

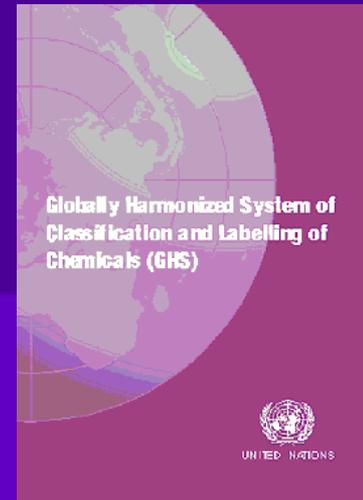
GHS: The New Hazard Communication: What you need to know and how to prepare

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Overview

- What is the GHS
- What are the hazards covered by the GHS
- How this will change MSDS and labels
- The proposed revision to the OSHA Standard
- How this will change your Hazcom program
- What happens next
- What can you do now to prepare

GHS



- The GHS is an internationally developed system for
 - Classification of chemicals
 - Hazard Communication for chemicals
 - Labelling of chemicals
 - Safety Data Sheets
- OSHA was involved in the development of the GHS and is currently involved in the maintenance of the GHS

GHS History

- 1989 - ILO Convention on Safety in the Use of Chemicals at Work
- 1992 Rio "Earth Summit" established 6 program areas on sound management of chemicals - including harmonization of classification and labelling of chemicals
- IOMC (Interorganization Programme for the Sound Management of Chemicals) - Coordinating Group for the Harmonization of Chemical Classification Systems led effort Technical Work
 - Physical Hazards - UN Experts on TDG
 - Health/Environmental Hazards - OECD
 - Hazard Communication - ILO
- Adopted December 2002, Rev 1 2005, Rev 2 2007, Rev 3 2009 - "Purple Book" available – English, French, Spanish, Arabic, Russian and Chinese

Similarity to Other Systems

- Physical Hazards similar to transport hazards
- Health hazards similar to current OSHA but more detailed with far more detailed criteria
- Environmental hazards similar to EU and IMDG Code

GHS Physical Hazards

- Explosives
- Flammable gases
- Flammable aerosols
- Oxidizing gases
- Gases under pressure
- Flammable liquids
- Flammable solids
- Self-reactive substances and mixtures
- Pyrophoric liquids

GHS Physical Hazards

- Pyrophoric solids
- Self-heating substances and mixtures
- Substances and mixtures which in contact with water, emit flammable gases
- Oxidising liquids
- Oxidizing solids
- Organic peroxides
- Corrosive to metals

GHS Health Hazards

- Acute toxicity
 - Poisons that cause serious, immediate effects via inhalation, ingestion or dermal contact at fairly low doses
- Skin corrosion/irritation
 - (irreversible/reversible effects)
- Serious eye damage/eye irritation
 - (irreversible/reversible effects)
- Respiratory or skin sensitization
- Germ cell mutagenicity
 - Cause heritable mutations in germ cells

GHS Health Hazards

- Carcinogenicity
- Reproductive toxicity
 - Effects on fertility, development of offspring, effects on or via lactation
- Specific target organ toxicity
 - Single and repeated exposure
- Aspiration hazard
 - Low viscosity hydrocarbons that cause lung damage when ingested

GHS Environmental Hazards

- Aquatic Toxicity
 - Acute aquatic toxicity
 - Chronic aquatic toxicity
- Hazardous to the Ozone Layer

How does the GHS Work

- Collect and Review Data on Intrinsic Hazards
- Classify Hazards of Chemicals
 - Assign hazard classes and categories
- Based on classification, select standardized label elements
- Create labels
- Add classification and labeling to SDS

Hazard Classification

- Data on the chemical is compared to criteria in the GHS
- All hazard classes must be considered
- Hazard classes have categories that reflect the degree of hazard
- Chemicals can have multiple hazard classes/categories
- Generally categories = transport packing groups

