GHS - OSHA HCS Comparison

Comparison of Hazard Communication Requirements

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Comparison of Hazard Communication Requirements

OSHA Hazard Communication Standard 29CFR1910.1200[1] (HCS)
Globally Harmonized System[2] (GHS)

Comparison of Hazard Communication Requirements

Introduction

The Globally Harmonized System (GHS) is not in itself a regulation or a model regulation. It is a framework from which competent authorities may select the appropriate harmonized classification & communication elements. Competent authorities will decide how to apply the various elements of the GHS within their systems based on their needs and the target audience.

The GHS includes the following 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 material safety data sheets.

The harmonized elements of the GHS may be seen as a collection of building blocks from which to form a regulatory approach. While the full range is available to everyone, and should be used if a country or organization chooses to cover a certain effect when it adopts the GHS, the full range does not have to be adopted. This constitutes the GHS building block approach.

Competent authorities, such as OSHA, will determine how to implement the elements of the GHS within their systems. This document compares the GHS elements to the OSHA Hazard Communication Standard (HCS) elements. The competent authority allowances/decision points and the selection of building blocks are addressed in Section VI.

This Comparison of Hazard Communication Requirements document includes the following segments:

- I. General provisions comparison
- II. Health hazard comparison
- III. Physical hazard comparison
- IV. Label comparison
    - GHS & transport pictograms
    - Label examples
- V. MSDS comparison
- VI. GHS Competent Authority Allowances & Building Block Discussion.

I. General Provisions Comparison

Purpose

Comparison The purpose of the HCS and GHS are consistent. The HCS is one of the major existing systems which was to be harmonized by the GHS. While the intent of the GHS in international harmonization, it will also address harmonization of sectors and regulations within countries.	
OSHA HCS 29CFR1910.1200[1]	GHS[2]
29 CFR 1910.1200 (a)(1) Purpose The purpose of this section is to ensure that the hazards of all chemicals produced or imported are evaluated, and that information concerning their hazards is transmitted to employers and employees. This transmittal of information is to be accomplished by means of comprehensive hazard communication programs, which are to include container labeling and other forms of warning, material safety data sheets and employee training. **(a)(2)** This occupational safety and health standard is intended to address comprehensively the issue of evaluating the potential hazards of chemicals, and communicating information concerning hazards and appropriate protective measures to employees, and to preempt any legal requirements of a state, or political subdivision of a state, pertaining to this subject. Evaluating the potential hazards of chemicals, and communicating information concerning hazards and appropriate protective measures to employees, may include, for example, but is not limited to, provisions for: developing and maintaining a written hazard communication program for the workplace, including lists of hazardous chemicals present; labeling of containers of chemicals in the workplace, as well as of containers of chemicals being shipped to other workplaces; preparation and distribution of material safety data sheets to employees and downstream employers; and development and implementation of employee training programs regarding hazards of chemicals and protective measures. Under section 18 of the Act, no state or political subdivision of a state may adopt or enforce, through any court or agency, any requirement relating to the issue addressed by this Federal standard, except pursuant to a Federally-approved state plan.	**1.1.1 Purpose** 1.1.1.1. The use of chemical products to enhance and improve life is a widespread practice worldwide. But alongside the benefits of these products, there is also the potential for adverse effects to people or the environment. As a result, a number of countries or organizations have developed laws or regulations over the years that require information to be prepared and transmitted to those using chemicals, through labels or Safety Data Sheets (SDS). Given the large number of chemical products available, individual regulation of all of them is simply not possible for any entity. Provision of information gives those using chemicals the identities and hazards of these chemicals, and allows the appropriate protective measures to be implemented in the local use settings. 1.1.1.2 While these existing laws or regulations are similar in many respects, their differences are significant enough to result in different labels or SDS for the same product in different countries. Through variations in definitions of hazards, a chemical may be considered flammable in one country, but not another. Or it may be considered to cause cancer in one country, but not another. Decisions on when or how to communicate hazards on a label or SDS thus vary around the world, and companies wishing to be involved in international trade must have large staffs of experts who can follow the changes in these laws and regulations and prepare different labels and SDS. In addition, given the complexity of developing and maintaining a comprehensive system for classifying and labelling chemicals, many countries have no system at all. 1.1.1.3 Given the reality of the extensive global trade in chemicals, and the need to develop national programs to ensure their safe use, transport, and disposal, it was recognised that an internationally-harmonized approach to classification and labelling would provide the foundation for such programs. Once countries have consistent and appropriate information on the chemicals they import or produce in their own countries, the infrastructure to control chemical exposures and protect people and the environment can be established in a comprehensive manner.

1.1.1.4 Thus the reasons for setting the objective of harmonization were many. It is anticipated that, when implemented, the GHS will:

(a) enhance the protection of human health and the environment by providing an internationally comprehensible system for hazard communication;

(b) provide a recognized framework for those countries without an existing system;

(c) reduce the need for testing and evaluation of chemicals; and

(d) facilitate international trade in chemicals whose hazards have been properly assessed and identified on an international basis.

1.1.1.5 The work began with examination of existing systems, and determination of the scope of the work. While many countries had some requirements, the following systems were deemed to be the "major" existing systems and were used as the primary basis for the elaboration of the GHS:

Requirements of systems in the United States of America for the workplace, consumers and pesticides;

(b) Requirements of Canada for the workplace, consumers and pesticides;

(c) European Union directives for classification and labelling of substances and preparations;

(d) The United Nations Recommendations on the Transport of Dangerous Goods.

1.1.1.6 The requirements of other countries were also examined as the work developed, but the primary task was to find ways to adopt the best aspects of these existing systems and develop a harmonized approach. This work was done based on agreed principles of harmonization that were adopted early in the process:

(a) the level of protection offered to workers, consumers, the general public and the environment should not be reduced as a result of harmonizing the classification and labelling systems;

(b) the hazard classification process refers principally to the hazards arising from the intrinsic properties of chemical elements and compounds and mixtures thereof, whether natural or synthetic;

(c) harmonization means establishing a common and coherent basis for chemical hazard classification and communication, from which the appropriate elements relevant to means of transport, consumer, worker and environment protection can be selected;

(d) the scope of harmonization includes both hazard classification criteria and hazard communication tools, e.g. labelling and chemical safety data sheets, taking into account especially the four existing systems identified in the ILO report;

(e) changes in all these systems will be required to achieve a single globally harmonized system; transitional measures should be included in the process of moving to the new system;

	(f) the involvement of concerned international organizations of employers, workers, consumers, and other relevant organizations in the process of harmonization should be ensured; (g) the comprehension of chemical hazard information, by the target audience, e.g. workers, consumers and the general public should be addressed; (h)validated data already generated for the classification of chemicals under the existing systems should be accepted when reclassifying these chemicals under the harmonized system; (i) a new harmonized classification system may require adaptation of existing methods for testing of chemicals; (j) in relation to chemical hazard communication, the safety and health of workers, consumers and the public in general, as well as the protection of the environment, should be ensured while protecting confidential business information, as prescribed by the competent authorities.

Scope

<u>Comparison</u>

The GHS scope clarification is consistent with the HCS exemptions and labeling exceptions. Consumer products and pharmaceuticals are specifically addressed in the GHS scope. The HCS includes laboratories, sealed containers and distributors while as a framework for systems the GHS does not include these specific issues.

The GHS addresses testing in the scope section. The HCS addresses testing under hazard determination. The GHS and HCS do not require testing for health hazards. All the physical hazards in the HCS are not linked to specific test methods (as is the case in the GHS) and testing for physical hazards is not required.

OSHA HCS 29CFR1910.1200[1]	GHS[2]
29 CFR 1910.1200 (b) Scope and application **(b)(1)** This section requires chemical manufacturers or importers to assess the hazards of chemicals which they produce or import, and all employers to provide information to their employees about the hazardous chemicals to which they are exposed, by means of a hazard communication program, labels and other forms of warning, material safety data sheets, and information and training. In addition, this section requires distributors to transmit the required information to employers. (Employers who do not produce or import chemicals need only focus on those parts of this rule that deal with establishing a workplace program and communicating information to their workers. Appendix E of this section is a general guide for such employers to help them determine their compliance obligations under the rule.)	**1.1.2 Scope** 1.1.2.1 The GHS includes the following 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 labelling and safety data sheets. 1.1.2.2 This document describes the classification criteria and the hazard communication elements by type of hazard (e.g. acute toxicity; flammability). In addition, decision logics for each hazard have been developed. Some examples of classification of chemicals in the text, as well as in Annex 7, illustrate how to apply the criteria. There is also some discussion about issues that were raised during the development of the system where additional guidance was thought to be necessary to implement the system. 1.1.2.3 The scope of the GHS is based on the mandate from the 1992 United Nations Conference on Environment and Development (UNCED)for development of such a system as stated in paragraphs 26 and 27 of the Agenda 21, Chapter 19, Programme Area B, reproduced below: "*26. Globally harmonized hazard classification and labelling systems are not yet available to promote the safe use of chemicals, inter alia, at the workplace or in the home. Classification of chemicals can be made for different purposes and is a particularly important tool in establishing labelling systems. There is a need to develop harmonized hazard classification and labelling systems, building on ongoing work;*

(b)(3)(ii)
Employers shall maintain any material safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible during each workshift to laboratory employees when they are in their work areas;

(b)(3)(iii)
Employers shall ensure that laboratory employees are provided information and training in accordance with paragraph (h) of this section, except for the location and availability of the written hazard communication program under paragraph (h)(2)(iii) of this section; and,

(b)(3)(iv)
Laboratory employers that ship hazardous chemicals are considered to be either a chemical manufacturer or a distributor under this rule, and thus must ensure that any containers of hazardous chemicals leaving the laboratory are labeled in accordance with paragraph (f)(1) of this section, and that a material safety data sheet is provided to distributors and other employers in accordance with paragraphs (g)(6) and (g)(7) of this section.

b)(4)
In work operations where employees only handle chemicals in sealed containers which are not opened under normal conditions of use (such as are found in marine cargo handling, warehousing, or retail sales), this section applies to these operations only as follows:

(b)(4)(i)
Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced;

(b)(4)(ii)
Employers shall maintain copies of any material safety data sheets that are received with incoming shipments of the sealed containers of hazardous chemicals, shall obtain a material safety data sheet as soon as possible for sealed containers of hazardous chemicals received without a material safety data sheet if an employee requests the material safety data sheet, and shall ensure that the material safety data sheets are readily accessible during each work shift to employees when they are in their work area(s); and,

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

This mandate was later analyzed and refined in the harmonization process to identify the parameters of the GHS. As a result, the following clarification was adopted by the Interorganization Programme for the Sound Management of Chemicals (IOMC) Coordinating Group to ensure that participants were aware of the scope of the effort:
"*The work on harmonization of hazard classification and labelling focuses on a harmonized system for all chemicals, and mixtures of chemicals. The application of the components of the system may vary by type of product or stage of the life cycle. Once a chemical is classified, the likelihood of adverse effects may be considered in deciding what informational or other steps should be taken for a given product or use setting. Pharmaceuticals, food additives, cosmetics, and pesticide residues in food will not be covered by the GHS in terms of labelling at the point of intentional intake. However, these types of chemicals would be covered where workers may be exposed, and, in transport if potential exposure warrants. The Coordinating Group for the Harmonization of Chemical Classification Systems (CG/HCCS) recognizes that further discussion will be required to address specific application issues for some product use categories which may require the use of specialized expertise.*

1.1.2.5 In developing this clarification, the CG/HCCS carefully considered many different issues with regard to the possible application of the GHS. There were concerns raised about whether certain sectors or products should be exempted, for example, or about whether or not the system would be applied at all stages of the life cycle of a chemical. Three parameters were agreed in this discussion, and are critical to application of the system in a country or region. These are described below:

(b)(4)(iii) Employers shall ensure that employees are provided with information and training in accordance with paragraph (h) of this section (except for the location and availability of the written hazard communication program under paragraph (h)(2)(iii) of this section), to the extent necessary to protect them in the event of a spill or leak of a hazardous chemical from a sealed container. **(b)(5)** This section does not require labeling of the following chemicals: **(b)(5)(i)** Any pesticide as such term is defined in the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136 et seq.), when subject to the labeling requirements of that Act and labeling regulations issued under that Act by the Environmental Protection Agency; **(b)(5)(ii)** Any chemical substance or mixture as such terms are defined in the Toxic Substances Control Act (15 U.S.C. 2601 et seq.), when subject to the labeling requirements of that Act and labeling regulations issued under that Act by the Environmental Protection Agency; **(b)(5)(iii)** Any food, food additive, color additive, drug, cosmetic, or medical or veterinary device or product, including materials intended for use as ingredients in such products (e.g. flavors and fragrances), as such terms are defined in the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 et seq.) or the Virus-Serum-Toxin Act of 1913 (21 U.S.C. 151 et seq.), and regulations issued under those Acts, when they are subject to the labeling requirements under those Acts by either the Food and Drug Administration or the Department of Agriculture;	**a) Parameter 1: The GHS covers all hazardous chemicals. The mode of application of the hazard communication components of the GHS (e.g. labels, safety data sheets) may vary by product category or stage in the life cycle. Target audiences for the GHS include consumers, workers, transport workers, and emergency responders** (i) Existing hazard classification and labelling systems address potential exposures to all potentially hazardous chemicals in all types of use situations, including production, storage, transport, workplace use, consumer use, and presence in the environment. They are intended to protect people, facilities, and the environment. The most widely applied requirements in terms of chemicals covered are generally found in the parts of existing systems that apply to the workplace or transport. It should be noted that the term chemical is used broadly in the UNCED agreements and subsequent documents to include substances, products, mixtures, preparations, or any other terms that may be used in existing systems to denote coverage. (ii) Since all chemicals and chemical products in commerce are made in a workplace (including consumer products), handled during shipment and transport by workers, and often used by workers, there are no complete exemptions from the scope of the GHS for any particular type of chemical or product. In some countries, for example, pharmaceuticals are currently covered by workplace and transport requirements in the manufacturing, storage, and transport stages of the life cycle. Workplace requirements may also be applied to employees involved in the administration of some drugs, or clean-up of spills and other types of potential exposures in health care settings. SDSs and training must be available for these employees under some systems. It is anticipated that the GHS would be applied to pharmaceuticals in a similar fashion.

