The OSHA GHS Update of 2012

By Steven W. Ernst
15Mar2012
The Globally Harmonized System (GHS) is a hazard communication system which provides the criteria to classify chemical substances and mixtures according to their health, physical, and environmental hazards and then effectively communicate these hazards to the people who may be effected by these hazards.

**The Purpose of GHS is to:**

1) Improve human and environmental safety.
2) Give a common framework for chemical safety in all countries.
3) Improve international trade.
4) Reduce testing burdens.
GHS History

• In 1992 the United Nations Conference on the Environment and Development (UNCED) (Earth Summit), established the goal to strengthen national and international efforts related to the environmentally sound management of chemicals, including the Harmonization of classification and labeling of chemicals.

• The UN Sub-Committee of Experts on the Transport of Dangerous Goods (UNSCETDG), the Organization for Economic Co-operation and Development (OECD,) and International Labor Organization (ILO) were tasked with looking at the worlds “Major” haz-com. systems and consolidating them into the new system where possible. (OSHA, EPA, WHMIS, EU-Directives, and UN-TDG)

• The UN formally adopted these recommendations into the GHS in December 2002.

• The first revised edition of the GHS was adopted in December 2004 and published in 2005.

• The second revised edition of the GHS was adopted in December 2006 and published in 2007.

• The third revised edition of the GHS was adopted in December of 2008 and published in 2009.
GHS History

• September 30, 2009 - OSHA published the Notice of Proposed Rule Making (NPRM) for adoption of GHS.
• September 30 2009 – December 29, 2009 – OSHA allows for a 90 day comment period on NPRM
• March 2, 2010-June 1, 2010 – Public hearings and post-hearing comment period.
• October 25, 2011 – Final Rule sent to Office of Management and Budget

OMB concluded that OSHA’s revised HCS was “Consistent with Change,” indicating that OMB agrees with the intent of the rule, but may require some “substantive” revision by OSHA before promulgation.
GHS Development Timeline

- **1992**: UN Earth Summit Proposed Harmonized Classification and Labeling
  - Jul 1992

- **1995**: UN Adopts Technical Review as GHS
  - Dec 2002

- **1998**: UN Publishes First GHS
  - Dec 2005

- **2001**: OSHA Sends NPRM to OSHA
  - Oct 2011

- **2004**: UN Publishes Third GHS
  - Dec 2009

- **2007**: OSHA Publishes Second GHS
  - Sep 2009

- **2010**: UN Publishes Fourth GHS
  - Feb 2012

- **2012**: 5th Edition GHS Is In Progress!!

5th Edition GHS is In Progress!!
“While the existing laws and regulations are similar, they are different enough to require multiple labels for the same product both within the U.S. and in international trade and to require multiple safety data sheets for the same product in international trade. Several U.S. regulatory agencies and various countries have different requirements for hazard definitions as well as for information to be included on labels or material safety data sheets.”

- A Guide to The Globally Harmonized System of Classification and Labeling of Chemicals (GHS), OSHA website

Example: Flammability vs. Combustibility End Points

<table>
<thead>
<tr>
<th>°F</th>
<th>20°</th>
<th>40°</th>
<th>60°</th>
<th>80°</th>
<th>100°</th>
<th>120°</th>
<th>140°</th>
<th>&gt;200°</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSHA HCS</td>
<td>Flammable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Combustable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OSHA/NFPA</td>
<td>Flammable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Combustable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EU</td>
<td>Extremely/Highly/Flammable</td>
<td></td>
<td></td>
<td></td>
<td>131°F</td>
<td>Combustable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WHMIS</td>
<td>Division 2 Flammable</td>
<td></td>
<td></td>
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<td></td>
<td>Division 3 Combustable</td>
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<td></td>
</tr>
<tr>
<td>DOT</td>
<td>Flammable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Combustable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPSC</td>
<td>Flammable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Combustable</td>
<td>150°F</td>
<td></td>
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<tr>
<td>ANSI Z129.1</td>
<td>Extremely Flammable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Combustable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GHS</td>
<td>Flammable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Combustable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Why Did OSHA Implement GHS?