Criteria for Flammable Liquids

| Category | Criteria |
|----------|--|
| 1 | Flash point $< 23^{\circ}\text{C}$ and initial boiling point $\leq 35^{\circ}\text{C}$ |
| 2 | Flash point $< 23^{\circ}\text{C}$ and initial boiling point $> 35^{\circ}\text{C}$ |
| 3 | Flash point $\geq 23^{\circ}\text{C}$ and $\leq 60^{\circ}\text{C}$ |
| 4 | Flash point $> 60^{\circ}\text{C}$ and $\leq 93^{\circ}\text{C}$ |

Criteria for Acute Toxicity

| Acute toxicity | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4 | Cat. 5 |
|-----------------------|--------|--------|--------|--------|---|
| Oral (mg/kg) | ≤5 | ≤50 | ≤300 | ≤2000 | Criteria: - ≤5000 - - ≤5000 - Anticipated significant effects in human - Any mortality at class 4 - Significant clinical signs at class 4 - Indications from other studies |
| Dermal (mg/kg) | ≤50 | ≤200 | ≤1000 | ≤2000 | |
| Gases (ppm) | ≤100 | ≤500 | ≤2500 | ≤20000 | |
| Vapours (mg/l) | ≤0,5 | ≤2,0 | ≤10 | ≤20 | |
| Dust and mists (mg/l) | ≤0,05 | ≤0,5 | ≤1,0 | ≤5 | |
| | | | | | |

Criteria for Carcinogens

- Category 1: Known or Presumed Human Carcinogen
 - Category 1A: Known to have carcinogenic potential for humans, largely based on human evidence
 - Category 1B: Presumed to have carcinogenic potential for humans, largely based on animal evidence
- Category 2: Suspected human carcinogens (based on human or animal evidence but less convincing)

Mixture Classification

- Classify based on data for the mixture as a whole (generally all physical hazards)
- Follow bridging principles (dilution, batching, concentration, interpolation, substantially similar mixtures, aerosols)
- Use additivity formulas (only certain hazard classes)
- Cut-off values – hazard class specific

Acute Toxicity - Mixture Calculation

$$\frac{100}{ATE_{mix}} = \sum_{n=i} \frac{C_i}{ATE_i}$$

Where

- C_i = concentration of ingredient i
- ATE_i = Acute Toxicity Estimate of ingredient i
- ATE_{mix} = Acute Toxicity Estimate of mixture
- n ingredients in the mixture and i runs from 1 to n

Formula adjusted if >10% unknown toxicity

Skin Corrosion/Irritation – Mixtures

Additivity

| Sum of ingredients classified as: | Concentration triggering classification of a mixture as: | | |
|--|--|---------------|----------------|
| | Skin | | |
| | Corrosive | Irritant | |
| | Category 1 | Category 2 | Category 3 |
| Skin Category 1 | ≥ 5% | ≥ 1% but < 5% | |
| Skin Category 2 | | ≥ 10% | ≥ 1% but < 10% |
| Skin Category 3 | | | ≥ 10% |
| (10 x Skin Category 1) + Skin Category 2 | | ≥ 10% | ≥ 1% but < 10% |
| (10 x Skin Category 1) + Skin Category 2 + Skin Category 3 | | | ≥ 10% |

Signal Word

- A word used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label. The signal words used in this section are "danger" and "warning." "Danger" is used for the more severe hazards, while "warning" is used for the less severe.