(b)(5)(iv)
Any distilled spirits (beverage alcohols), wine, or malt beverage intended for nonindustrial use, as such terms are defined in the Federal Alcohol Administration Act (27 U.S.C. 201 et seq.) and regulations issued under that Act, when subject to the labeling requirements of that Act and labeling regulations issued under that Act by the Bureau of Alcohol, Tobacco, and Firearms;

(b)(5)(v)
Any consumer product or hazardous substance as those terms are defined in the Consumer Product Safety Act (15 U.S.C. 2051 et seq.) and Federal Hazardous Substances Act (15 U.S.C. 1261 et seq.) respectively, when subject to a consumer product safety standard or labeling requirement of those Acts, or regulations issued under those Acts by the Consumer Product Safety Commission; and,

(b)(5)(vi)
Agricultural or vegetable seed treated with pesticides and labeled in accordance with the Federal Seed Act (7 U.S.C. 1551 et seq.) and the labeling regulations issued under that Act by the Department of Agriculture.

(b)(6)
This section does not apply to:

(b)(6)(i)
Any hazardous waste as such term is defined by the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6901 et seq.), when subject to regulations issued under that Act by the Environmental Protection Agency;

(b)(6)(ii)
Any hazardous substance as such term is defined by the Comprehensive Environmental Response, Compensation and Liability ACT (CERCLA) (42 U.S.C. 9601 et seq.) when the hazardous substance is the focus of remedial or removal action being conducted under CERCLA in accordance with the Environmental Protection Agency regulations.

(b)(6)(iii)
Tobacco or tobacco products;

(b)(6)(iv)
Wood or wood products, including lumber which will not be processed, where the chemical manufacturer or importer can establish that the only hazard they pose to employees is the potential for flammability or combustibility (wood or wood products which have been treated with a hazardous chemical covered by this standard, and wood which may be subsequently sawed or cut, generating dust, are not exempted);

(iii) At other stages of the life cycle for these same products, the GHS may not be applied at all. For example, at the point of intentional human intake or ingestion, or intentional application to animals, products such as human or veterinary pharmaceuticals are generally not subject to hazard labelling under existing systems. Such requirements would not normally be applied to these products as a result of the GHS. (It should be noted that the risks to subjects associated with the medical use of human or veterinary pharmaceuticals are generally addressed in package inserts and are not part of this harmonization process.) Similarly, products such as foods that may have trace amounts of food additives or pesticides in them are not currently labelled to indicate the presence or hazard of those materials. It is anticipated that application of the GHS would not require them to be labelled as such.

b) Parameter 2: The mandate for development of a GHS does not include establishment of uniform test methods or promotion of further testing to address adverse health outcomes.

(i) Tests that determine hazardous properties, which are conducted according to internationally recognized scientific principles, can be used for purposes of a hazard determination for health and environmental hazards. The GHS criteria for determining health and environmental hazards are test method neutral, allowing different approaches as long as they are scientifically sound and validated according to international procedures and criteria already referred to in existing systems for the hazard class of concern and produce mutually acceptable data. While the OECD is the lead organization for development of harmonized health hazard criteria, the GHS is not tied to the OECD Test Guidelines Program. For example, drugs are tested according to agreed criteria developed under the auspices of the World Health Organization (WHO). Data generated in accordance with these tests would be acceptable under the GHS. Criteria for physical hazards under the UNSCETDG are linked to specific test methods for hazard classes such as flammability and explosivity.

(ii) The GHS is based on currently available data. Since the harmonized classification criteria are developed on the basis of existing data, compliance with these criteria will not require retesting of chemicals for which accepted test data already exists.

(c) Parameter 3: In addition to animal data and valid in vitro testing, human experience, epidemiological data, and clinical testing provide important information that should be considered in application of the GHS.

(b)(6)(v) Articles (as that term is defined in paragraph (c) of this section); **(b)(6)(vi)** Food or alcoholic beverages which are sold, used, or prepared in a retail establishment (such as a grocery store, restaurant, or drinking place), and foods intended for personal consumption by employees while in the workplace; **(b)(6)(vii)** Any drug, as that term is defined in the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 et seq.), when it is in solid, final form for direct administration to the patient (e.g., tablets or pills); drugs which are packaged by the chemical manufacturer for sale to consumers in a retail establishment (e.g., over-the-counter drugs); and drugs intended for personal consumption by employees while in the workplace (e.g., first aid supplies); **(b)(6)(viii)** Cosmetics which are packaged for sale to consumers in a retail establishment, and cosmetics intended for personal consumption by employees while in the workplace; **(b)(6)(ix)** Any consumer product or hazardous substance, as those terms are defined in the Consumer Product Safety Act (15 U.S.C. 2051 et seq.) and Federal Hazardous Substances Act (15 U.S.C. 1261 et seq.) respectively, where the employer can show that it is used in the workplace for the purpose intended by the chemical manufacturer or importer of the product, and the use results in a duration and frequency of exposure which is not greater than the range of exposures that could reasonably be experienced by consumers when used for the purpose intended; **(b)(6)(x)** Nuisance particulates where the chemical manufacturer or importer can establish that they do not pose any physical or health hazard covered under this section; **(b)(6)(xi)** Ionizing and nonionizing radiation; and, **(b)(6)(xii)** Biological hazards.	Most of the current systems acknowledge and make use of ethically obtained human data or available human experience. Application of the GHS should not prevent the use of such data, and the GHS explicitly acknowledges the existence and use of all appropriate and relevant information concerning hazards or the likelihood of harmful effects (i.e. risk). **1.1.2.6 *Other scope limitations*** 1.1.2.6.1 The GHS is not intended to harmonize risk assessment procedures or 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. In addition, chemical inventory requirements in various countries are not related to the GHS.

Application

Comparison Implementing the GHS will require the HCS to make decisions concerning the application of the building blocks for physical and health hazard classes and hazard categories. See the individual health & physical endpoints for details. For other Competent Authority decisions see GHS Competent Authority Allowances & Building Block Discussion section.	
OSHA HCS 29CFR1910.1200[1]	GHS[2]
Comment: The HCS is a performance – oriented regulation. The GHS is a specification oriented. Implementation of the GHS will require changes to the performance-oriented nature of the HCS. These changes will include required label elements and a required MSDS format, as well as criteria changes. Although the GHS has the building block approach, changes to the HCS are expected. The HCS may not implement all hazard classes, e.g., hazardous for the environment. Even within some hazard classes the HCS may not regulate all hazard categories, e.g., acute toxicity. Many hazard classes will require some type of change to the HCS.	**1.1.3 Application of the GHS** **1.1.3.1 *Harmonization of the application of the GHS*** 1.1.3.1.1 The goal of the GHS is to identify the intrinsic hazards found in chemical substances and mixtures and to convey hazard information about these hazards. The criteria for hazard classification are harmonized. Hazard statements, symbols and signal words have been standardized and harmonized and now form an integrated hazard communication system. The GHS will allow the hazard communication elements of the existing systems to converge. Competent authorities will decide how to apply the various elements of the GHS based on the needs of the competent authority and the target audience. (See also Hazard Communication: Labelling (Chapter 1.4, paragraph 1.4.10.5.4.2) and Consumer Product Labelling Based on the Likelihood of Injury, Annex 4.) 1.1.3.1.2 For transport, it is expected that application of the GHS will be similar to application of current transport requirements. Containers of dangerous goods will be marked with pictograms that address acute toxicity, physical hazards, and environmental hazards. As is true for workers in other sectors workers in the transport sector will be trained. The elements of the GHS that address such elements as signal words and hazard statements are not expected to be adopted in the transport sector. 1.1.3.1.3 In the workplace, it is expected that all of the GHS elements will be adopted, including labels that have the harmonized core information under the GHS, and safety data sheets. It is also anticipated that this will be supplemented by employee training to help ensure effective communication. 1.1.3.1.4 For the consumer sector, it is expected that labels will be the primary focus of GHS application. These labels will include the core elements of the GHS, subject to some sector-specific considerations in certain systems. (See also Hazard Communication: Labelling (Chapter 1.4, paragraph 1.4.10.5.4.2) and Consumer Product Labelling Based on the Likelihood of Injury, Annex 4) 1.1.3.1.5 Building block approach 1.1.3.1.5.1 Consistent with the building block approach, countries are free to determine which of the building blocks

	will be applied in different parts of their systems. However, where a system covers something that is in the GHS, and implements the GHS, that coverage should be consistent. For example, if a system covers the carcinogenicity of a chemical, it should follow the harmonized classification scheme and the harmonized label elements. 1.1.3.1.5.2 In examining the requirements of existing systems, it was noted that coverage of hazards may vary by the perceived needs of the target audience for information. In particular, the transport sector focuses on acute health effects and physical hazards, but has not to date covered chronic effects due to the types of exposures expected to be encountered in that setting. But there may be other differences as well, with countries choosing not to cover all of the effects addressed by the GHS in each use setting. 1.1.3.1.5.3 The harmonized elements of the GHS may thus be seen as a collection of building blocks from which to form a regulatory approach. While the full range is available to everyone, and should be used if a country or organization chooses to cover a certain effect when it adopts the GHS, the full range does not have to be adopted. While physical hazards are important in the workplace and transport sectors, consumers may not need to know some of the specific physical hazards in the type of use they have for a product. As long as the hazards covered by a sector or system are covered consistently with the GHS criteria and requirements, it will be considered appropriate implementation of the GHS. Not withstanding the fact that an exporter needs to comply with importing countries GHS implementation, it is hoped that the application of the GHS worldwide will eventually lead to a fully harmonized situation.

Definitions

Comparison The HCS will need to add definitions and some existing HCS definitions will need to be changed. The above definitions illustrate some of the key changes to be considered. Substance, chemical, liquid and gas are some differences. In the HCS physical hazards have definitions. The GHS has criteria for physical hazards.

OSHA HCS 29CFR1910.1200[1] 29 CFR 1910.1200 (c) Definitions	GHS[2] Chapter 1.2 Definitions and abbreviations
"Chemical" means any element, chemical compound or mixture of elements and/or compounds.	***Substance*** means chemical elements and their compounds in the natural state or obtained by any production process, including any additive necessary to preserve the stability of the product and any impurities deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition;
"Chemical name" means the scientific designation of a chemical in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS) rules of nomenclature, or a name which will clearly identify the chemical for the purpose of conducting a hazard evaluation. "Specific chemical identity" means the chemical name, Chemical Abstracts Service (CAS) Registry Number, or any other information that reveals the precise chemical designation of the substance.	***Chemical identity*** means a name that will uniquely identify a chemical. This can be a name that is in accordance with the nomenclature systems of the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS), or a technical name;
"Combustible liquid" means any liquid having a flashpoint at or above 100 deg. F (37.8 deg. C), but below 200 deg. F (93.3 deg. C), except any mixture having components with flashpoints of 200 deg. F (93.3 deg. C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.	See flammable liquid hazard categories**.**
"Common name" means any designation or identification such as code name, code number, trade name, brand name or generic name used to identify a chemical other than by its chemical name.	No GHS definition
"Compressed gas" means: (i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70 deg. F (21.1 deg. C); or (ii) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130 deg. F (54.4 deg. C) regardless of the pressure at 70 deg. F (21.1 deg. C); or (iii) A liquid having a vapor pressure exceeding 40 psi at 100 deg. F (37.8 deg. C) as determined by ASTM D-323-72.	***"Compressed gas"****: A gas which when packaged under pressure is entirely gaseous at -50 °C; including all gases with a critical temperature ≤ -50 °C.*
No HCS definition.	***Corrosive to metal*** means a substance or a mixture which by chemical action will materially damage, or even destroy, metals;

