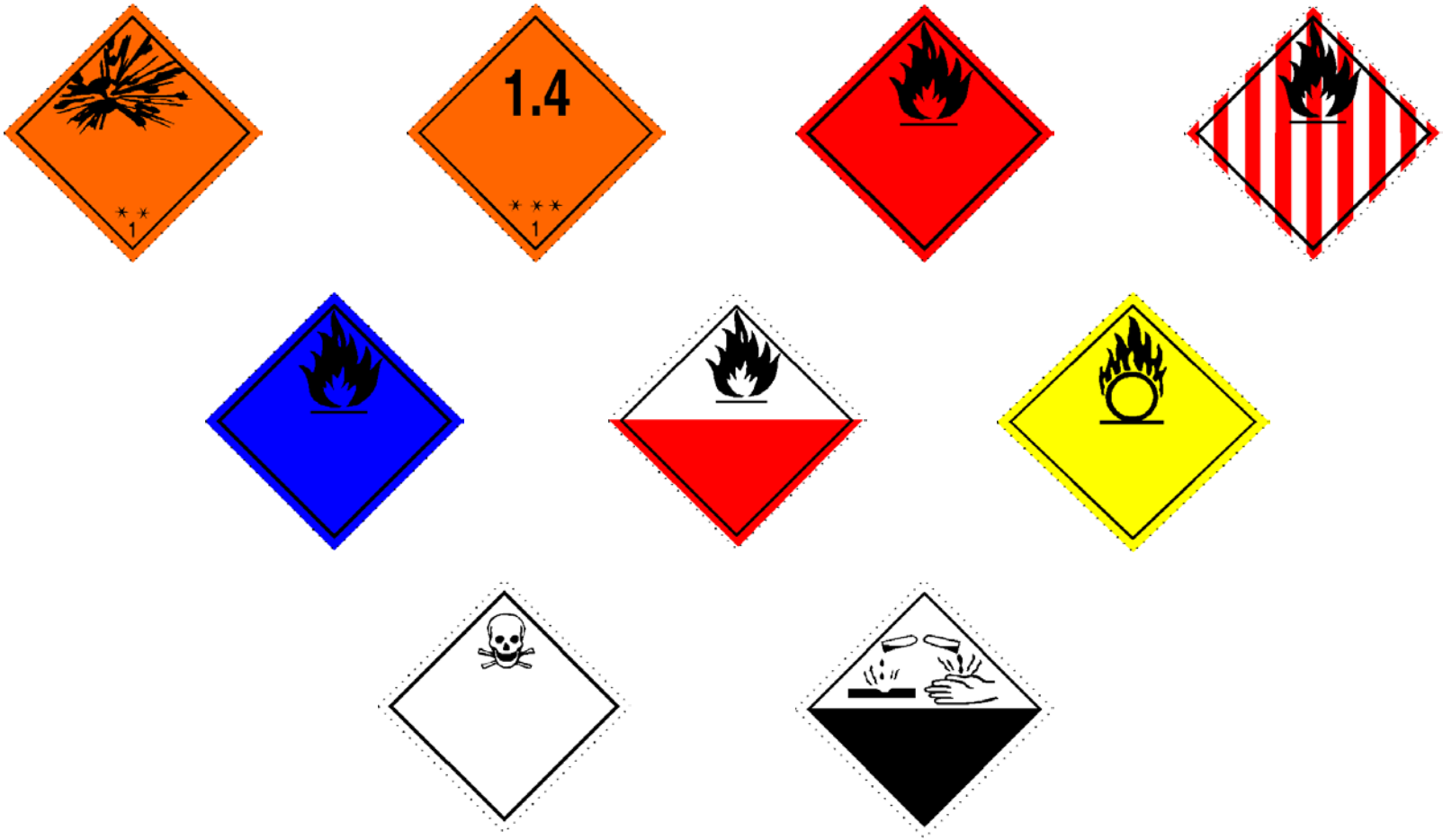
Signal words*

Hazard statements*

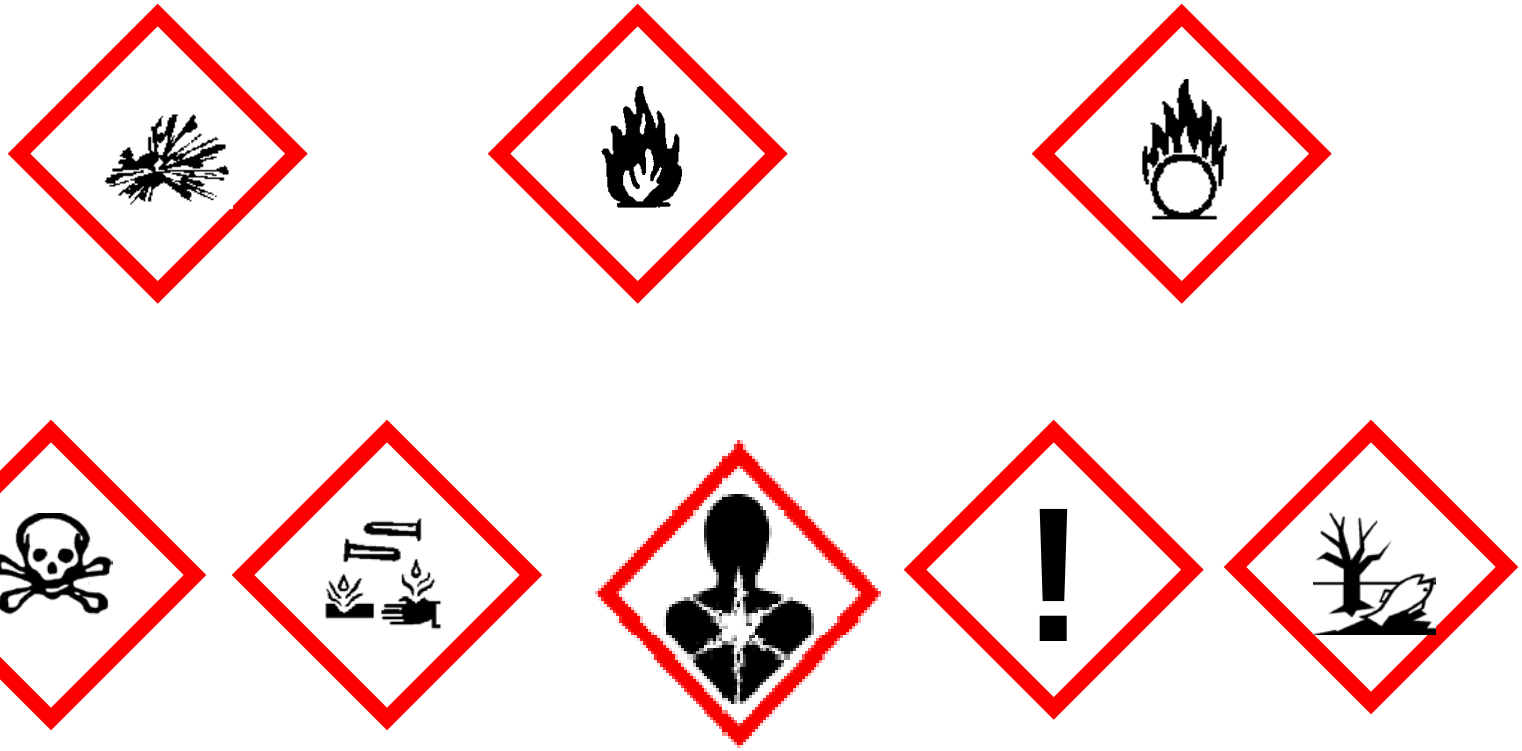
Precautionary information

***Standardized**

Transport Pictograms



GHS Pictograms



Signal Words

“Danger” or **“Warning”**

Used to emphasize hazard and discriminate between levels of hazard.

Hazard Statements

- A single harmonized hazard statement for each level of hazard within each hazard class
  - Example: Flammable liquids
    - Category 1: Extremely flammable liquid and vapour
    - Category 2: Highly flammable liquid and vapour
    - Category 3: Flammable liquid and vapour
    - Category 4: Combustible liquid

Precautionary Information

- GHS label should include appropriate precautionary information.
- The GHS document includes examples of precautionary statements which can be used.
- The intent is to harmonize precautionary statements in the future.

Role of the SDS in the GHS

- The SDS should provide comprehensive information about a chemical substance or mixture.
- Primary Use: The Workplace
- Employers and workers use the SDS as a source of information about hazards and to obtain advice on safety precautions.