Pictogram

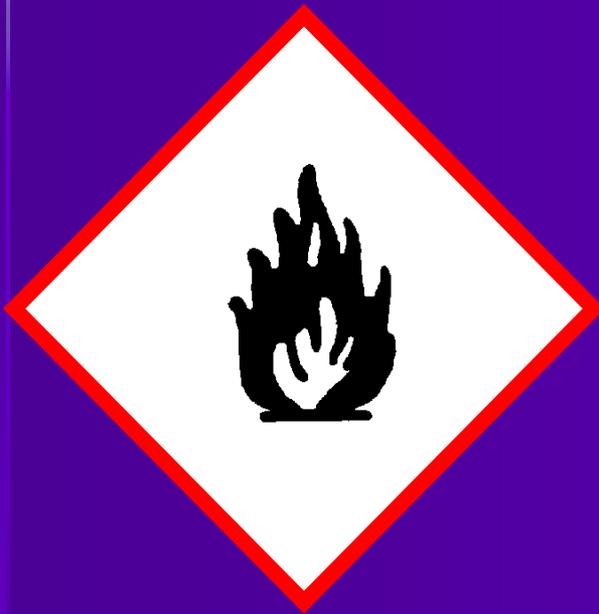
- A composition that may include a symbol plus other graphic elements such as a border, background pattern, or color, that is intended to convey specific information about the hazards of a chemical.
- Nine pictograms are designated under the GHS
- Red border, black symbol, white background

Exploding Bomb Pictogram



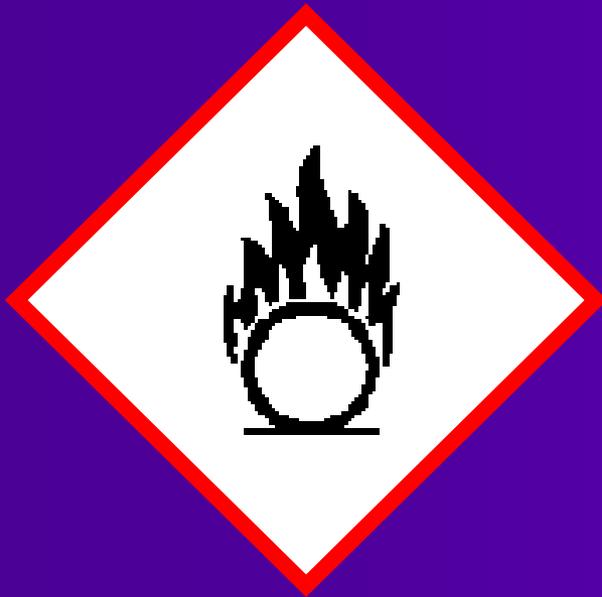
- Unstable Explosives
- Explosives (Divisions 1.1-1.4)
- Self-reactives (Type A and Type B with Flame)
- Organic Peroxides (Type A and Type B with Flame)

Flame Pictogram



- Flammable Gases
- Flammable Aerosols
- Flammable Liquids (Categories 1-3)
- Flammable Solids
- Self-Reactives (Type B with bomb, Types C-F)
- Pyrophoric liquids and solids
- Self-heating substances
- Substances which in contact with water emit flammable gases
- Organic Peroxides (Type B with bomb, Types C-F)

Flame over Circle Pictogram



- Oxidizing Gases
- Oxidizing Liquids
- Oxidizing Solids

Gas Cylinder Pictogram



- Compressed Gas
- Liquefied Gas
- Refrigerated Liquefied Gas
- Dissolved Gas

Corrosion Pictogram



- Corrosive to Metals (steel or aluminum >6.25 mm/year at 55C)
- Skin corrosion/ irritation – Category 1 (A, B and C)
- Serious eye damage/ irritation – Category 1

Skull and Crossbones Pictogram



- Acute Toxicity –
Categories 1-3 (oral,
inhalation or dermal
routes)