"Explosive" means a chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.	***Explosive article*** means an article containing one or more explosive substances; ***Explosive substance*** means a solid or liquid substance (or mixture of substances) which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings. Pyrotechnic substances are included even when they do not evolve gases;
"Flammable" means a chemical that falls into one of the following categories: (i) "Aerosol, flammable" means an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening; (ii) "Gas, flammable" means: (A) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of thirteen (13) percent by volume or less; or (B) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than twelve (12) percent by volume, regardless of the lower limit; (iii) "Liquid, flammable" means any liquid having a flashpoint below 100 deg. F (37.8 deg. C), except any mixture having components with flashpoints of 100 deg. F (37.8 deg. C) or higher, the total of which make up 99 percent or more of the total volume of the mixture. (iv) "Solid, flammable" means a solid, other than a blasting agent or explosive as defined in 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.	"*Flammable gas*": A gas having a flammable range with air at 20 C and a standard pressure of 101.3 kPa. "*Flammable Liquid*": A flammable liquid means a liquid having a flash point of not more than 93 C. "Flammable Solid": A flammable solid is a solid which is readily combustible, or may cause or contribute to fire through friction. ***"Aerosols"*** means any non-refillable receptacles made of metal, glass or plastics and containing a gas compressed, liquefied or dissolved under pressure, with or without a liquid, paste or powder, and fitted with a release device allowing the contents to be ejected as solid or liquid particles in suspension in a gas, as a foam, paste or powder or in a liquid state or in a gaseous state. Aerosol includes aerosol dispensers; "*Readily Combustible Solid*": Readily combustible solids are powdered, granular, or pasty substances which are dangerous if they can be easily ignited by brief contact with an ignition source, such as a burning match, and if the flame spreads rapidly.
"Flashpoint" means the minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows: (i) Tagliabue Closed Tester (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24-1979 (ASTM D 56-79)) for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100 deg. F (37.8 deg. C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or (ii) Pensky-Martens Closed Tester (see American National Standard Method of Test for Flash Point by Pensky-Martens Closed Tester, Z11.7-1979 (ASTM D 93-79)) for liquids with a viscosity equal to or greater than 45 SUS at 100 deg. F (37.8 deg. C), or that contain suspended solids, or that	***"Flash point"*** means the lowest temperature (corrected to a standard pressure of 101.3 kPa) at which the application of an ignition source causes the vapours of a liquid to ignite under specified test conditions;

have a tendency to form a surface film under test; or (iii) Setaflash Closed Tester (see American National Standard Method of Test for Flash Point by Setaflash Closed Tester (ASTM D 3278-78)).	
No HCS definition	***Gas*** means a substance which (i) at 50 °C has a vapour pressure greater than 300 kPa; or (ii) is completely gaseous at 20 °C at a standard pressure of 101.3 kPa; ***Dissolved gas*** means a gas which when packaged under pressure is dissolved in a liquid phase solvent; ***Liquefied gas*** means a gas which when packaged under pressure, is partially liquid at temperatures above –50 °C. A distinction is made between: (i) High pressure liquefied gas: a gas with a critical temperature between -50 °C and +65 °C; and (ii) Low pressure liquefied gas: a gas with a critical temperature above +65 °C; "*Refrigerated liquefied gas*": A gas which when packaged is made partially liquid because of its low temperature.
"Health hazard" means a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes. Appendix A provides further definitions and explanations of the scope of health hazards covered by this section, and Appendix B describes the criteria to be used to determine whether or not a chemical is to be considered hazardous for purposes of this standard. (See appendix for criteria.)	***Hazard category*** means the division of criteria within each hazard class,.e.g. oral acute toxicity includes five hazard categories and flammable liquids includes four hazard categories. These categories compare hazard severity within a hazard class and should not be taken as a comparison of hazard categories more generally; ***Hazard class*** means the nature of the physical, health or environmental hazard,e.g. flammable solid carcinogen, oral acute toxicity;
"Hazard warning" means 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), including target organ effects, of the chemical(s) in the container(s). (See the definitions for "physical hazard" and "health hazard" to determine the hazards which must be covered.)	***Hazard statement*** means a statement assigned to a hazard class and category that describes the nature of the hazards of a hazardous product, including, where appropriate, the degree of hazard; "*Signal word*": A signal word means a word used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label. The GHS uses 'Danger' and 'Warning'. ***"Pictogram":*** A pictogram means a composition that may include a symbol plus other graphic elements, such as a border, background pattern or colour that is intended to convey specific information.

	"*Precautionary statement*": A precautionary statement means a phrase (and/or pictogram) that describes recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a hazardous product, or improper storage or handling of a hazardous product. "*Supplemental Label Element*": A supplemental label element means any additional non-harmonized type of information supplied on the container of a hazardous product that is not required or specified under the GHS. In some cases this information may be required by other competent authorities or it may be additional information provided at the discretion of the manufacturer/distributor. "*Symbol*": A symbol means a graphical element intended to succinctly convey information.
"Label" means any written, printed, or graphic material displayed on or affixed to containers of hazardous chemicals.	***Label*** means an appropriate group of written, printed or graphic information elements concerning a hazardous product, selected as relevant to the target sector (s), that is affixed to, printed on, or attached to the immediate container of a hazardous product, or to the outside packaging of a hazardous product; ***Label element*** means one type of information that has been harmonized for use in a label, e.g. pictogram, signal word;
No HCS definition	***Liquid*** means a substance or mixture which at 50 °C has a vapour pressure of not more than 300 kPa (3 bar), which is not completely gaseous at 20 °C and at a standard pressure of 101.3 kPa, and which has a melting point or initial melting point of 20 °C or less at a standard pressure of 101.3 kPa. A viscous substance or mixture for which a specific melting point cannot be determined shall be subjected to the ASTM D 4359-90 test; or to the test for determining fluidity (penetrometer test) prescribed in section 2.3.4 of Annex A of the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR);
"Mixture" means any combination of two or more chemicals if the combination is not, in whole or in part, the result of a chemical reaction.	***Mixture*** means a mixture or a solution composed of two or more substances in which they do not react; ***Alloy*** means a metallic material, homogeneous on a macroscopic scale, consisting of two or more elements so combined that they cannot be readily separated by mechanical means. Alloys are considered to be mixtures for the purpose of classification under the GHS;
"Oxidizer" means a chemical other than a blasting agent or explosive as defined in 1910.109(a), that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other	***Oxidizing gas*** means any gas which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does; ***Oxidizing liquid*** means a liquid which, while in itself not

gases.	necessarily combustible, may, generally by yielding oxygen, cause, or contribute to, the combustion of other material; ***Oxidizing solid*** means a solid which, while in itself not necessarily combustible, may, generally by yielding oxygen, cause, or contribute to, the combustion of other material;
"Organic peroxide" means an organic compound that contains the bivalent -O-O-structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.	***Organic peroxide*** means a liquid or solid organic substance which contains the bivalent -0-0- structure and may be considered a derivative of hydrogen peroxide, where one or both of the hydrogen atoms have been replaced by organic radicals. The term also includes organic peroxide formulation (mixtures);
"Identity" means any chemical or common name which is indicated on the material safety data sheet (MSDS) for the chemical. The identity used shall permit cross-references to be made among the required list of hazardous chemicals, the label and the MSDS.	***"Product identifier":*** A product identifier means the name or number used for a hazardous product on a label or in the SDS. It provides a unique means by which the product user can identify the substance or mixture within the particular use setting e.g. transport, consumer or workplace.
"Pyrophoric" means a chemical that will ignite spontaneously in air at a temperature of 130 deg. F (54.4 deg. C) or below.	"*Pyrophoric Liquid*": A pyrophoric liquid is a liquid which, even in small quantities, is liable to ignite within five minutes after coming into contact with air. *"**Pyrophoric Solid**": A pyrophoric solid is a solid which, even in small quantities, is liable to ignite within five minutes after coming into contact with air.* "*Pyrotechnic substance*": A substance or mixture of substances designed to produce an effect by heat, light, sound, gas or smoke or a combination of these as the result of non-detonative self-sustaining exothermic chemical reactions.
No HCS definition	"*Technical name*": A name that is generally used in commerce, regulations and codes to identify a substance or mixture, other than the IUPAC or CAS name, and that is recognized by the scientific community. Examples of technical names include those used for complex mixtures (e.g., petroleum fractions or natural products), pesticides (e.g., ISO or ANSI systems), dyestuffs (Colour Index system) and minerals.
"Trade secret" means any confidential formula, pattern, process, device, information or compilation of information that is used in an employer's business, and that gives the employer an opportunity to obtain an advantage over competitors who do not know or use it. Appendix D sets out the criteria to be used in evaluating trade secrets.	*CBI* means "confidential business information";
"Unstable (reactive)" means a chemical which in the pure state, or as produced or transported, will vigorously	"*Self-Heating Substance*": A self-heating substance is a solid or liquid substance, other than a pyrophoric substance,

polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature. "Pyrophoric" means a chemical that will ignite spontaneously in air at a temperature of 130 deg. F (54.4 deg. C) or below.	which, by reaction with air and without energy supply, is liable to self-heat; this substance differs from a pyrophoric substance in that it will ignite only when in large amounts (kilograms) and after long periods of time (hours or days).
"Unstable (reactive)" means a chemical which in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature.	"*Self-reactive Substance*": Self-reactive substances are thermally unstable liquid or solid substances liable to undergo a strongly exothermic decomposition even without participation of oxygen (air). This definition excludes substances or mixtures classified under the GHS as explosive, organic peroxides or as oxidizing.
"Water-reactive" means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.	"*Substances which, in contact with water, emit flammable gases*" are solid or liquid substances which, by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities.

Hazard Determination/Classification

Comparison
A significant difference between the HCS and GHS is the evaluation of mixtures. The GHS criteria for mixtures varies by hazard class. See individual end points for details. The HCS allows test data on mixtures to be used for all hazard classes. The GHS allows test data on carcinogens, mutagens & reproductive toxins on a case-by-case basis. The GHS expectation of physical test data for mixtures is another difference.
The HCS "floor" of hazardous chemicals is a difference and one which is likely helpful to small businesses. Guidance on how IARC, NTP and OSHA carcinogens fit with the GHS cancer classification scheme could also be useful guidance.

OSHA HCS 29CFR1910.1200[1]	GHS[2]
1910.1200(d) *Hazard Determination* (d)(1) Chemical manufacturers and importers shall evaluate chemicals produced in their workplaces or imported by them to determine if they are hazardous. Employers are not required to evaluate chemicals unless they choose not to rely on the evaluation performed by the chemical manufacturer or importer for the chemical to satisfy this requirement. (d)(2) Chemical manufacturers, importers or employers evaluating chemicals shall identify and consider the available scientific evidence concerning such hazards. For health hazards, evidence which is statistically significant and which is based on at least one positive study conducted in accordance with established scientific principles is considered to be sufficient to establish a hazardous effect if the results of the study meet the definitions of health hazards in this section. Appendix A shall be consulted for the scope of health hazards covered, and Appendix B shall be consulted for the criteria to be followed with respect to the completeness of the evaluation, and the data to be reported. (d)(3) The chemical manufacturer, importer or employer evaluating chemicals shall treat the following sources as establishing that the chemicals listed in them are hazardous: (d)(3)(i) 29 CFR part 1910, subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA); or, (d)(3)(ii) "Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment," American Conference of Governmental Industrial Hygienists (ACGIH) (latest edition). The chemical manufacturer, importer, or employer is still responsible for evaluating the hazards associated with the chemicals in these source lists in accordance with the requirements of this	**1.3.2 General considerations on the GHS** ***1.3.2.1 Scope of the System*** 1.3.2.1.1 The GHS applies to pure chemical substances, their dilute solutions and to mixtures of chemical substances. "Articles" as defined in the Hazard Communication Standard (29 CFR 1910.1200) of the US Occupational Safety and Health Administration, or by similar definition, are outside the scope of the system. 1.3.2.1.2 One objective of the GHS is for it to be simple and transparent with a clear distinction between classes and categories in order to allow for "self classification" as far as possible. For many hazard classes the criteria are semi-quantitative or qualitative and expert judgement is required to interpret the data for classification purposes. Furthermore, for some hazard classes (e.g. eye irritation, explosives or self-reactive substances) a decision tree approach is provided to enhance ease of use. 1.3.2.2 Concept of "Classification" 1.3.2.2.1 The GHS uses the term "hazard classification" to indicate that only the intrinsic hazardous properties of substances or mixtures are considered. 1.3.2.2.2 Hazard classification incorporates only 3 steps, i.e.: (a) identification of relevant data regarding the hazards of a substance or mixture; (b) subsequent review of those data to ascertain the hazards associated with the substance or mixture; and (c) a decision on whether the substance or mixture will be classified as a hazardous substance or mixture and the degree of hazard, where appropriate, by comparison of the data with agreed hazard classification criteria. 1.3.2.2.3 As noted in IOMC Description and Further Clarification of the Anticipated Application of the GHS text in the Purpose, Scope and Application (Chapter 1.1, paragraph **1.3.2.3** ***Classification criteria (mixtures)***