SDS Format: 16 headings

1. Identification
2. Hazard(s) identification
3. Composition/information on ingredients
4. First-aid measures
5. Fire-fighting measures
6. Accidental release measures
7. Handling and storage
8. Exposure control/personal protection

Format: 16 headings (cont.)

9. Physical and chemical properties
10. Stability and reactivity
11. Toxicological information
12. Ecological information
13. Disposal considerations
14. Transport information
15. Regulatory information
16. Other information

Key GHS Words

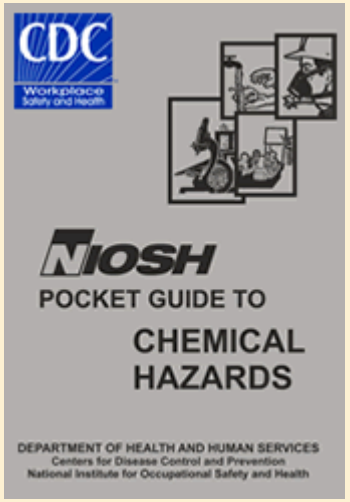
- Pictogram: Symbols comprehensible worldwide
- Signal Words: Also indicates degree of danger but gets user attention
- Hazard Statement: Phrases to summarize product hazards on labels and SDSs

GHS Point Of Use Exemptions

- Pharmaceuticals
- Food Additives
- Cosmetics
- Pesticide Residues in food

Chemical Hazards

- Chemicals can pose a danger for human health and the environment from:
  - Production
  - Handling
  - Storage
  - Transportation
  - Use
  - Disposal



Basic Hazard Categories Under GHS

- Physical, e.g., fire/explosion, corrosion
  - Use standard tests (e.g., FP), Structure Activity Relationships & Expert Judgment
- Health Effects - Chronic & Acute
  - Tox testing, LD_{50}, human data, calculations
- Environmental - Aquatic environment, i.e., Marine pollutants (Not OSHA Regulated)

GHS Categories Based On Severity

5 Categories
- Category 1 = Most Hazardous
- Category 5 = Least Hazardous

Not all Categories are regulated in all modes

GHS Pictograms

Description	Pictogram	Hazard class and hazard category:
Exploding Bomb		Unstable explosives Explosives of Divisions 1.1, 1.2, 1.3, 1.4 Self reactive substances and mixtures, Types A,B Organic peroxides, Types A, B

GHS Pictograms

Description	Pictogram	Hazard class and hazard category:
Flame		Flammable gases, category 1 Flammable aerosols, categories 1,2 Flammable liquids, categories 1,2,3 Flammable solids, categories 1,2 Self-reactive substances and mixtures, Types B,C,D,E,F Pyrophoric liquids, category 1 Pyrophoric solids, category 1 Self-heating substances and mixtures, categories 1,2 Substances and mixtures, which in contact with water, emit flammable gases, categories 1,2,3 Organic peroxides, Types B,C,D,E,F

GHS Pictograms

Description	Pictogram	Hazard class and hazard category:
Flame Over Circle		Oxidizing gases, category 1 Oxidizing liquids, categories 1,2,3

GHS Pictograms

Description	Pictogram	Hazard class and hazard category:
Gas Cylinder		Gases under pressure: - Compressed gases - Liquefied gases - Refrigerated liquefied - gases Dissolved gases

GHS Pictograms

Description	Pictogram	Hazard class and hazard category:
Corrosion		Corrosive to metals, category 1 Skin corrosion, categories 1A,1B,1C Serious eye damage, category 1

GHS Pictograms

Description	Pictogram	Hazard class and hazard category:
Skull and Crossbones		Acute toxicity (oral, dermal, inhalation), categories 1,2,3

GHS Pictograms

Description	Pictogram	Hazard class and hazard category:
Exclamation Mark		Acute toxicity (oral, dermal, inhalation), category 4 Skin irritation, category 2 Eye irritation, category 2 Skin sensitization, category 1 Specific Target Organ Toxicity – Single exposure, category 3