Exclamation Mark Pictogram



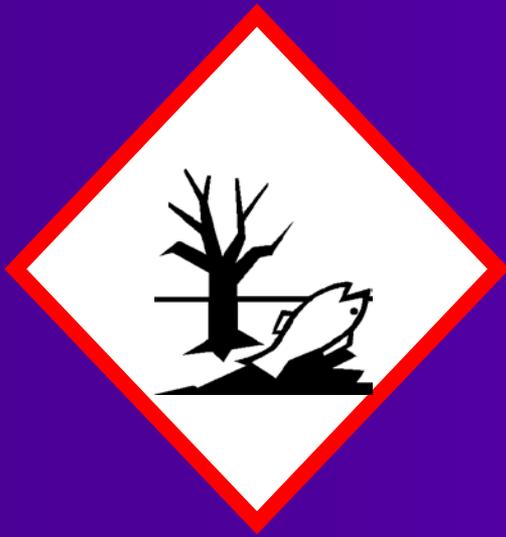
- Acute Toxicity – Category 4 (oral, inhalation or dermal routes)
- Skin Irritation/ Corrosion – Category 2
- Serious Eye damage/ irritation – Category 2A
- Skin Sensitizer
- STOST (single exposure) – Category 3 (respiratory tract irritation, narcotic effects)

Health Hazard Pictogram



- Respiratory Sensitizer
- Germ Cell Mutagenicity
- Carcinogenicity
- Toxic to Reproduction
- STOST (single exposure) –
Categories 1-2
- STOST (repeated exposure)
– Categories 1-2
- Aspiration Hazard

Environment Pictogram



- Acute hazards to the aquatic environment – Category 1 (Categories 2 and 3 no pictogram or signal word)
- Chronic hazards to the aquatic environment – Categories 1 and 2 (Categories 3 and 4 no pictogram or signal word)

Hazard and Precautionary Statements

- Hazard statement for each level of hazard (category) 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 Statements are selected from tables, based on the classification.

Label Elements Flammable Liquids

| Hazard Category | Signal Word | Hazard Statement | Pictogram |
|-----------------|-------------|--------------------------------------|---|
| 1 | Danger | Extremely flammable liquid and vapor |  |
| 2 | Danger | Highly flammable liquid and vapor | |
| 3 | Warning | Flammable liquid and vapor | |

| Prevention | Response | Storage | Disposal |
|--|--|--|--|
| <p>Keep away from heat/ sparks/open flames/ hot surfaces. – No smoking</p> <p>Keep containers tightly closed.</p> <p>Ground/Bond container and receiving equipment.</p> <p>Use explosion-proof electrical/ ventilating / lighting/.../equipment.</p> <p>Use only non-sparking tools.</p> <p>Take precautionary measures against static discharge.</p> <p>Wear protective gloves/ eye protection/ face protection</p> | <p>If on skin (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/shower.</p> <p>In case of fire: Use ... for extinction.</p> | <p>Store in a well-ventilated place. Keep cool</p> | <p>Dispose of contents/container to...</p> <p><i>... in accordance with local/ regional/ national/ international regulations (to be specified)</i></p> |

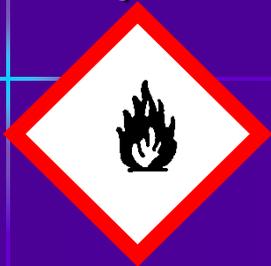
Label Elements Carcinogenicity

| Hazard Category | Signal Word | Hazard Statement | Pictogram |
|-----------------|-------------|-----------------------------|---|
| 1A and 1B | Danger | May cause cancer |  |
| 2 | Warning | Suspected of causing cancer | |

| Prevention | Response | Storage | Disposal |
|---|--|------------------------|--|
| <p>Obtain special instructions before use</p> <p>Do not handle until all safety precautions have been read and understood</p> <p>Use personal protective equipment as required.</p> | <p>If exposed or concerned: Get medical advice/attention</p> | <p>Store locked up</p> | <p>Dispose of contents/container to...</p> <p><i>... in accordance with local/ regional/ national/ international regulations (to be specified)</i></p> |