standard. (d)(4) Chemical manufacturers, importers and employers evaluating chemicals shall treat the following sources as establishing that a chemical is a carcinogen or potential carcinogen for hazard communication purposes: (d)(4)(i) National Toxicology Program (NTP), "Annual Report on Carcinogens" (latest edition); (d)(4)(ii) International Agency for Research on Cancer (IARC) "Monographs" (latest editions); or (d)(4)(iii) 29 CFR part 1910, subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration. (d)(5) The chemical manufacturer, importer or employer shall determine the hazards of mixtures of chemicals as follows: (d)(5)(i) If a mixture has been tested as a whole to determine its hazards, the results of such testing shall be used to determine whether the mixture is hazardous; (d)(5)(ii) If a mixture has not been tested as a whole to determine whether the mixture is a health hazard, the mixture shall be assumed to present the same health hazards as do the components which comprise one percent (by weight or volume) or greater of the mixture, except that the mixture shall be assumed to present a carcinogenic hazard if it contains a component in concentrations of 0.1 percent or greater which is considered to be a carcinogen under paragraph (d)(4) of this section; (d)(5)(iii) If a mixture has not been tested as a whole to determine whether the mixture is a physical hazard, the chemical manufacturer, importer, or employer may use whatever scientifically valid data is available to evaluate the physical hazard potential of the mixture; and,	The classification criteria for substances and mixtures are presented in Parts 2 and 3 of this document, each of which is for a specific hazard class or a group of closely related hazard classes. The recommended process of classification of mixtures is based on the following sequence: (a) Where test data are available for the complete mixture, the classification of the mixture will always be based on that data; (b) Where test data are not available for the mixture itself, then bridging principles included and explained in each specific chapter should be considered to see whether they permit classification of the mixture; In addition, for the health and environmental classes, (c) If (i) test data are not available for the mixture itself, and (ii) the available information is not sufficient to allow application of the above mentioned bridging principles, then the agreed method(s) described in each chapter for estimating the hazards based on the information known will be applied to classify the mixture. **1.3.1.2 *UNCETDG/ILO Working Group on Physical Hazards*** The UNCETDG/ILO Working Group for Physical Hazards used a similar process to the OECD Task Force on HCL. The work involved a comparison of the major classification systems, identification of similar or identical elements and for the elements, which were dissimilar, development of a consensus on a compromise. For physical hazards, however, the transport definitions, test methods and classification criteria were used as a basis for the work since they were already substantially harmonized. The work proceeded through examination of the scientific basis for the criteria, gaining consensus on the test methods, data interpretation and on the criteria. For most hazard classes, the existing schemes were already in place and being used by the transport sector. On this basis, a portion of the work focused on ensuring that workplace, environment and consumer safety issues were adequately addressed. See the individual health hazard classes for mixture considerations.

Labels

Comparison
The HCS label requirements will now have to be specified. GHS labels have pictograms, as well as specified signal words, and hazard statements. See pictogram table and label element comparison. The HCS provision for no component disclosure on labels is accommodated in the GHS. The use of transport pictograms in non-transport settings is an option, as is the use of a black border for GHS pictograms in domestic settings. See competent authority allowance discussions.

OSHA HCS 29CFR1910.1200[1]	GHS[2]
***1910.1200**(f) Labels and Other Forms of Warning* (f)(1) The chemical manufacturer, importer, or distributor shall ensure that each container of hazardous chemicals leaving the workplace is labeled, tagged or marked with the following information: (f)(1)(i) Identity of the hazardous chemical(s); (f)(1)(ii) Appropriate hazard warnings; and (f)(1)(iii) Name and address of the chemical manufacturer, importer, or other responsible party. (f)(4) If the hazardous chemical is regulated by OSHA in a substance-specific health standard, the chemical manufacturer, importer, distributor or employer shall ensure that the labels or other forms of warning used are in accordance with the requirements of that standard. (f)(6) The employer may use signs, placards, process sheets, batch tickets, operating procedures, or other such written materials in lieu of affixing labels to individual stationary process containers, as long as the alternative method identifies the containers to which it is applicable and conveys the information required by paragraph (f)(5) of this section to be on a label. The written materials shall be readily accessible to the employees in their work area throughout each work shift. (f)(7) The employer is not required to label portable containers into which hazardous chemicals are transferred from labeled containers, and which are intended only for the immediate use of the employee who performs the transfer. For purposes of this section, drugs which are dispensed by a pharmacy to a health care provider for direct administration to a patient are exempted from labeling. (f)(11) Chemical manufacturers, importers, distributors, or	**1.4.6.2 *Application of standardization in the harmonized system*** For labels, the hazard symbols, signal words and hazard statements have all been standardised and assigned to each of the hazard categories. These standardised elements should not be subject to variation, and should appear on the GHS label as indicated in the Chapters for each hazard class in this document. For safety data sheets, the chapter *Hazard Communication: Safety Data Sheets* (Chapter 1.5) provides a standardised format for the presentation of information. Whilst precautionary information was considered for standardisation, there was insufficient time to develop detailed proposals. However, there are examples of precautionary statements and pictograms in Annex 3 and it remains a goal to develop them into fully standardised label elements. 1.4.6.3 *Use of non-standardized or supplemental information* 1.4.6.3.1 There are many other label elements which may appear on a label which have not been standardised in the harmonized system. Some of these clearly need to be included on the label, for example precautionary statements. Competent authorities may require additional information, or suppliers may choose to add supplementary information on their own initiative. In order to ensure that the use of non-standardised information does not lead to unnecessarily wide variation in information or undermine GHS information, the use of supplementary information should be limited to the following circumstances: (a) the supplementary information provides further detail and does not contradict or cast doubt on the validity of the standardised hazard information; or; (b) the supplementary information provides information about hazards not yet incorporated into the GHS. In either instance, the supplementary information should not lower standards of protection. 1.4.6.3.2 The labeller should have the option of providing supplementary information related to the hazard, such as physical state or route of exposure, with the hazard statement rather than in the supplementary information section on the label, see also paragraph 1.4.10.5.4.1.

employers who become newly aware of any significant information regarding the hazards of a chemical shall revise the labels for the chemical within three months of becoming aware of the new information. Labels on containers of hazardous chemicals shipped after that time shall contain the new information. If the chemical is not currently produced or imported, the chemical manufacturer, importers, distributor, or employer shall add the information to the label before the chemical is shipped or introduced into the workplace again.	**1.4.10 Labelling procedures** 1.4.10.1 ***Scope*** The following sections describe the procedures for preparing labels in the GHS, comprising the following: (a) Allocation of label elements; (b) Reproduction of the symbol; (c) Reproduction of the hazard pictogram; (d) Signal words; (e) Hazard statements; (f)Precautionary statements and pictograms; (g) Product and supplier identification; (h) Multiple hazards and precedence of information; (i) Arrangements for presenting the GHS label elements; (j) Special labelling arrangements. 1.4.10.2 ***Label elements*** The tables in the individual Chapters for each hazard class detail the label elements (symbol, signal word, hazard statement) that have been assigned to each of the hazard categories of the GHS. Hazard categories reflect the harmonized classification criteria. A summary of the allocation of label elements is provided in Annex 1. There are special arrangements, which apply to the use of certain mixture concentrations in the GHS to take account of the information needs of different target audiences. These are further described in paragraph 1.4.10.5.4 1.4.10.5.2 *Information required on a GHS label* (a) Signal words A signal word means 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 the GHS are “Danger” and “Warning”. “Danger” is used for the more severe hazard categories (i.e. in the main for hazard categories 1 and 2), while “Warning” is used for the less severe. The tables in the individual Chapters for each hazard class detail the signal words that have been assigned to each of the hazard categories of the GHS. (b) Hazard statements A hazard statement means a phrase assigned to a hazard class and category that describes the nature of the hazards of a hazardous product, including, where appropriate, the degree of hazard. The tables of label elements in the individual Chapters for each hazard class detail the hazard statements that have been assigned to each of the hazard categories of the GHS. (c) Precautionary statements and pictograms A precautionary statement means a phrase (and/or pictogram) that describes recommended measures that should be taken to minimise or prevent adverse effects resulting from exposure to a hazardous product, or improper storage or handling of a hazardous product. The GHS label should include appropriate precautionary information, the choice of which is with the labeller or the competent authority. Annex 3 contains examples of precautionary statements, which can be used, and also

	examples of precautionary pictograms, which can be used where allowed by the Competent Authority. (d)Product identifier (i) A product identifier should be used on a GHS label and it should match the product identifier used on the SDS. Where a substance or mixture is covered by the UN Model Regulations on the Transport of Dangerous Goods, the UN proper shipping name should also be used on the package; (ii) The label for a substance should include the chemical identity of the substance. For mixtures or alloys, the label should include the chemical identities of all ingredients or alloying elements that contribute to acute toxicity, skin corrosion or serious eye damage, germ cell mutagenicity, carcinogenicity, reproductive toxicity, skin or respiratory sensitisation, or Target Organ Systemic Toxicity (TOST), when these hazards appear on the label. Alternatively, the Competent Authority may require the inclusion of all ingredients or alloying elements that contribute to the hazard of the mixture or alloy; (iii) Where a substance or mixture is supplied exclusively for workplace use, the competent authority may choose to give suppliers discretion to include chemical identities on the SDS, in lieu of including them on labels; (iv) The competent authority rules for CBI take priority over the rules for product identification. This means that where an ingredient would normally be included on the label, if it meets the competent authority criteria for CBI, its identity does not have to be included on the label. (e) Supplier identification 1.4.10.5.4 *Arrangements for presenting the GHS label elements* 1.4.10.5.4.1 Location of GHS information on the label The GHS hazard pictograms, signal word and hazard statements should be located together on the label. The Competent Authority may choose to provide a specified layout for the presentation of these and for the presentation of precautionary information, or allow supplier discretion. Specific guidance and examples are provided in the Chapters on individual hazard classes.

Workplace Labeling

Comparison
The HCS workplace labeling option is allowed in the GHS. This option is a common practice in many USA workplaces. See competent authority allowance discussion.

OSHA HCS 29CFR1910.1200[1]	GHS[2]
1910. 1200(f) (6)-(7) Workplace Labeling (f)(6) The employer may use signs, placards, process sheets, batch tickets, operating procedures, or other such written materials in lieu of affixing labels to individual stationary process containers, as long as the alternative method identifies the containers to which it is applicable and conveys the information required by paragraph (f)(5) of this section to be on a label. The written materials shall be readily accessible to the employees in their work area throughout each work shift. (f)(7) The employer is not required to label portable containers into which hazardous chemicals are transferred from labeled containers, and which are intended only for the immediate use of the employee who performs the transfer. For purposes of this section, drugs which are dispensed by a pharmacy to a health care provider for direct administration to a patient are exempted from labeling.	**1.4.10.5.5.1 Workplace labelling** Products falling within the scope of the GHS will carry the GHS label at the point where they are supplied to the workplace, and that label should be maintained on the supplied container in the workplace. The GHS label or label elements should also be used for workplace containers. However, the competent authority can allow employers to use alternative means of giving workers the same information in a different written or displayed format when such a format is more appropriate to the workplace and communicates the information as effectively as the GHS label. For example, label information could be displayed in the work area, rather than on the individual containers. Alternative means of providing workers with the information contained in GHS labels are needed usually where hazardous chemicals are transferred from an original supplier container into a workplace container or system, or where chemicals are produced in a workplace but are not packaged in containers intended for sale or supply. Chemicals that are produced in a workplace may be contained or stored in many different ways such as: small samples collected for testing or analysis, piping systems including valves, process or reaction vessels, ore cars, conveyer systems or free-standing bulk storage of solids. In batch manufacturing processes, one mixing vessel may be used to contain a number of different chemical mixtures. In many situations, it is impractical to produce a complete GHS label and attach it to the container, due, for example, to container size limitations or lack of access to a process container. Some examples of workplace situations where chemicals may be transferred from supplier containers include: containers for laboratory testing or analysis, storage vessels, piping or process reaction systems or temporary containers where the chemical will be used by one worker within a short timeframe. Decanted chemicals intended for immediate use could be labelled with the main components and directly refer the user to the supplier label information and SDS. All such systems should ensure that there is clear hazard communication. Workers should be trained to understand the specific communication methods used in a workplace. Examples of alternative methods include: use of product identifiers together with GHS symbols and other

	pictograms to describe precautionary measures; use of process flow charts for complex systems to identify chemicals contained in pipes and vessels with links to the appropriate SDS; use of displays with GHS symbols, colour and signal words in piping systems and processing equipment; use of permanent placarding for fixed piping; use of batch tickets or recipes for labelling batch mixing vessels and use of piping bands with hazard symbols and product identifiers**.**

Updating Labels

Comparison
The current HCS requirements for updating labels are accommodated by the GHS. Other options could be considered for the purpose of harmonization. See competent authority allowances discussion.