Table VII-1

Net Benefits

The point estimates below do not reflect the uncertainties described throughout the analysis. While OSHA is reluctant to provide quantified ranges, OSHA recognizes that these estimates are uncertain and invites comments on the estimates. OSHA provides a Sensitivity Analysis on these estimates in the final section of the PEA.

<table>
<thead>
<tr>
<th>Annualized Costs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Reclassification of Chemical Hazards and</td>
<td>$11 million</td>
</tr>
<tr>
<td>Revision of SDSs and Labels</td>
<td></td>
</tr>
<tr>
<td>Employee Training</td>
<td>$44 million</td>
</tr>
<tr>
<td>Management Familiarization and Other Costs</td>
<td>$42 million</td>
</tr>
<tr>
<td><strong>Total Annualized Costs:</strong></td>
<td><strong>$97 million</strong></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Annual Benefits</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Non-lost-workday Injuries and Illnesses Prevented</td>
<td>318 (159-1,590)</td>
</tr>
<tr>
<td>Number of Lost Workday Injuries and Illnesses Prevented</td>
<td>203 (101-1,015)</td>
</tr>
<tr>
<td>Number of Chronic Injuries Prevented</td>
<td>64 (32-302)</td>
</tr>
<tr>
<td>Number of Fatalities Prevented</td>
<td>43 (22-215)</td>
</tr>
<tr>
<td>Monetized Benefits of Reduction in Safety and Health Risks</td>
<td>$266 ($133-$1,318) million</td>
</tr>
<tr>
<td>Cost Reductions and Productivity Gains</td>
<td>$585 million</td>
</tr>
<tr>
<td>Reductions in non-tariff trade barriers</td>
<td>unquantified</td>
</tr>
<tr>
<td>OSHA standards that are consistent with international standards, consensus standards, and standards of other federal regulatory agencies</td>
<td>unquantified</td>
</tr>
<tr>
<td>Contribution towards achieving international goals supported by the U.S. government</td>
<td>unquantified</td>
</tr>
<tr>
<td><strong>Total Annual Monetized Benefits:</strong></td>
<td><strong>$851 ($738-$1,903) million</strong></td>
</tr>
<tr>
<td><strong>Net Annual Monetized Benefits (Benefits Minus Costs):</strong></td>
<td><strong>$754 ($641-$1,806) million</strong></td>
</tr>
</tbody>
</table>

Note: Costs and benefits are expressed in 2007 dollars.

Estimated 64 Injuries and 43 Deaths Prevented!

$754 Million in Benefits
Worldwide Use of GHS

- **27 European Union Countries** — GHS under EU Regulation 1272/2008
  - CLP is mandatory for the over 4,500 SUBSTANCES as of December, 2010
  - CLP will be implemented for all MIXTURES as of June, 2015
  - EU is into the 2nd revision: Regulation 286/2011

- **67 Countries Worldwide— Implemented at least parts of GHS**
  - The UN has a running list of implementation nations and their schemes of implementation dates and building blocks
    - [http://www.unece.org/trans/danger/publi/ghs/implementation_e.html](http://www.unece.org/trans/danger/publi/ghs/implementation_e.html)
  - Third party websites:
Scope of GHS

Covers all hazardous chemical substances, mixtures, and dilute solutions, and includes the following key elements:

(a) harmonized criteria for classifying substances and mixtures according to their health, environmental and physical hazards; and

(b) harmonized hazard communication elements, including requirements for labeling and safety data sheets.