GHS Label Example

2-Methyl Flammaline



Danger
Highly Flammable Liquid and Vapor
May cause cancer

Keep away from heat/, sparks, open flames and hot surfaces. – No smoking
Keep containers tightly closed.
Ground container and receiving equipment.
Use explosion-proof electrical equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Wear protective gloves and eye protection.
Use other personal protective equipment as required.
If on skin (or hair): Remove immediately all contaminated clothing. Rinse skin with water/shower.
If exposed or concerned: Get medical advice.
In case of fire: Use water fog, foam or dry chemical for extinction.
Store in a well-ventilated place. Keep cool
Dispose of contents to hazardous waste in accordance with all local, state and national regulations

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GHS Safety Data Sheet

- GHS incorporates a standard 16 section SDS
- Same as ANSI Z400.1
- GHS Classification detailed in Section 2
- All GHS labeling appears in Section 2 of the SDS

16 Section 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
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

Proposed Hazcom Standard

- Published September 30, 2009
- Conform to the Globally Harmonized System for the Classification and Labelling of Chemicals (GHS) Rev 3
- Changes to
 - Classification
 - Label Content
 - Safety Data Sheet Content (mandatory 16 section SDS, % required)
- No Changes to
 - Scope and Exemptions
 - Written Hazcom Program
 - Labeling requirement
 - MSDS Distribution and Availability in the Workplace
 - Employee Information and Training (other than training on new labels and MSDS within 2 years)
 - Trade Secrets (except to include percentage)

OSHA's Approach

- Maintain the basic requirements of the current Standard
 - Only change those provisions that need to be changed to adopt the GHS
- Maintain or enhance the level of protection provided by the HCS
 - Scope of chemicals, hazards, information availability and workplace requirements

Format of the Standard

- (a) Purpose
- (b) Scope and Application
- (c) Definitions
- (d) Hazard Classification
- (e) Written Hazard Communication Program
- (f) Labels and Other Forms of Warning
- (g) Safety Data Sheets
- (h) Employee Information and Training
- (i) Trade Secrets
- (j) Effective Dates
- Appendix A, Health Hazard Criteria (Mandatory)
- Appendix B, Physical Hazard Criteria (Mandatory)
- Appendix C, Allocation of Label Elements (Mandatory)
- Appendix D, Safety Data Sheets (Mandatory)
- Appendix E, Definition of "Trade Secret" (Mandatory)
- Appendix F, Guidance for Hazard Classifications re: Carcinogenicity (Non-Mandatory)

Scope and Application (b)

- No change except for reference to Appendix E which is removed
- Still applies to all chemicals known to be present in the workplace in such a manner that employees may be exposed to them under normal conditions of use or in a foreseeable emergency.
- All labeling and full exemptions retained
- Laboratory and warehouse coverage remains unchanged (b)(3) and (b)(4)

Labeling exemptions (b)(5)

- Pesticides
- TSCA regulated chemicals
- Food, food additives, color additives, drugs, cosmetics, medical/veterinary devices
Alcoholic beverages
- Consumer products when labeled in accordance with CPSC
- Seeds treated with pesticides if labeled under USDA

Full Exemptions (b)(6)

- Hazardous Waste
- Hazardous substances at a CERCLA remediation site
- Tobacco
- Wood and wood products which will not be processed and only present a fire hazard
- Articles
- Food and alcoholic beverages sold, used or prepared in retail establishments or intended for personal consumption

Full Exemptions (b)(6)

- Drugs, in solid, final form for direct administration to patient, or packaged for sale, or for consumption by employees
- Cosmetics packaged for sale or for use by employees
- Consumer products if used only in consumer manner
- Nuisance particulates
- Radiation (ionizing and non-ionizing)
- Biological hazards

Definitions (c)

- All physical hazard definitions removed – now in Appendix B
- Definitions for flashpoint, hazard warning, identity, material safety data sheets deleted
- Some definitions are revised to be GHS-consistent: chemical; chemical name; hazardous chemical; health hazard; label; mixture; and physical hazard
- New definitions for: classification; hazard category; hazard class; hazard statement; label elements; pictogram; precautionary statement; product identifier; safety data sheet; signal word; substance; and unclassified hazards

Hazard Classification

- New Definition

- “Classification” means to identify the relevant data regarding the hazards of a chemical; review those data to ascertain the hazards associated with the chemical; and decide whether the chemical will be classified as hazardous, and the degree of hazard where appropriate, by comparing the data with the criteria for health and physical hazards.