OSHA HCS 29CFR1910.1200[1]	GHS[2]
1910.1200(f)(11) updating labels (f)(11) Chemical manufacturers, importers, distributors, or employers who become newly aware of any significant information regarding the hazards of a chemical shall revise the labels for the chemical within three months of becoming aware of the new information. Labels on containers of hazardous chemicals shipped after that time shall contain the new information. If the chemical is not currently produced or imported, the chemical manufacturer, importers, distributor, or employer shall add the information to the label before the chemical is shipped or introduced into the workplace again.	**1.4.7 Updating information** All systems should specify a means of responding in an appropriate and timely manner to new information and updating labels and SDS information accordingly. The following are examples of how this could be achieved. **1.4.7.2 *General guidance on updating of information*** 1.4.7.2.1 Suppliers should respond to "new and significant" information they receive about a chemical hazard by updating the label and safety data sheet for that chemical. New and significant information is any information that changes the GHS classification of the substance or mixture and leads to a resulting change in the information provided on the label or any information concerning the chemical and appropriate control measures that may affect the SDS. This could include, for example, new information on the potential adverse chronic health effects of exposure as a result of recently published documentation or test results, even if a change in classification may not yet be triggered. 1.4.7.2.2 Updating should be carried out promptly on receipt of the information that necessitates the revision. The competent authority may choose to specify a time limit within which the information should be revised. This applies only to labels and SDS for products that are not subject to an approval mechanism such as pesticides. In pesticide labelling systems, where the label is part of the product approval mechanism, suppliers cannot update the supply label on their own initiative. However when the products are subject to the transport of dangerous goods requirements, the label used should be updated on receipt of the new information, as above. 1.4.7.2.3 Suppliers should also periodically review the information on which the label and safety data sheet for a substance or mixture is based, even if no new and significant information has been provided to them in respect of that substance or mixture. This will require e.g. a search of chemical hazard databases for new information. The competent authority may choose to specify a time (typically 3 – 5 years) from the date of original preparation, within which suppliers should review the labels and SDS information.

MSDS/SDS

Comparison

The performance orientation of the HCS MSDS will need to be changed. The GHS requires a 16 section MSDS format with a specified sequence and minimum required contents. See separate table for more detailed comparison of MSDS sections/information.

Based on requirements in existing systems, there is some discretion in the GHS for determining when an MSDS is required. The hazard pictogram/symbol can be graphically reproduced on the MSDS or the name of the symbol may be provided instead. The level of hazardous components can be given as ranges or concentrations.

OSHA HCS 29CFR1910.1200[1]	GHS[2]
1910.1200(g) MSDS **(g)(2)** Each material safety data sheet shall be in English (although the employer may maintain copies in other languages as well), and shall contain at least the following information: **(g)(2)(i)** The identity used on the label, and, except as provided for in paragraph (i) of this section on trade secrets: **(g)(2)(i)(A)** If the hazardous chemical is a single substance, its chemical and common name(s); **(g)(2)(i)(B)** If the hazardous chemical is a mixture which has been tested as a whole to determine its hazards, the chemical and common name(s) of the ingredients which contribute to these known hazards, and the common name(s) of the mixture itself; or, **(g)(2)(i)(C)** If the hazardous chemical is a mixture which has not been tested as a whole: **(g)(2)(i)(C)(1)** The chemical and common name(s) of all ingredients which have been determined to be health hazards, and which comprise 1% or greater of the composition, except that chemicals identified as carcinogens under paragraph (d) of this section shall be listed if the concentrations are 0.1% or greater; and, **(g)(2)(i)(C)(2)** The chemical and common name(s) of all ingredients which have been determined to be health hazards, and which comprise less than 1% (0.1% for carcinogens) of the mixture, if there is evidence that the ingredient(s) could be released from the mixture in concentrations which would exceed an established OSHA permissible exposure limit or ACGIH Threshold Limit Value, or could present a health risk to employees; and, **(g)(2)(i)(C)(3)** The chemical and common name(s) of all ingredients which have been determined to present a physical hazard when present in the mixture; **(g)(2)(ii)** Physical and chemical characteristics of the hazardous chemical (such as vapor pressure, flash point);	**Table 1.5.2 Minimum information for an SDS** (1) Product and company identification - GHS product identifier - Other means of identification. - Recommended use of the chemical and restrictions on use. - Supplier's details (including name, address, phone number etc). - Emergency phone number (2) Hazards identification - GHS classification of the substance/mixture and any regional information. - GHS label elements, including precautionary statements. (Hazard symbols may be provided as a graphical reproduction of the symbols in black and white or the name of the symbol e.g. flame, skull and crossbones.) - Other hazards which do not result in classification (e.g. dust explosion hazard) or are not covered by the GHS. (3) Composition/ Information On Ingredients **Substance** - Chemical identity - Common name, synonyms etc. - CAS number, EC number etc. - Impurities and stabilizing additives which are themselves classified and which contribute to the classification of the substance. **Mixture** - The chemical identity and concentration or concentration ranges of all ingredients which are hazardous within the meaning of the GHS and are present above their cut-off levels. - Cutoff level for reproductive toxicity, carcinogenicity and category 1 mutagenicity is $\geq$ 0.1% - Cutoff level for all other hazard classes is $\geq$ 1% Note: For information on ingredients, the competent authority rules for CBI take priority over the rules for product identification.

(g)(2)(iii) The physical hazards of the hazardous chemical, including the potential for fire, explosion, and reactivity; **(g)(2)(iv)** The health hazards of the hazardous chemical, including signs and symptoms of exposure, and any medical conditions which are generally recognized as being aggravated by exposure to the chemical; **(g)(2)(v)** The primary route(s) of entry; **(g)(2)(vi)** The OSHA permissible exposure limit, ACGIH Threshold Limit Value, and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the material safety data sheet, where available; **(g)(2)(vii)** Whether the hazardous chemical is listed in the National Toxicology Program (NTP) Annual Report on Carcinogens (latest edition) or has been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest editions), or by OSHA; **(g)(2)(viii)** Any generally applicable precautions for safe handling and use which are known to the chemical manufacturer, importer or employer preparing the material safety data sheet, including appropriate hygienic practices, protective measures during repair and maintenance of contaminated equipment, and procedures for clean-up of spills and leaks; **(g)(2)(ix)** Any generally applicable control measures which are known to the chemical manufacturer, importer or employer preparing the material safety data sheet, such as appropriate engineering controls, work practices, or personal protective equipment; **(g)(2)(x)** Emergency and first aid procedures; **(g)(2)(xi)** The date of preparation of the material safety data sheet or the last change to it; and, (g)(2)(xii) The name, address and telephone number of the chemical manufacturer, importer, employer or other responsible party preparing or distributing the material safety data sheet, who can provide additional information on the hazardous chemical and appropriate emergency procedures, if necessary. (g)(3) If no relevant information is found for any given category on the material safety data sheet, the chemical manufacturer, importer or employer preparing the material safety data sheet shall mark it to indicate that no applicable information was found.	(4) First-aid measures • Description of necessary measures, subdivided according to the different routes of exposure, i.e. inhalation, skin and eye contact and ingestion. • Most important symptoms/effects, acute and delayed. • Indication of immediate medical attention and special treatment needed, if necessary (5) Fire-fighting measures itable (and unsuitable) extinguishing media. ecific hazards arising from the chemical (e.g. nature of any hazardous combustion products). • Special protective equipment and precautions for fire-fighters (6) Accidental release measures - Personal precautions, protective equipment and emergency procedures. - Environmental precautions. - Methods and materials for containment and cleaning up. (7) Handling and storage • Precautions for safe handling. • Conditions for safe storage, including any incompatibilities (8) Exposure controls/personal protection - Control parameters e.g. occupational exposure limit values or biological limit values. - Appropriate engineering controls. - Individual protection measures, such as personal protective equipment (9) Physical and chemical properties - Appearance (physical state, colour etc) - Odour - Odour 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 - vapour pressure - vapour density - relative density: - solubility(ies) - partition coefficient: n-octanol/water: - auto-ignition temperature decomposition temperature (10) Stability and reactivity - Chemical stability.

(g)(5) [MSDS Updating] The chemical manufacturer, importer or employer preparing the material safety data sheet shall ensure that the information recorded accurately reflects the scientific evidence used in making the hazard determination. If the chemical manufacturer, importer or employer preparing the material safety data sheet becomes newly aware of any significant information regarding the hazards of a chemical, or ways to protect against the hazards, this new information shall be added to the material safety data sheet within three months. If the chemical is not currently being produced or imported the chemical manufacturer or importer shall add the information to the material safety data sheet before the chemical is introduced into the workplace again. (g)(10) [MSDS Format] Material safety data sheets may be kept in any form, including operating procedures, and may be designed to cover groups of hazardous chemicals in a work area where it may be more appropriate to address the hazards of a process rather than individual hazardous chemicals. However, the employer shall ensure that in all cases the required information is provided for each hazardous chemical, and is readily accessible during each work shift to employees when they are in in their work area(s).	- Possibility of hazardous reactions. - Conditions to avoid (e.g. static discharge, shock or vibration) - Incompatible materials - Hazardous decomposition products (11) Toxicological information Concise but complete and comprehensible description 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 eye 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). (12) Ecological information - Ecotoxicity (aquatic and terrestrial, where available). - Persistence and degradability - Bioaccumulative potential - Mobility in soil - Other adverse effects (13) Disposal considerations • Description of waste residues and information on their safe handling and methods of disposal, including any contaminated packaging. (14) Transport information • UN number • UN Proper shipping name. • Transport Hazard class(es). • Packing group, if applicable. • Marine pollutant (Yes/No). • Special precautions which a user needs to be aware of or needs to comply with in connection with transport or conveyance either within or outside their premises. (15) Regulatory information • Safety, health and environmental regulations specific for the product in question. (16) Other information • Other information including information on preparation and revision of the SDS **1.5.2 Criteria for determining whether an SDS should be produced** An SDS should be produced for all substances and

mixtures which meet the harmonised criteria for physical, health or environmental hazards under the GHS and for all mixtures which contain substances that meet the criteria for carcinogenic, toxic to reproduction or target organ systemic toxicity in concentrations exceeding the cut-off limits for SDS specified by the criteria for mixtures (see paragraph 6).The competent authority may choose also to require SDSs for mixtures not meeting the criteria for classification as hazardous but which contain hazardous substances in certain concentrations (see paragraph 6).

An SDS should be provided based on the following generic cut-off /concentration limits:

≥ 1% for acute toxicity, skin corrosion/irritation, serious damage to eyes/eye irritation, respiratory/skin sensitization, mutagenicity category 2, target organ toxicity (single & repeat) exposures, and hazardous to the environment; and

≥ 0.1% for mutagenicity category 1, carcinogenicity and reproductive toxicity.

As noted in the *Classification of Hazardous Substances and Mixtures* (Chapter 1.2, paragraphs 28-31), there may be some cases when the available hazard data may justify classification on the basis of other cut-off-limits than the generic ones specified in the health and environment hazard class chapters (Chapters 3.2 to 3.10). When such specific cut-offs are used for classification, they should also apply to the obligation to compile an SDS.

Some competent authorities (CA) may require SDSs to be compiled for mixtures which are not classified for acute toxicity or aquatic toxicity as a result of application of the additivity formula, but which contain acutely toxic substances or substances toxic to the aquatic environment in concentrations equal to or greater than 1 %.

In accordance with the building block principle, some competent authorities may choose not to regulate certain categories within a hazard class. In such situations, there would be no obligation to compile a SDS.

(The above 4 paragraphs are not part of the agreed text on hazard communication including SDSs developed by the ILO Working Group on Hazard Communication, but have been provided here as additional guidance on the compiling of an SDS).

Once it is clear that a SDS is required for a substance

	or a mixture then the information required to be included in the SDS should in all cases be provided in accordance with GHS requirements.

MSDS/SDS Component Disclosure

Comparison

The values for component disclosure in mixtures vary by end point. Some changes will be required on MSDS component disclosure. The level of hazardous components can be given as ranges or concentrations in the MSDS.