The Target Audiences for GHS

- workers
- transport workers
- emergency responders
- consumers

GHS is not intended to harmonize risk assessment procedures risk management decisions(such as establishment of a permissible exposure limit for employee exposure), which generally require some risk assessment in addition to hazard classification.
Key GHS Elements - Building Blocks

Purple Book – Revision 3
Classification Criteria – The Building Block Approach

- Physical Hazards – 16 very specific criteria
- Health Hazards – 10 very specific criteria
- Environmental Hazards - 2
  (Not covered in this regulation change!)
- Mixtures

Hazard Communication
- Labels
- Safety Data Sheets
# GHS Classification

## Physical Hazards (16)
- **Explosives** (Division 1.1-1.6)
- **Flammable Gases** (category I or II)
- **Flammable Aerosols** (category I or II)
- **Oxidizing Gases** (single category)
- **Gases Under Pressure** (Four types)
- **Flammable Liquids** (Category 1, 2, 3, 4)
- **Flammable Solids** (category I or II)
- **Self-Reactive Substances** (Type A, B, C, D, E, F, G)
- **Pyrophoric Liquids** (single category)
- **Pyrophoric Solids** (single category)
- **Self-Heating Substances** (category I or II)
- **Substances which, in contact with water emit flammable gases** (category I, II, III)
- **Oxidizing Liquids** (category I, II, III)
- **Oxidizing Solids** (category I, II, III)
- **Organic Peroxides** (Type A, B, C, D, E, F, G)
- **Corrosive to Metals** (single category)

## Health Hazards (10)
- **Acute Toxicity** (Category 1-4)
- **Skin Corrosion/Irritation** (Category 1A, 1B, 1C, 2)
- **Serious Eye Damage/Eye Irritation** (Category 1, 2A, 2B)
- **Respiratory or Skin Sensitization** (single category)
- **Germ Cell Mutagenicity** (Category 1A, 1B, 2)
- **Carcinogenicity** (Category 1A, 1B, 2)
- **Reproductive Toxicity** (Category 1A, 1B, 2)
- **Target Organ Systemic Toxicity** — Single (Category 1, 2, 3)
- **and Repeated Dose** (Category 1, 2, 3)
- **Aspiration Toxicity** (Category 1)

## Environmental Hazards (Not Implemented)
- **Hazardous to the Aquatic Environment**
  - Acute aquatic toxicity (Category I, II, III)
  - Chronic aquatic toxicity (Category I, II, III, IV)
- **Bioaccumulation potential**
- **Rapid Biogradability**
- **Ozone Deleting Substances**

OHSA – Classification and labeling are “Performance Based” so any methods could be used to determine and communicate hazards. Common third party systems…

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- Pace Analytical
- NFPA
- HMIS
GHS Classification Omissions

U.S.: Omitted Hazard Categories
- Acute Toxicity Cat. 5 (Oral, Dermal & Inhl.)
- Skin Corrosion/Irritation Cat. 3
- Aspiration Hazard Cat. 2
- Environmental Classifications

Note: These were also omitted from EU CLP (i.e., REACH), however show up in other implementations (Oral Cat 5. in China, New Zealand, Brazil, etc.)

Canada: Likely to follow the same suit as OSHA’s implementation.
In order to minimize confusion, OSHA has renamed unclassified hazards, “hazards not otherwise classified.” These hazards are: pyrophoric gases, simple asphyxiants, and combustible dust. OSHA has added definitions to the final rule for pyrophoric gases and simple asphyxiants, and provided guidance on defining combustible dust for purposes of complying with the HCS.

**Combustible Dusts**
- Not specifically classified in GHS but OSHA had already worked to define these hazards in the previous Hazard Communication Standard
- In the Final Amendment published, Combustible Dusts are given their own classification definition
- Combustible Dust’s are defined in classification as a hazard. They must carry the signal word “Warning”. No pictogram is required. Hazard phrase “May form combustible dust concentrations in air”
- OSHA previous standards need to be consulted, OSHA’s *Hazard Communication Guidance for Combustible Dusts, OSHA (3371-08 2009)*, and its Combustible Dust National Emphasis Program Directive CPL 03-00-008.