Unclassified Hazard

- New Definition

Unclassified hazard means a chemical for which there is scientific evidence identified during the classification process that it may pose an adverse physical or health effect when present in a workplace under normal conditions of use or in a foreseeable emergency, but the evidence does not currently meet the specified criteria for physical or health hazard classification in this section. This does not include adverse physical and health effects for which there is a hazard class addressed in this section.

Hazard Classification (d)

- Introduces the concept of classification based on detailed criteria that appears in Appendix A and B.
- Mixture rules vary for the different hazard classes – no more 1% rule
- No “floor” of hazardous chemicals as in the current standard – no reference to NTP or IARC for carcinogenicity

Hazard Classes Proposed

- OSHA has proposed to adopt:
 - All physical hazard classes and categories
 - All health hazard classes but does not adopt the following categories
 - Acute toxicity category 5
 - Skin corrosion category 3
 - Eye irritation category 2B
 - Aspiration category 2
- OSHA will not adopt environmental hazards (has no jurisdiction)

Hazard Criteria, Class and Category

- Appendix A – Health Hazard Criteria
- Appendix B – Physical Hazard Criteria
- Hazard Class – the nature of the physical or health hazard
- Hazard Category – the division of the criteria within each hazard class. Categories compare hazard severity within the class.

Written Hazard Communication Programs (e)

- No changes to the requirements
- Employers need to assure that the program is current and reflects the revised requirements
 - Will workplace labeling change?
 - Does your program include reference to hazard definitions that may need to be updated?
 - Change MSDS references to SDS
 - Update the list of hazardous chemicals as needed based on revised SDS received

Labeling (f)

- The requirement for labeling unchanged
- Label content changed – based on
 - Hazard classification
 - Refer to Appendix C for the specific requirements

Proposed Label Content Shipped Containers

- Product Identifier
 - Ingredients not required but are part of GHS label
- Signal Word (Danger or Warning)
- Hazard Statements (harmonized)
- Pictograms
- Precautionary Statements (harmonized)
- Name, address and telephone number of the chemical manufacturer, importer or other responsible party
- Information on unclassified hazards if applicable
- Unknown acute toxicity statement if applicable

Proposed Label Content in the Workplace

- Product Identifier
- Signal Word (Danger or Warning)
- Hazard Statements (harmonized)
- Pictograms
- Precautionary Statements (harmonized)
- or
- Product identifier and words, pictures, symbols, or combination thereof, which provide at least general information regarding the hazards of the chemicals, and which, in conjunction with the other information immediately available to employees under the hazard communication program, will provide employees with the specific information regarding the physical and health hazards of the hazardous chemical.

Workplace Labeling

Will you continue to use HMIS or NFPA?

While the Hazard Category number does not appear on the label, consider:

| Hazard | | HMIS/NFPA | |
|-----------------|---------------|--------------|---------------|
| <u>Category</u> | <u>Hazard</u> | <u>Index</u> | <u>Hazard</u> |
| 1 | highest | 1 | slight |
| 2 | high | 2 | moderate |
| 3 | medium | 3 | serious |
| 4 | low | 4 | severe |

Safety Data Sheets (SDS) (g)

- Mandates 16 Section headings and information required in each section.
- Will not enforce sections 12-15 that require information outside OSHA's jurisdiction
- Section 2 includes
 - Classification of the chemical
 - Signal word, hazard statements, symbols and precautionary statements (hazard symbols may be graphics or name of symbol)
 - Unclassified hazards
- Section 3 requires chemicals name and percentage (range) for ingredients of mixtures that are classified as health hazards