OSHA HCS 29CFR1910.1200[1]	GHS[2]
(g)(2)(i) The identity used on the label, and, except as provided for in paragraph (i) of this section on trade secrets: **(g)(2)(i)(A)** If the hazardous chemical is a single substance, its chemical and common name(s); **(g)(2)(i)(B)** If the hazardous chemical is a mixture which has been tested as a whole to determine its hazards, the chemical and common name(s) of the ingredients which contribute to these known hazards, and the common name(s) of the mixture itself; or, **(g)(2)(i)(C)** If the hazardous chemical is a mixture which has not been tested as a whole: **(g)(2)(i)(C)(1)** The chemical and common name(s) of all ingredients which have been determined to be health hazards, and which comprise 1% or greater of the composition, except that chemicals identified as carcinogens under paragraph (d) of this section shall be listed if the concentrations are 0.1% or greater; and, **(g)(2)(i)(C)(2)** The chemical and common name(s) of all ingredients which have been determined to be health hazards, and which comprise less than 1% (0.1% for carcinogens) of the mixture, if there is evidence that the ingredient(s) could be released from the mixture in concentrations which would exceed an established OSHA permissible exposure limit or ACGIH Threshold Limit Value, or could present a health risk to employees; and, **(g)(2)(i)(C)(3)** The chemical and common name(s) of all ingredients which have been determined to present a physical hazard when present in the mixture;	**Table 1.5.2 Minimum information for an SDS** 3. Composition/information on ingredients Substance • Chemical identity. • Common name, synonyms, etc. • CAS number, EC number, etc. • Impurities and stabilizing additives which are themselves classified and which contribute to the classification of the substance. Mixture • The chemical identity and concentration or concentration ranges of all ingredients which are hazardous within the meaning of the GHS and are present above their cut-off levels. *NOTE: For information on ingredients, the competent authority rules for CBI take priority over the rules for product identification.* **1.5.2 Criteria for determining whether an SDS should be produced** An SDS should be produced for all substances and mixtures which meet the harmonized criteria for physical, health or environmental hazards under the GHS and for all mixtures which contain substances that meet the criteria for carcinogenic, toxic to reproduction or target organ systemic toxicity in concentrations exceeding the cut-off limits for SDS specified by the criteria for mixtures (see paragraph1.5.3.1). The competent authority may choose also to require SDSs for mixtures not meeting the criteria for classification as hazardous but which contain hazardous substances in certain concentrations (see paragraph1.5.3.1). **1.5.3 General guidance for compiling a Safety Data Sheet** 1.5.3.1 Cut-off values/concentration limits 1.5.3.1.1 An SDS should be provided based on the generic cut-off values/concentration limit ≥ 1% for acute toxicity, skin corrosion/irritation, serious damage to eyes/eye irritation, respiratory/skin sensitization, mutagenicity category 2, target organ toxicity (single & repeat) exposures, and hazardous to the environment; and ≥ 0.1% for mutagenicity category 1, carcinogenicity and reproductive toxicity, (sensitizers). 1.5.3.1.2 As noted in the *Classification of Hazardous*

	Substances and Mixtures (see 1.3.3.2), there may be some cases when the available hazard data may justify classification on the basis of other cut-off values/concentration limits than the generic ones specified in the health and environment hazard class chapters (Chapters 3.2 to 3.10). When such specific cut-off values are used for classification, they should also apply to the obligation to compile an SDS. 1.5.3.1.3 Some competent authorities (CA) may require SDSs to be compiled for mixtures which are not classified for acute toxicity or aquatic toxicity as a result of application of the additivity formula, but which contain acutely toxic substances or substances toxic to the aquatic environment in concentrations equal to or greater than 1 %. 1.5.3.1.4 In accordance with the building block principle, some competent authorities may choose not to regulate certain categories within a hazard class. In such situations, there would be no obligation to compile an SDS. *(The paragraphs 1.5.3.1 – 1.5.3.4 are not part of the agreed text on hazard communication including SDSs developed by the ILO Working Group on Hazard Communication, but have been provided here as additional guidance on the compiling of an SDS).* 1.5.3.1.5 Once it is clear that an SDS is required for a substance or a mixture then the information required to be included in the SDS should in all cases be provided in accordance with GHS requirements.

Updating MSDS/SDS

<u>Comparison</u>
The current HCS requirements for updating MSDS are accommodated by the GHS. Other options could be considered for the purpose oh harmonization.

OSHA HCS 29CFR1910.1200[1]	GHS[2]
1910.1200(g)(5) updating MSDS (g)(5) [MSDS Updating] The chemical manufacturer, importer or employer preparing the material safety data sheet shall ensure that the information recorded accurately reflects the scientific evidence used in making the hazard determination. If the chemical manufacturer, importer or employer preparing the material safety data sheet becomes newly aware of any significant information regarding the hazards of a chemical, or ways to protect against the hazards, this new information shall be added to the material safety data sheet within three months. If the chemical is not currently being produced or imported the chemical manufacturer or importer shall add the information to the material safety data sheet before the chemical is introduced into the workplace again.	**1.4.7 Updating information** All systems should specify a means of responding in an appropriate and timely manner to new information and updating labels and SDS information accordingly. The following are examples of how this could be achieved. **1.4.7.2 *General guidance on updating of information*** 1.4.7.2.1 Suppliers should respond to "new and significant" information they receive about a chemical hazard by updating the label and safety data sheet for that chemical. New and significant information is any information that changes the GHS classification of the substance or mixture and leads to a resulting change in the information provided on the label or any information concerning the chemical and appropriate control measures that may affect the SDS. This could include, for example, new information on the potential adverse chronic health effects of exposure as a result of recently published documentation or test results, even if a change in classification may not yet be triggered. 1.4.7.2.2 Updating should be carried out promptly on receipt of the information that necessitates the revision. The competent authority may choose to specify a time limit within which the information should be revised. This applies only to labels and SDS for products that are not subject to an approval mechanism such as pesticides. In pesticide labelling systems, where the label is part of the product approval mechanism, suppliers cannot update the supply label on their own initiative. However when the products are subject to the transport of dangerous goods requirements, the label used should be updated on receipt of the new information, as above. 1.4.7.2.3 Suppliers should also periodically review the information on which the label and safety data sheet for a substance or mixture is based, even if no new and significant information has been provided to them in respect of that substance or mixture. This will require e.g. a search of chemical hazard databases for new information. The competent authority may choose to specify a time (typically 3 – 5 years) from the date of original preparation, within which suppliers should review the labels and SDS information.

Information & Training

Comparison The GHS has broad general training requirements. The HCS has more detailed training requirements than the GHS.	
OSHA HCS 29CFR1910.1200[1]	GHS[2]
(h) "Employee information and training." **(h)(1)** Employers shall provide employees with effective information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new physical or health hazard the employees have not previously been trained about is introduced into their work area. Information and training may be designed to cover categories of hazards (e.g., flammability, carcinogenicity) or specific chemicals. Chemical-specific information must always be available through labels and material safety data sheets. **(h)(2)** "Information." Employees shall be informed of: **(h)(2)(i)** The requirements of this section; **(h)(2)(ii)** Any operations in their work area where hazardous chemicals are present; and, **(h)(2)(iii)** The location and availability of the written hazard communication program, including the required list(s) of hazardous chemicals, and material safety data sheets required by this section. **(h)(3)** "Training." Employee training shall include at least: **(h)(3)(i)** Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.); **(h)(3)(ii)** The physical and health hazards of the chemicals in the work area; **(h)(3)(iii)** The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices,	**1.4.9 Training** Training users of hazard information is an integral part of hazard communication. Systems should identify the appropriate education and training for GHS target audiences who are required to interpret label and/or SDS information and to take appropriate action in response to chemical hazards. Training requirements should be appropriate for and commensurate with the nature of the work or exposure. Key target audiences for training include workers, emergency responders, and those involved in the preparation of labels, SDS and hazard communication strategies as part of risk management systems. Others involved in the transport and supply of hazardous chemicals also require training to varying degrees. In addition, systems should consider strategies required for educating consumers in interpreting label information on products that they use.

emergency procedures, and personal protective equipment to be used; and, **(h)(3)(iv)** The details of the hazard communication program developed by the employer, including an explanation of the labeling system and the material safety data sheet, and how employees can obtain and use the appropriate hazard information.	

Trade Secrets /CBI

Comparison
The GHS provides CBI principles and guidance. The GHS does not harmonize CBI requirements. The HCS is aligned with the CBI principles in the GHS.

OSHA HCS 29CFR1910.1200[1]	GHS[2]
i) "Trade secrets." **(i)(1)** chemical name and other specific identification of a hazardous chemical, from the material safety data sheet, provided that: **(i)(1)(i)** The claim that the information withheld is a trade secret can be supported; **(i)(1)(ii)** Information contained in the material safety data sheet concerning the properties and effects of the hazardous chemical is disclosed; **(i)(1)(iii)** The material safety data sheet indicates that the specific chemical identity is being withheld as a trade secret; and, **(i)(1)(iv)** The specific chemical identity is made available to health professionals, employees, and designated representatives in accordance with the applicable provisions of this paragraph. **(i)(2)** Where a treating physician or nurse determines that a medical emergency exists and the specific chemical identity of a hazardous chemical is necessary for emergency or first-aid treatment, the chemical manufacturer, importer, or employer shall immediately disclose the specific chemical identity of a trade secret chemical to that treating physician or nurse, regardless of the existence of a written statement of need or a confidentiality agreement. The chemical manufacturer, importer, or employer may require a written statement of need and confidentiality agreement, in accordance with the provisions of paragraphs (i)(3) and (4) of this section, as soon as circumstances permit. **(i)(3)** In non-emergency situations, a chemical manufacturer, importer, or employer shall, upon request, disclose a specific chemical identity, otherwise permitted to be withheld under paragraph (i)(1) of this section, to a health professional (i.e. physician, industrial hygienist, toxicologist, epidemiologist, or occupational health nurse) providing medical or other occupational health services to exposed employee(s), and to employees or designated representatives, if: **(i)(3)(i)**	**1.4.8 Confidential business information** 1.4.8.1 Systems adopting the GHS should consider what provisions may be appropriate for the protection of confidential business information (CBI). Such provisions should not compromise the health and safety of workers or consumers, or the protection of the environment. As with other parts of the GHS, the rules of the importing country should apply with respect to CBI claims for imported substances and mixtures. 1.4.8.2 Where a system chooses to provide for protection of confidential business information, competent authorities should establish appropriate mechanisms**,** in accordance with national law and practice, and consider: (a) whether the inclusion of certain chemicals or classes of chemicals in the arrangements is appropriate to the needs of the system; (b) what definition of "confidential business information" should apply, taking account of factors such as the accessibility of the information by competitors, intellectual property rights and the potential harm disclosure would cause to the employer or supplier's business; and (c) appropriate procedures for the disclosure of confidential business information, where necessary to protect the health and safety of workers or consumers, or to protect the environment, and measures to prevent further disclosure. 1.4.8.3 Specific provisions for the protection of confidential business information may differ among systems in accordance with national law and practice. However, they should be consistent with the following general principles: (a) For information otherwise required on labels or safety data sheets, CBI claims should be limited to the names of chemicals, and their concentrations in mixtures. All other information should be disclosed on the label and/or safety data sheet, as required; (b) Where CBI has been withheld, the label or chemical safety data sheet should so indicate; (c) CBI should be disclosed to the competent authority upon request. The competent authority should protect the confidentiality of the information in accordance with applicable law and practice; (d) Where a medical professional determines that a medical emergency exists due to exposure to a hazardous chemical

The request is in writing; **(i)(3)(ii)** The request describes with reasonable detail one or more of the following occupational health needs for the information: **(i)(3)(ii)(A)** To assess the hazards of the chemicals to which employees will be exposed; **(i)(3)(ii)(B)** To conduct or assess sampling of the workplace atmosphere to determine employee exposure levels; **i)(3)(ii)(C)** To conduct pre-assignment or periodic medical surveillance of exposed employees; **(i)(3)(ii)(D)** To provide medical treatment to exposed employees; **(i)(3)(ii)(E)** To select or assess appropriate personal protective equipment for exposed employees; **i)(3)(ii)(F)** To design or assess engineering controls or other protective measures for exposed employees; and, **(i)(3)(ii)(G)** To conduct studies to determine the health effects of exposure. **(i)(3)(iii)** The request explains in detail why the disclosure of the specific chemical identity is essential and that, in lieu thereof, the disclosure of the following information to the health professional, employee, or designated representative, would not satisfy the purposes described in paragraph (i)(3)(ii) of this section: **(i)(3)(iii)(A)** The properties and effects of the chemical; **(i)(3)(iii)(B)** Measures for controlling workers' exposure to the chemical; **(i)(3)(iii)(C)** Methods of monitoring and analyzing worker exposure to the chemical; and, **(i)(3)(iii)(D)** Methods of diagnosing and treating harmful exposures to the chemical; **(i)(3)(iv)** The request includes a description of the procedures to be used to maintain the confidentiality of the disclosed	or a chemical mixture, mechanisms should be in place to ensure timely disclosure by the supplier or employer or competent authority of any specific confidential information necessary for treatment. The medical professional should maintain the confidentiality of the information; (e) For non-emergency situations, the supplier or employer should ensure disclosure of confidential information to a safety or health professional providing medical or other safety and health services to exposed workers or consumers, and to workers or workers' representatives. Persons requesting the information should provide specific reasons for the disclosure, and should agree to use the information only for the purpose of consumer or worker protection, and to otherwise maintain its confidentiality; (f) Where non-disclosure of CBI is challenged, the competent authority should address such challenges or provide for an alternative process for challenges. The supplier or employer should be responsible for supporting the assertion that the withheld information qualifies for CBI protection.

information; and,

(i)(3)(v)
The health professional, and the employer or contractor of the services of the health professional (i.e. downstream employer, labor organization, or individual employee), employee, or designated representative, agree in a written confidentiality agreement that the health professional, employee, or designated representative, will not use the trade secret information for any purpose other than the health need(s) asserted and agree not to release the information under any circumstances other than to OSHA, as provided in paragraph (i)(6) of this section, except as authorized by the terms of the agreement or by the chemical manufacturer, importer, or employer.

(i)(4)
The confidentiality agreement authorized by paragraph (i)(3)(iv) of this section:

(i)(4)(i)
May restrict the use of the information to the health purposes indicated in the written statement of need;

(i)(4)(ii)
May provide for appropriate legal remedies in the event of a breach of the agreement, including stipulation of a reasonable pre-estimate of likely damages; and,

(i)(4)(iii)
May not include requirements for the posting of a penalty bond.