**Simple Asphyxiants**
- Simple asphyxiant is defined in the new Hazard Communication Standard as a substance or mixture that displaces oxygen in the ambient atmosphere, and can thus cause oxygen deprivation in those who are exposed, leading to unconsciousness and death.”
- Simple asphyxiants will require the signal word “Warning”
- Simple asphyxiants will require the Hazard statement “May displace oxygen and cause rapid suffocation.”

**Pyrophoric Gases**
- The signal word will be “Danger”;
- The pictogram is the flame;
- The hazard statement is “Catches fire spontaneously if exposed to air.”
GHS Classification

How are substances placed in these classes?

- Use Test Data (for substances and mixtures)
- Compared to substance hazard criteria
- Use Bridging Principles
  - **Dilution**: if mixture is diluted the hazards of the mixture are the same as original
  - **Batching**: hazards are the same from batch to batch
  - **Concentration of Highly Toxic Mixtures**: if mixture is severely hazardous, then a concentrated mixture is also severely hazardous
  - **Interpolation within one Toxic Category**: known component hazards applied to the mixture
  - **Substantially Similar Mixtures**: slight changes in concentration of components doesn’t change the hazards
  - **Aerosols**: aerosols have same hazards as the non-aerosol mixture
- Estimate hazards based on the known components information if bridging cannot be used
GHS Label Elements

What are the GHS label elements?
Some GHS label elements have been standardized (identical with no variation) and are directly related to the endpoints and hazard level. Other label elements are harmonized with common definitions and/or principles. See Figure 4.8 for an illustration of the GHS label elements.

The standardized label elements included in the GHS are:

**Symbols** (hazard pictograms): Convey health, physical and environmental hazard information, assigned to a GHS hazard class and category.

**Signal Words**: "Danger" or "Warning" are used to emphasize hazards and indicate the relative level of severity of the hazard, assigned to a GHS hazard class and category.

**Hazard Statements**: Standard phrases assigned to a hazard class and category that describe the nature of the hazard.

The symbols, signal words, and hazard statements have all been standardized and assigned to specific hazard categories and classes, as appropriate.
Classification is the starting point for the GHS. Once a chemical has been classified, the hazard(s) must then be communicated to target audiences.
# GHS Label Elements

## Figure C.1 - Hazard Symbols and Classes

<table>
<thead>
<tr>
<th>Flame</th>
<th>Flame Over Circle</th>
<th>Exclamation Mark</th>
<th>Exploding Bomb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammables</td>
<td>Oxidizers</td>
<td>Irritant</td>
<td>Explosives</td>
</tr>
<tr>
<td>Self Reactives</td>
<td></td>
<td>Dermal Sensitizer</td>
<td>Self Reactives</td>
</tr>
<tr>
<td>Pyrophorics</td>
<td></td>
<td>Acute Toxicity (harmful)</td>
<td>Organic Peroxides</td>
</tr>
<tr>
<td>Self-heating</td>
<td></td>
<td>Narcotic Effects</td>
<td></td>
</tr>
<tr>
<td>Emits Flammable Gas</td>
<td></td>
<td>Respiratory Tract Irritation</td>
<td></td>
</tr>
<tr>
<td>Organic Peroxides</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Corrosion</th>
<th>Gas Cylinder</th>
<th>Health Hazard</th>
<th>Skull and Crossbones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrosives</td>
<td>Gases Under Pressure</td>
<td>Carcinogen</td>
<td>Acute Toxicity (severe)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Respiratory Sensitizer</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reproductive Toxicity</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Target Organ Toxicity</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mutagenicity</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aspiration Toxicity</td>
<td></td>
</tr>
</tbody>
</table>
GHS Signal Words

“Danger” or “Warning”

- Used to emphasize hazard and discriminate between levels of hazard.

- OSHA states the use of “Hazard Warnings” which may be any words, pictures, symbols, or combination thereof appearing on a label or other appropriate form of warning which convey the specific physical and health hazard(s).
Once Classified, Substances and Mixtures can be assigned Hazard Phrases and Precautionary Phrases. H and P phrases are single harmonized hazard statements for each level of hazard within each hazard class.