GHS Pictograms

Description	Pictogram	Hazard class and hazard category:
Health Hazard		Respiratory sensitization, category 1 Germ cell mutagenicity, categories 1A,1B,2 Carcinogenicity, categories 1A,1B,2 Reproductive toxicity, categories 1A,1B,2 Specific Target Organ Toxicity – Single exposure, categories 1,2 Specific Target Organ Toxicity – Repeated exposure, categories 1,2 Aspiration Hazard, category 1

Six Elements Of The GHS Label

- Product Identifier
- Supplier Identification
- Chemical Identification
- Hazard Pictograms
- Signal Words
- Hazard Statements describing nature of hazards

GHS Label For Acetone

Acetone

DANGER
Highly flammable liquid and vapor.
Causes severe eye irritation.
Keep away from heat, sparks and flame – No smoking.
Take precautionary measures against static discharge.
Keep from direct sunlight.
Keep container closed when not in use.
Store in a cool/low temperature, well-ventilated place away from heat and ignition sources.

Use only in a well-ventilated area.
Avoid contact with eyes, skin and clothing.
Wear appropriate personal protective equipment, avoid direct contact.
Flush eyes with water for at least 15 minutes while holding eyelids open.

Company Name
Street Address, City, State/Province, Country
Telephone: (Country Code)-###-####

GHS Label For Epichlorohydrin

Top Half Of Label

Epichlohydrin
1-Chloro-2,3-epoxypropane
CAS No. 106-89-8
UN No. 2023

Hazard

Hazard statements:

- **Toxic if swallowed**
- **Toxic in contact with skin**
- **Fatal if inhaled**
- **May cause an allergic skin reaction.**
- **May cause genetic defects.**
- **May cause cancer**
- **Cause severe skin burns and eye damage**
- **Cause serious eye irritation**
- **Toxic to aquatic life**