(i)(5)
Nothing in this standard is meant to preclude the parties from pursuing non-contractual remedies to the extent permitted by law.

(i)(6)
If the health professional, employee, or designated representative receiving the trade secret information decides that there is a need to disclose it to OSHA, the chemical manufacturer, importer, or employer who provided the limitations or conditions upon the disclosure of the requested chemical information as may be appropriate to assure that the occupational health services are provided without an undue risk of harm to the chemical manufacturer, importer, or employer.

(i)(11)
If a citation for a failure to release specific chemical identity information is contested by the chemical manufacturer, importer, or employer, the matter will be adjudicated before the Occupational Safety and Health Review Commission in accordance with the Act's enforcement scheme and the applicable Commission rules of procedure. In accordance

with the Commission rules, when a chemical manufacturer, importer, or employer continues to withhold the information during the contest, the Administrative Law Judge may review the citation and supporting documentation "in camera" or issue appropriate orders to protect the confidentiality of such matters.

(i)(12)
Notwithstanding the existence of a trade secret claim, a chemical manufacturer, importer, or employer shall, upon request, disclose to the Assistant Secretary any information which this section requires the chemical manufacturer, importer, or employer to make available. Where there is a trade secret claim, such claim shall be made no later than at the time the information is provided to the Assistant Secretary so that suitable determinations of trade secret status can be made and the necessary protections can be implemented.

(i)(13)
Nothing in this paragraph shall be construed as requiring the disclosure under any circumstances of process or percentage of mixture information which is a trade secret.

Appendix D Definition of Trade Secret (Mandatory)
The following is a reprint of the "Restatement of Torts" section 757, comment b (1939):
b. "Definition of trade secret." A trade secret may consist of any formula, pattern, device or compilation of information which is used in one's business, and which gives him an opportunity to obtain an advantage over competitors who do not know or use it. It may be a formula for a chemical compound, a process of manufacturing, treating or preserving materials, a pattern for a machine or other device, or a list of customers. It differs from other secret information in a business (see s759 of the Restatement of Torts which is not included in this Appendix) in that it is not simply information as to single or ephemeral events in the conduct of the business, as, for example, the amount or other terms of a secret bid for a contract or the salary of certain employees, or the security investments made or contemplated, or the date fixed for the announcement of a new policy or for bringing out a new model or the like. A trade secret is a process or device for continuous use in the operations of the business. Generally it relates to the production of goods, as, for example, a machine or formula for the production of an article. It may, however, relate to the sale of goods or to other operations in the business, such as a code for determining discounts, rebates or other concessions in a price list or catalogue, or a list of specialized customers, or a method of bookkeeping or other office management.
"Secrecy." The subject matter of a trade secret must be secret. Matters of public knowledge or of general knowledge in an industry cannot be appropriated by one as his secret.

Matters which are completely disclosed by the goods which one markets cannot be his secret. Substantially, a trade secret is known only in the particular business in which it is used. It is not requisite that only the proprietor of the business know it. He may, without losing his protection, communicate it to employees involved in its use. He may likewise communicate it to others pledged to secrecy. Others may also know of it independently, as, for example, when they have discovered the process or formula by independent invention and are keeping it secret. Nevertheless, a substantial element of secrecy must exist, so that, except by the use of improper means, there would be difficulty in acquiring the information. An exact definition of a trade secret is not possible. Some factors to be considered in determining whether given information is one's trade secret are: (1) The extent to which the information is known outside of his business; (2) the extent to which it is known by employees and others involved in his business; (3) the extent of measures taken by him to guard the secrecy of the information; (4) the value of the information to him and his competitors; (5) the amount of effort or money expended by him in developing the information; (6) the ease or difficulty with which the information could be properly acquired or duplicated by others.

"Novelty and prior art." A trade secret may be a device or process which is patentable; but it need not be that. It may be a device or process which is clearly anticipated in the prior art or one which is merely a mechanical improvement that a good mechanic can make. Novelty and invention are not requisite for a trade secret as they are for patentability. These requirements are essential to patentability because a patent protects against unlicensed use of the patented device or process even by one who discovers it properly through independent research. The patent monopoly is a reward to the inventor. But such is not the case with a trade secret. Its protection is not based on a policy of rewarding or otherwise encouraging the development of secret processes or devices. The protection is merely against breach of faith and reprehensible means of learning another's secret. For this limited protection it is not appropriate to require also the kind of novelty and invention which is a requisite of patentability. The nature of the secret is, however, an important factor in determining the kind of relief that is appropriate against one who is subject to liability under the rule stated in this Section. Thus, if the secret consists of a device or process which is a novel invention, one who acquires the secret wrongfully is ordinarily enjoined from further use of it and is required to account for the profits derived from his past use. If, on the other hand, the secret consists of mechanical improvements that a good mechanic can make without resort to the secret, the wrongdoer's liability may be limited to damages, and an injunction against future use of the improvements made with the aid of the secret may be inappropriate.

Multiple Hazards/Precedence

Comparison The HCS will need to consider label requirements for multiple hazards with prescribed pictograms and statements. Are all elements required? Is there a precedence? See competent authority allowances discussions.	
OSHA HCS 29CFR1910.1200[1]	GHS[2]
Multiple hazards CPL2-2.38D, Appendix A The label is intended to be an immediate visual reminder of the hazards of a chemical. It is not necessary, however, that every hazard presented by a chemical be listed on the label. Manufacturers, importers, and distributors will have to assess the evidence regarding the product's hazards and must consider exposures under normal circumstances of use or foreseeable emergencies when evaluating what hazards to put on the label. This is not to say that only acute hazards are to be listed on the label, or that well-substantiated hazards should be left off the label because they appear on the data sheet.	**1.4.10.5.3** ***Multiple hazards and precedence of hazard information*** The following arrangements apply where a substance or mixture presents more than one GHS hazard. It is without prejudice to the building block principle described in the *Purpose, Scope and Application* (Chapter 1.1). Therefore where a system does not provide information on the label for a particular hazard, the application of the arrangements should be modified accordingly. 1.4.10.5.3.1 Precedence for the allocation of symbols For substances and mixtures covered by the UNRecommendations on the Transport of Dangerous Goods, Model Regulations, the precedence of symbols for physical hazards should follow the rules of the UN Model Regulations. In workplace situations, the Competent Authority may require all symbols for physical hazards to be used. For health hazards the following principles of precedence apply: (a) if the skull and crossbones applies, the exclamation mark should not appear; (b)if the corrosive symbol applies, the exclamation mark should not appear where it is used for skin or eye irritation; (c) if the new health hazard symbol appears for respiratory sensitisation, the exclamation mark should not appear where it is used for skin sensitisation or for skin or eye irritation. 1.4.10.5.3.2 Precedence for allocation of signal words If the signal word 'Danger' applies, the signal word 'Warning' should not appear. 1.4.10.5.3.3 Precedence for allocation of hazard statements All assigned hazard statements should appear on the label. The Competent Authority may choose to specify the order in which they appear. 1.4.10.5.4 *Arrangements for presenting the GHS label elements* 1.4.10.5.4.1 Location of GHS information on the label The GHS hazard pictograms, signal word and hazard statements should be located together on the label. The Competent Authority may choose to provide a specified layout for the presentation of these and for the presentation of precautionary information, or allow supplier discretion. Specific guidance and examples are provided in the Chapters on individual hazard classes.

	There have been some concerns about how the label elements should appear on different packagings. Specific examples are provided in Annex 6. 1.4.10.5.4.2 Supplemental information The competent authority has the discretion to allow the use of supplemental information subject to the parameters outlined in 1.4.6.3. The competent authority may choose to specify where this information should appear on the label or allow supplier discretion. In either approach, the placement of supplemental information should not impede identification of GHS information.

Hazard Determination/Classification Provisions

Comparison

The GHS and HCS hazard determination/classification are self-classification processes. As classification is more involved in the GHS, additional guidance could be useful. The GHS includes weight of evidence in the hazard determination The HCS has a one positive study threshold. The GHS provides for the one positive study issue within the individual endpoints. *In vitro* studies are treated differently. Substances not bioavailable or inextricably bound are addressed. Professional/expert judgement is included. Human experience is taken into account. In the HCS negative findings and data which refute findings of hazard are allowed. The HCS does not address animal welfare.

The GHS addresses the import concept of previously classified substances. Existing data should be accepted when classifying substances under the GHS.

OSHA HCS 29CFR1910.1200[1]	GHS[2]
Appendix B Hazard Determination (mandatory) The quality of a hazard communication program is largely dependent upon the adequacy and accuracy of the hazard determination. The hazard determination requirement of this standard is performance-oriented. Chemical manufacturers, importers, and employers evaluating chemicals are not required to follow any specific methods for determining hazards, but they must be able to demonstrate that they have adequately ascertained the hazards of the chemicals produced or imported in accordance with the criteria set forth in this Appendix. ….. For purposes of this standard, the following criteria shall be used in making hazard determinations that meet the requirements of this standard. 1. "Carcinogenicity:" As described in paragraph (d)(4) of this section and Appendix A of this section, a determination by the National Toxicology Program, the International Agency for Research on Cancer, or OSHA that a chemical is a carcinogen or potential carcinogen will be considered conclusive evidence for purposes of this section. In addition, however, all available scientific data on carcinogenicity must be evaluated in accordance with the provisions of this Appendix and the requirements of the rule. …… 4. "Adequacy and reporting of data." The results of any studies which are designed and conducted according to established scientific principles, and which report statistically significant conclusions regarding the health effects of a chemical, shall be a sufficient basis for a hazard determination and reported on any material safety data sheet. *In vitro* studies alone generally do not form the basis for a definitive finding of hazard under the HCS since they have a positive or negative result rather than a statistically significant finding. The chemical manufacturer, importer, or employer may also report the results of other scientifically valid studies which tend to refute the findings of hazard.	**1.3.2.4 Available data, test methods and test data quality** 1.3.2.4.1 The GHS itself does not include requirements for testing substances or mixtures. Therefore, there is no requirement under the GHS to generate test data for any hazard class. It is recognised that some parts of regulatory systems do require data to be generated (e.g. pesticides), but these requirements are not related specifically to the GHS. The criteria established for classifying a mixture will allow the use of available data for the mixture itself and /or similar mixtures and /or data for ingredients of the mixture. 1.3.2.4.2 The classification of a chemical substance or mixture depends both on the criteria and on the reliability of the test methods underpinning the criteria. In some cases the classification is determined by a pass or fail of a specific test, (e.g. the ready biodegradation test for substances or ingredients of mixtures), while in other cases, interpretations are made from dose/response curves and observations during testing. In all cases, the test conditions need to be standardised so that the results are reproducible with a given chemical substance and the standardised test yields "valid" data for defining the hazard class of concern. In this context, validation is the process by which the reliability and the relevance of a procedure are established for a particular purpose. 1.3.2.4.3 Tests that determine hazardous properties, which are conducted according to internationally recognised scientific principles, can be used for purposes of a hazard determination for health and environmental hazards. The GHS criteria for determining health and environmental hazards are test method neutral, allowing different approaches as long as they are scientifically sound and validated according to international procedures and criteria already referred to in existing systems for the hazard of concern and produce mutually acceptable data. Test methods for determining physical hazards are generally more clear-cut, and are specified in the GHS.