**H-statements**
Hazard statements describe physical, health and environmental hazards. They are codified by using one letter, “H”, and three figures, the first of which indicates the primary nature of the hazard:
- H2xy for physical hazards,
- H3xy for health hazards and
- H4xy for environmental hazards.

**P-statements**
Precautionary statements are also assigned a unique code, consisting of the letter, “P”, and three figures, the first of which refers to one of the 5 types of statements:
- P1xy for General recommendations
- P2xy for Prevention recommendations
- P3xy for Response recommendations
- P4xy for Storage recommendations
- P5xy for Disposal recommendations
Example:
Sodium Hydroxide CAS No. 1310-73-2
Hazard Class and Category Codes: Skin Corr. 1A H314
ECHA website gives information on H & P phrases. REACH CLP also gives full H & P phrases from the classification

<table>
<thead>
<tr>
<th>Classification</th>
<th>Category 1 A/1 B/1 C</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHS Pictograms</td>
<td></td>
</tr>
<tr>
<td>Signal Word</td>
<td>Danger</td>
</tr>
<tr>
<td>Hazard Statement</td>
<td>H314: Causes severe skin burns and eye damage</td>
</tr>
<tr>
<td>Precautionary Statement Prevention</td>
<td>P260 P264 P280</td>
</tr>
<tr>
<td>Precautionary Statement Storage</td>
<td>P405</td>
</tr>
<tr>
<td>Precautionary Statement Disposal</td>
<td>P501</td>
</tr>
</tbody>
</table>

- **P260**: Do not breathe dust/fume/gas/mist/vapors/spray
- **P264**: Wash … thoroughly after handling
- **P280**: Wear protective gloves/protective clothing/eye protection/face protection
- **P301 + 330 + 331**: IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
- **P303 + 361 + 353**: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
- **P363**: Wash contaminated clothing before reuse
- **P304 + 340**: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
- **P310**: Immediately call a POISON CENTER or doctor/physician
- **P321**: Specific treatment (see … on this label)
- **P305 + 351 + 338**: IF IN EYES: Rinse continuously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing
- **P405**: Store locked up
- **P501**: Dispose of contents/container to …
Examples of Labeling

US Workplace Label Example

ToxiFlam
TOXIC
COMBUSTIBLE LIQUID AND VAPOR
My Company, My Street, My Town NJ 00000
Tel. 444 999 9999

ToxiFlam (Contains XYZ)

WARNING! HARMFUL IF SWALLOWED, FLAMMABLE LIQUID AND VAPOR
Do not taste or swallow. Do not take internally. Wash thoroughly after handling. Keep away from heat, sparks and flame. Keep container closed. Use only with adequate ventilation.

FIRST AID: If swallowed, do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person.
In case of Fire, use water fog, dry chemical, CO2, or alcohol foam. Water may be ineffective.
Flash Point = 120°F. Residue vapor may explode or ignite on ignition; do not cut, drill, grind, or weld on or near the container.
See Material Safety Data Sheet for further details regarding safe use of this product.

My Company, My Street, My Town NJ 00000 Tel. 444 999 9999

ANSI Z129.1 Precautionary Labelling Standard for workplace labeling

ToxiFlam (Contains XYZ)

Danger! Toxic If Swallowed, Flammable Liquid and Vapor
Do not eat, drink or use tobacco when using this product. Wash hands thoroughly after handling. Keep container tightly closed. Keep away from heat/sparks/open flame. - No smoking. Wear protective gloves and eye/face protection. Ground container and receiving equipment. Use explosion-proof electrical equipment. Take precautionary measures against static discharge. Use only non-sparking tools. Store in cool/well-ventilated place.

IF SWALLOWED: Immediately call a POISON CONTROL CENTER or doctor/physician. Rinse mouth.
In case of fire, use water fog, dry chemical, CO2, or "alcohol" foam.

See Material Safety Data Sheet for further details regarding safe use of this product.