Effective Dates

- OSHA is proposing that workers be trained in two years after the final rule.
 - An explanation of the labels received on shipped containers
 - The safety data sheet, including the order of information
- All other provisions effective in three years
 - No difference in compliance dates for substances and mixtures
- During the three year period, compliance with either the current or the new final rule will be permitted

What Should You Do To Prepare

Hazard Changes

- Read and understand the new hazard classifications
 - Hazard classification in SDS Section 2

| SECTION 2 HAZARDS IDENTIFICATION | | |
|---|--------------------------------------|----------------------------|
| GHS Classification: | | |
| Health | Environmental | Physical |
| Eye Corrosion/Irritation- Category 1 Skin Corrosion/Irritation – Category 1B Acute Toxicity (Oral) – Category 4 | Acute aquatic toxicity Category 3 | Oxidizing Solid Category 2 |

- Review updated SDS for changes in hazards
- Assess workplace controls in light of new classifications

Hazcom Program

- Review and update your hazcom program
- Review and modify your in-plant labeling if needed
- Keep your list of hazardous chemicals up to date

Secondary Labeling

- Use of NFPA ratings may create confusion
- Consider using pictograms and signal word for secondary containers



Employee Information and Training

- New Labels
 - Signal Word significance
 - Meaning of Pictograms
 - How hazard statements indicate the severity of hazard in that hazard class
 - Standardization of hazard and precautionary statements
- SDS
 - New format
 - New content in Section 2 (hazard classification and labeling information)
- Hazards
 - Some hazard classes may be less familiar, for example, germ cell mutagenicity and effects on or via lactation

Specific Implementation Ideas

Develop Website for GHS

- Target to Management, HSE professionals and employees
- Include a description of the GHS
 - What is it?
 - What does this mean to me?
 - When will this happen?
 - What are the new GHS labeling elements?
 - How can I learn more and prepare my site for these changes

Post Useful Resources

- GHS Training Guide
- Lists of GHS
H and P Phrases
- GHS Wallet Card
- GHS Symbol Poster
- FAQ

| Physical | | | | |
|--|--|--|---|--|
|  |  |  |  |  |
| Flammable Self Reactives Pyrophorics Self-Heating Emits Flammable Gas Organic Peroxides | Oxidizers | Explosives (Divisions 1.1 to 1.4 only) Self Reactives Organic Peroxides | Corrosive to Metals | Gas Under Pressure |
|  |  |  |  |  |
| Aquatic Toxicity (acute) Aquatic Toxicity (chronic) | Skin Corrosion Irritation Eye Damage/ Serious Eye | Dermal Sensitizer Acute Toxicity (harmful) | Acute Toxicity (severe) Respiratory/Sensitizer Reproductive Toxicity Target Organ Toxicity Aspiration Toxicity | Carcinogen Mutagenicity (severe) |
| Environmental | Health | | | |

Other Website Ideas

- Include links to GHS Resources
- Include email link to GHS internal expert for questions
- Compile and Post internal FAQ
- Internal GHS Blog

Training Options

- Consider various methods
 - Live, instructor based
 - Video (DVD)
 - Computer or Web-based (may be most effective)
- Incorporate into other routine training (hatmat, haz waste, safety meetings)
- Consider time requirements and employee availability
- Pre-test/Post-test needs
- Begin soon – GHS labels and SDS are already here

For More Information

Information

- The GHS

- http://live.unece.org/trans/danger/publi/ghs/ghs_rev03/03files_e.html

- Proposed HCS Standard

- http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=FEDERAL_REGISTER&p_id=21110

- Side by Side Comparison – Current Standard – Proposed Standard

- http://www.osha.gov/dsg/hazcom/hcs_side_by_side_draft_100109.pdf

- OSHA GHS Information

- <http://www.osha.gov/dsg/hazcom/global.html>

Thank You

Feel free to contact me with your questions

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