GHS Label For Epichlorohydrin

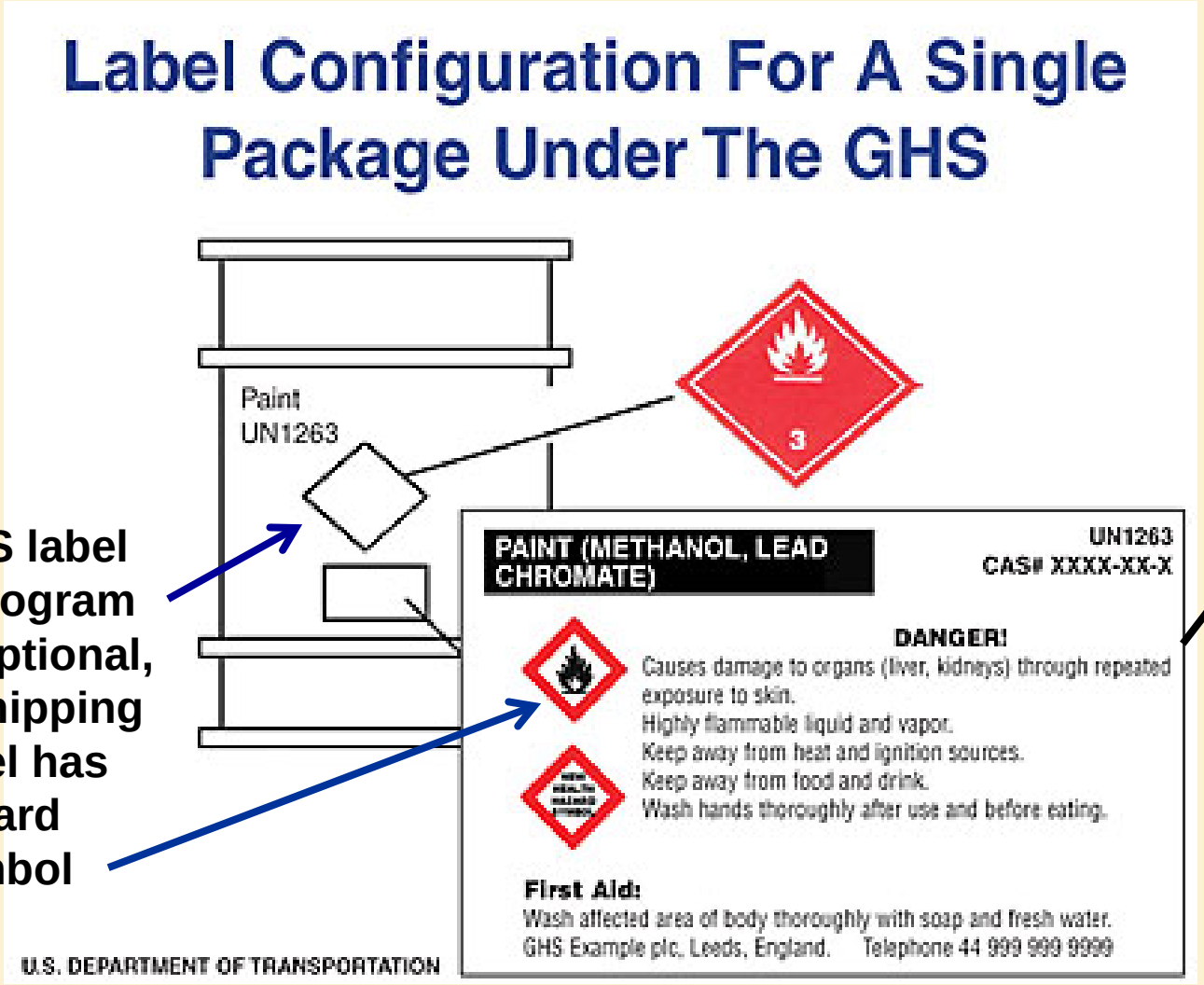
Bottom Half Of Label

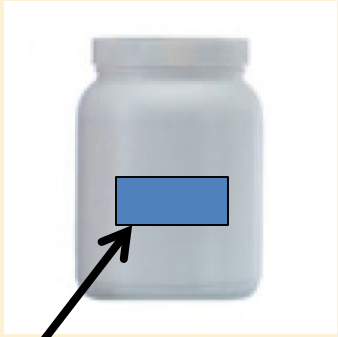
Precautionary statements:

- **Keep out of reach of children.**
- **Keep container tightly closed.**
- **Do not handle until all safety precautions have been read and understood.**
- **Wear eye/face protection.**
- **Wear protective gloves/clothing.**
- **Wear respiratory protection, as specified by the manufacturer.**
- **Do not breathe dust/fume/gas/mist/vapors/spray.**
- **Use appropriate ventilation.**
- **Wash thoroughly after handling.**

United Nations Co., Ltd.
1-1, Peace Avenue
Geneva, Switzerland
Tel. 41 22 917 00 00 **Fax. 41 22 917 00 00**

GHS Label Placement

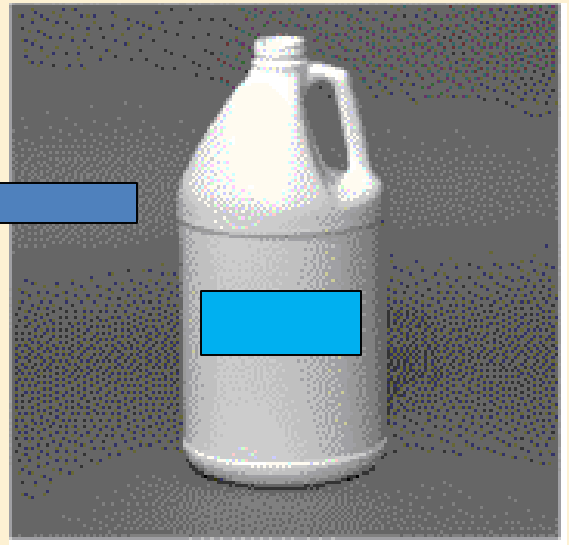




GHS label Pictogram is optional, if shipping label has hazard symbol

GHS Label Placement For Combination Packages

Put 6 Units in box



No GHS Label on Outer Package if Danger is noted by diamond label(s)

GHS Single Package Label

Safety Data Sheets

Safety Data Sheets Under GHS

Section 1. Identification
Section 2. Hazard(s) classification & labeling statements
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

Safety Data Sheets Under GHS

Section 9. Phys and Chem Properties/Measurements

Section 10. Stability & reactivity (Heat, water, incompatibles)

Section 11. Toxicological information (Health info)

Section 12. Ecological information (Environ effects)

Section 13. Disposal considerations

Section 14. Transport info (49CFR, Can DGR...)

Section 15. Regulatory info (CA Prop 65, NJRTK…)

Section 16. Other info (Preparer, Contact #, Date…)