My Company, My Street, My Town NJ 00000 Tel. 444 999 9999

Example GHS Inner Container Label (e.g., bottle inside a shipping box)

ToxiFlam (Contains: XYZ)

Danger! Toxic If Swallowed, Flammable Liquid and Vapor
Do not eat, drink or use tobacco when using this product. Wash hands thoroughly after handling. Keep container tightly closed. Keep away from heat/sparks/open flame. - No smoking. Wear protective gloves and eye/face protection. Ground container and receiving equipment. Use explosion-proof electrical equipment. Take precautionary measures against static discharge. Use only non-sparking tools. Store in cool/well-ventilated place.

IF SWALLOWED: Immediately call a POISON CONTROL CENTER or doctor/physician. Rinse mouth.
In case of fire, use water fog, dry chemical, CO2, or "alcohol" foam.

See Material Safety Data Sheet for further details regarding safe use of this product.

My Company, My Street, My Town NJ 00000 Tel. 444 999 9999
GHS Safety Data Sheets

- MSDS’s will now be known as SDS’s
- New **required** format
- 16 required sections

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

No content required under OSHA GHS
Section 1: Identification

• Identification of the substance or mixture:
  - GHS identifier.
  - Other unique identifiers.

• Recommended use of the chemical and restrictions on use

• Supplier’s details:
  - Name, address and phone number, etc.

• Emergency phone number.

SDS Format Section 1
Section 2: Hazard identification

- GHS Classification of the substance/mixture (and any nat. or regional info)
- GHS labels elements, including H & P statements (pictograms optional)
- Other hazards which do not result in classification (e.g. dust explosion hazard)

Section 3: Composition/information on ingrédients

- Substances:
  - Chemical identity
  - Common name, synonyms, etc.
  - CAS number, EC numbers, etc.
  - Impurities and stabilizing additives which are classified

- Mixtures (for all hazardous ingredients):
  - Chemical identity
  - Identification number
  - Concentration range of hazardous materials
Section 4: First-aid measures

• Description of necessary measures by routes of exposure.
• Most important symptoms/effects, acute and delayed.
• Indication of immediate medical attention and special treatment needed.

Section 5: Fire-fighting measures:

• Suitable and unsuitable extinguishing media.
• Specific hazards arising from the chemical (e.g. haz combustion products)
• Special protective equipment and precautions for fire-fighters.
Section 6: Accidental release measures:
• Personal precautions, protective equipment and emergency procedures.
• Environmental precautions.
• Methods and materials for containment and cleaning up.

Section 7: Handling and storage
• Precautions for safe handling;
• Conditions for safe storage, including incompatibilities.
Section 8: Exposure controls/personal protection

- Control parameters e.g. occupational exposure limits or biological limit values.
- Appropriate engineering controls.
- Individual protection measures such as personal protective equipment (PPE)).
Section 9: Physical and chemical properties

- Appearance
- Color
- Odor
- Odor threshold
- pH
- Melting point/freezing point
- Initial boiling point and boiling range
- Flash point
- Evaporation rate
- Flammability (solid, gas)
- Upper/lower flammability or explosive limits
- Vapor pressure
- Vapor density
- Relative density
- Solubility (ies)
- Partition coefficient: n-octanol/water
- Auto-ignition temperature
- Decomposition temperature
- Viscosity
- Surface tension
- Oxidizing properties
- Granulometry
Section 10: Stability and reactivity

- Chemical stability
- Possibility of hazardous reactions
- Conditions to avoid, e.g. static discharge, shock or vibration
- Incompatible materials
- Hazard decomposition products
SDS Format Section 11

Section 11: Toxicological information

Concise but complete and comprehensible descriptions of the various toxicological (health) effects and the available data used to identify those effects, including:

- Information on the likely routes of exposure (inhalation, ingestion, skin and eyes contact);
- Symptoms related to the physical, chemical and toxicological characteristics;
- Delayed and immediate effects and also chronic effects from short- and long-term exposure;
- Numerical measures of toxicity (such as acute toxicity estimates i.e. LD50, IC50)
SDS Format Section 12 & 13

Section 12: Ecological information (Not Required!)
- Eco toxicity (aquatic and terrestrial, where available).
- Persistence and degradability.
- Bio accumulative potential.
- Mobility in soil.
- Other adverse effects.

Section 13: Disposal considerations (Not Required!)
Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging.
Section 14: Transport information  (Not Required!)
• UN Number.
• UN Proper Shipping Name.
• Transport hazard class(es).
• Packing group, if applicable.
• Marine pollutant (yes/no).
• Special precautions for user;
• Other Nations transportation information

Section 15: Regulatory information  (Not Required!)
• Safety, health and environmental regulations specific for the chemical in question
• Status of chemical or mixture in foreign nations (e.g. Canadian DSL)
Section 16: Other information

• Date of preparation of the latest version of the SDS.
  - Revision history
• HMIS/NFPA information

<table>
<thead>
<tr>
<th>Version</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version 1.1(Oct2011)</td>
<td>Added CLP Symbols</td>
</tr>
<tr>
<td>Version 2.0(Nov2011)</td>
<td>Added Toxicity Info.</td>
</tr>
<tr>
<td>Version 3.0(Jan2012)</td>
<td>Added Eco.Tox Info.&amp; Haz.Identification</td>
</tr>
<tr>
<td>Version 4.0(Feb2012)</td>
<td>Added LLNA &amp; LD50 info.</td>
</tr>
<tr>
<td>Version 4.2(Feb2012)</td>
<td>Amended Disclaimer</td>
</tr>
</tbody>
</table>
SDS Data Information

- GHS specifically is “test neutral” for health and environmental hazards. So no specific test methods are required. Physical hazards likely use specific test methods.
- Existing data can be used without any new testing requirements.
- If sales are planned outside the United States however, be aware that GHS implementation in foreign nations often come with data quality requirements!
- REACH style implementation often have production volumes tied to required test data! (e.g. China).
- So, OSHA GHS is still not universally “harmonized” but closer!
GHS: The Qualifications...

• It is uncertain when OSHA will update the GHS standard to Revision 4? Revision 5?
• Indications are this may not occur for some time.
• Mexico and Canada have stated they have been waiting for the US to enact GHS before they themselves started the process.
## GHS Implementation Timeline

<table>
<thead>
<tr>
<th>Effective Completion Date</th>
<th>Requirement(s)</th>
<th>Who</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Dec-13</td>
<td>Train employees on the new label elements and SDS format.</td>
<td>Employers</td>
</tr>
<tr>
<td>June 1, 2015*</td>
<td>Comply with all modified provisions of this final rule, except:</td>
<td>Chemical manufacturers, importers, distributors and employers</td>
</tr>
<tr>
<td>1-Dec-15</td>
<td>Distributors may ship products labeled by manufacturers under the old system until December 1, 2015.</td>
<td></td>
</tr>
<tr>
<td>1-Jun-16</td>
<td>Update alternative workplace labeling and hazard communication program as necessary, and provide additional employee training for newly identified physical or health hazards.</td>
<td>Employers</td>
</tr>
<tr>
<td>Transition Period</td>
<td>Comply with either 29 CFR 1910.1200 (this final standard), or the current standard, or both.</td>
<td>All chemical manufacturers, importers, distributors and employers</td>
</tr>
</tbody>
</table>

* This date coincides with the European Union implementation date for classification of mixtures.*
Thank you for your attention!
References

- United Nation homepage “Globally Harmonized System of Classification and Labeling of Chemicals (GHS) Presentations”
  http://www.unece.org/trans/danger/publi/ghs/presentation_e.html
- The final GHS amended Hazard Communication Standard is available on Pace Yourself Training Center Lab Ops or at
- US Federal Register Hazard Communication Standard
  https://www.federalregister.gov/articles/2012/03/26/2012-4826/hazard-communication
- USDOT
- USEPA
  http://www.epa.gov/oppfead1/international/globalharm.htm
- Health Canada