	1.3.2.4.9.5 Both positive and negative results are assembled together in the weight of evidence determination. However, a single positive study performed according to good scientific principles and with statistically and biologically significant positive results may justify classification.
"Human data:" Where available, epidemiological studies and case reports of adverse health effects shall be considered in the evaluation.	1.3.2.4.7 *Evidence from humans* For classification purposes, reliable epidemiological data and experience on the effects of chemicals on humans (e.g. occupational data, data from accident databases) should be taken into account in the evaluation of human health hazards of a chemical. Testing on humans solely for hazard identification purposes is generally not acceptable.
Not addressed in HCS	1.3.2.4.6 *Animal welfare* The welfare of experimental animals is a concern. This ethical concern includes not only the alleviation of stress and suffering but also, in some countries, the use and consumption of test animals. Where possible and appropriate, tests and experiments that do not require the use of live animals are preferred to those using sentient live experimental animals. To that end, for certain hazards (skin and eye irritation/corrosion or serious damage) testing schemes starting with non-animal observations/measurements are included as part of the classification system. For other hazards, such as acute toxicity, alternative animal tests, using fewer animals or causing less suffering are internationally accepted and should be preferred to the conventional LD_{50} test.
"Animal data:" Human evidence of health effects in exposed populations is generally not available for the majority of chemicals produced or used in the workplace. Therefore, the available results of toxicological testing in animal populations shall be used to predict the health effects that may be experienced by exposed workers. In particular, the definitions of certain acute hazards refer to specific animal testing results (see Appendix A).	
Hazard evaluation is a process which relies heavily on the professional judgment of the evaluator, particularly in the area of chronic hazards. The performance-orientation of the hazard determination does not diminish the duty of the chemical manufacturer, importer or employer to conduct a thorough evaluation, examining all relevant data and producing a scientifically defensible evaluation	**1.3.2.4.8 Expert judgement** The approach to classifying mixtures includes the application of expert judgement in a number of areas in order to ensure existing information can be used for as many mixtures as possible to provide protection for human health and the environment. Expert judgement may also be required in interpreting data for hazard classification of substances, especially where weight of evidence determinations are needed.
Hazard evaluation is a process which relies heavily on the professional judgment of the evaluator, particularly in the area of chronic hazards. The performance-orientation of the hazard determination does not diminish the duty of the chemical manufacturer, importer or employer to conduct a thorough evaluation, examining all relevant data and	**1.3.2.4.4 Previously classified chemicals** One of the general principles established by the IOMC-CG-HCCS states that test data already generated for the classification of chemicals under the existing systems should be accepted when classifying these chemicals under the harmonized system thereby avoiding duplicative testing

producing a scientifically defensible evaluation	and the unnecessary use of test animals. This policy has important implications in those cases where the criteria in the GHS are different from those in an existing system. In some cases, it may be difficult to determine the quality of existing data from older studies. In such cases, expert judgement will be needed.
CPL2-2.38D Hazard Determination Decomposition products which are produced during the normal use of the product or in foreseeable emergencies (e.g., plastics which are injection molded, diesel fuel emissions) are covered. An employer may rely upon the hazard determination performed by the chemical manufacturer. Normally, the chemical manufacturer possesses knowledge of hazardous intermediates, by-products, and decomposition products that can be emitted by their product. Any substance which is inextricably bound in a product is not covered under the HCS. For example, a hazard determination for a product containing crystalline silica may reveal that it is bound in a rubber elastomer and under normal conditions of use or during foreseeable emergencies cannot become airborne and, therefore, cannot present an inhalation hazard. In such a situation, the crystalline silica need not be indicated as a hazardous ingredient since it cannot result in employee exposure.	**1.3.2.4.5 Substances / Mixtures posing special problems** The effect of a substance or mixture on biological and environmental systems is influenced, among other factors, by the physico chemical properties of the substance or mixture and/or ingredients of the mixture and the way in which ingredient substances are biologically available. Some groups of substances may present special problems in this respect, for example, some polymers and metals. A substance or mixture need not be classified when it can be shown by conclusive experimental data from internationally acceptable test methods that the substance or mixture is not biologically available. Similarly, bioavailability data on ingredients of a mixture should be used where appropriate in conjunction with the harmonized classification criteria when classifying mixtures.
"Adequacy and reporting of data." The results of any studies which are designed and conducted according to established scientific principles, and which report statistically significant conclusions regarding the health effects of a chemical, shall be a sufficient basis for a hazard determination and reported on any material safety data sheet. *In vitro* studies alone generally do not form the basis for a definitive finding of hazard under the HCS since they have a positive or negative result rather than a statistically significant finding. The chemical manufacturer, importer, or employer may also report the results of other scientifically valid studies which tend to refute the findings of hazard.	1.3.2.4.9. *Weight of evidence* 1.3.2.4.9.1 For some hazard classes, classification results directly when the data satisfy the criteria. For others, classification of a substance or a mixture is made on the basis of the total weight of evidence. This means that all available information bearing on the determination of toxicity is considered together, including the results of valid *in vitro* tests, relevant animal data, and human experience such as epidemiological and clinical studies and well-documented case reports and observations. 1.3.2.4.9.2 The quality and consistency of the data are important. Evaluation of substances or mixtures related to the material being classified should be included, as should site of action and mechanism or mode of action study results. Both positive and negative results are assembled together in a single weight of evidence determination. 1.3.2.4.9.3 Positive effects which are consistent with the criteria for classification in each chapter, whether seen in humans or animals, will normally justify classification. Where evidence is available from both sources and there is a conflict between the findings, the quality and reliability of the evidence from both sources must be assessed in order to resolve the question of classification. Generally, data of good quality and reliability in humans will have precedence over other data. However, even well-designed and

	conducted epidemiological studies may lack sufficient numbers of subjects to detect relatively rare but still significant effects, or to assess potentially confounding factors. Positive results from well-conducted animal studies are not necessarily negated by the lack of positive human experience but require an assessment of the robustness and quality of both the human and animal data relative to the expected frequency of occurrence of effects and the impact of potentially confounding factors. 1.3.2.4.9.4 Route of exposure, mechanistic information and metabolism studies are pertinent to determining the relevance of an effect in humans. When such information raises doubt about relevance in humans, a lower classification may be warranted. When it is clear that the mechanism or mode of action is not relevant to humans, the substance or mixture should not be classified.

Health Hazard Definition

Comparison See separate table for detailed technical comparison of HCS and GHS health hazards.	
OSHA HCS 29CFR1910.1200[1]	*GHS*[2]
Appendix A to 1910.1200 – Health Hazard Definitions	*GHS PART 3 Health and Environmental Hazards*

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1. U.S. DOL, OSHA, 29 CFR 1910.1200, The Hazard Communication Standard (HCS).
2. Globally Harmonized System of Classification and Labelling of Chemicals (GHS), Sub-Committee of Experts on the Globally Harmonized System of Classification and Labelling of Chemicals (Third Session, 10 -12 July 2002)

II. Comparison of Health Hazards

General Comments

The GHS has several health hazard endpoints, e.g., mutagenicity and target organ systemic toxicity, that do not exactly correspond to the HCS hazards. In general the major difference between the HCS and the GHS is untested mixtures. OSHA has a single 1% cut-off value for all health hazards, except carcinogens at 0.1%. These cut-off values require labels, MSDSs, and disclosure of hazardous components. In the GHS cut-off values for mixtures vary by endpoint. The GHS cut-off values for labeling, MSDSs and disclosure can be different. The GHS acute toxicity and irritant hazard determinations for mixtures have more steps.

For substances previously classified under the HCS, existing data should be accepted when these substances are classified under the GHS.

Comparison of OSHA HCS and GHS Criteria

Acute Toxicity

Comparison

Five GHS categories have been included in the GHS Acute Toxicity scheme from which the appropriate elements relevant to means of transport, consumer, worker and environment protection can be selected. The HCS has 2 Acute Toxicity hazard categories whose cut-off values do not exactly correspond to the GHS cut-offs. The untested mixture hazard determination is different in the HCS and GHS. The GHS Acute Toxicity hazard determination for mixtures is involved. Acute Toxicity is a common data set.

HCS Criteria	GHS Criteria
Criteria Substances and mixtures are assigned to one of two acute toxicity hazards on the basis of LD_{50}/LC_{50}: *"Highly toxic:"* A chemical falling within any of the following categories: (a) A chemical that has a median lethal dose (LD(50)) of 50 milligrams or less per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each. (b) A chemical that has a median lethal dose (LD(50)) of 200 milligrams or less per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each. (c) A chemical that has a median lethal concentration (LC(50)) in air of 200 parts per million by volume or less of gas or vapor, or 2 milligrams per liter or less of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each. *"Toxic."* A chemical falling within any of the following categories: (a) A chemical that has a median lethal dose (LD(50)) of more than 50 milligrams per kilogram but not more than 500 milligrams per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each. (b) A chemical that has a median lethal dose (LD(50)) of more than 200 milligrams per kilogram but not more than 1,000 milligrams per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each. (c) A chemical that has a median lethal concentration (LC(50)) in air of more than 200 parts per million but not more than 2,000 parts per million by volume of gas or vapor, or more than two milligrams per liter but not more than 20 milligrams per liter of mist, fume, or	Criteria Substances of this hazard class are assigned to one of five toxicity categories on the basis of LD_{50} (oral, dermal) or LC_{50} (inhalation): Category 1 $LD_{50} \leq 5$ mg/kg bodyweight (oral) $LD_{50} \leq 50$ mg/kg bodyweight (skin/dermal) $LC_{50} \leq 100$ ppm (gas) $LC_{50} \leq 0.5$ (mg/l) (vapour) $LC_{50} \leq 0.05$ (mg/l) (dust,mist) Category 2 $LD_{50} > 5$ and < 50 mg/kg bodyweight (oral) $LD_{50} > 50$ and < 200 mg/kg bodyweight (skin/dermal) $LD_{50} > 100$ and < 500 ppm (gas) $LD_{50} > 0.5$ and < 2.0 (mg/l) (vapour) $LC_{50} > 0.05$ and < 0.5 (mg/l) (dust, mist) Category 3 $LD_{50} > 50$ and < 300 mg/kg bodyweight (oral) $LD_{50} > 200$ and < 1000 mg/kg bodyweight (skin/dermal) $LC_{50} > 500$ and < 2500 ppm (gas) $LC_{50} > 2.0$ and < 10.0 (mg/l) (vapour) $LC_{50} > 0.5$ and < 1.0 (mg/l) (dust, mist) Category 4 LD50 between 300 and less than 2000 mg/kg bodyweight (oral) LD50 between 1000 and less than 2000 mg/kg bodyweight (skin/dermal) LC50 between 2500 and less than 5000 ppm (gas) LC50 between 10.0 and less than 20.0 (mg/l) (vapour) LC50 between 1.0 and less than 5.0 (mg/l) (dust, mist Category 5 LD50 between 2000 and 5000 (oral or skin/dermal) For gases, vapours, dusts, mists, LC50 in the equivalent range of the oral and dermal LD50 (i.e., between 2000 and 5000 mg/kg bodyweight). See also the additional criteria: • Indication of significant effect in humans • Any mortality at Category 4 • Significant clinical signs at Category 4

dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.	• Indication from other studies.

For mixtures:
Untested mixtures are assumed to present the same health hazards as components present at ≥ 1% (by weight or volume).
	For mixtures:
	Conversion values for range tests or hazard categories are in Table 3.1.2.
	"Relevant components" are those present at ≥1% (w/w for solids, liquids, dusts, mists and vapours and v/v for gases), unless there is a reason to suspect that an ingredient present at a < 1% is still relevant.
	• Apply bridging principles;
	• If bridging principles do not apply,
	    • If data available for all components or data available to estimate and unknown components ≤ 10% apply
	$\frac{100}{\mathrm{ATE}_{mix}} = \sum_{n} \frac{C_i}{\mathrm{ATE}_i}$
	where:
	C_i = concentration of ingredient i
	n ingredients and i is running from 1 to n
	ATE_i = Acute Toxicity Estimate of ingredient i.
	    • When unknown components > 10%, apply
	$\frac{100-(\sum \mathrm{C}_{\mathrm{unknown}} \text{if} > 10\%)}{ATE_{mix}} = \sum_{n} \frac{Ci}{ATEi}$

Skin corrosion

Comparison

A single harmonized GHS Corrosion category is provided. For authorities wanting more than one designation for Corrosivity, up to three subcategories are provided within the Corrosive category. Only some authorities will use the subcategories in Corrosive category 1. The HCS has one Corrosion hazard category. The untested mixture hazard determination is different in the HCS and GHS.

HCS Criteria	GHS Criteria
Definition/Criteria "*Corrosive*:" A chemical that causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the site of contact. For example, a chemical is considered to be corrosive if, when tested on the intact skin of albino rabbits by the method described by the U.S. Department of Transportation in appendix A to 49 CFR part 173, it destroys or changes irreversibly the structure of the tissue at the site of contact following an exposure period of four hours. This term shall not refer to action on inanimate surfaces. For mixtures: Untested mixtures are assumed to present the same health hazards as components present at ≥ 1% (by weight or volume).	Definition Skin corrosion means the production of irreversible damage to the skin following the application of a test substance for up to 4 hours. Criteria Substances and mixtures of this hazard class are assigned to a single harmonized corrosion category. Category1 1. *For Substances and Tested Mixtures*: • Human experience showing irreversible damage to the skin; • Structure/activity or structure property relationship to a substance or mixture already classified as corrosive; • pH extremes of ≤ 2 and ≥ 11.5 including acid/alkali reserve capacity; • Positive results in a valid and accepted *in vitro* skin corrosion test; or • Animal experience or test data that indicate that the substance/mixture causes irreversible damage to the skin following exposure of up to 4 hours (See Table 3.2.1) 2. *If data for a mixture are not available*, use bridging principles in 3.2.3.2. 3. *If bridging principles do not apply,* (a)For mixtures where substances can be added: Classify as corrosive if the sum of the concentrations of corrosive substances in the mixture is ≥ 5% (for substances with additivity); or (b)For mixtures where substances cannot be added: ≥ 1% corrosive substance. See 3.2.3.3.4. For those authorities wanting more than one designation for corrosivity, up to three subcategories are provided within the corrosive category: Subcategory 1A - ≤ 3 minutes exposure and ≤ 1 hour observation; Subcategory 1B - >3 minutes ≤ 1 hour exposure and ≤ 14 days observations; and Subcategory 1C - > 1 hour and ≤ 4 hours exposures and ≤ 14 days observations.

Skin irritation

Comparison

A single harmonized GHS Skin Irritant category is provided. An additional Mild Irritant category is available for authorities that want to have more than one Skin Irritant category. The HCS has one Skin Irritation hazard category. The untested mixture hazard determination is quite different in the HCS and GHS. The GHS Irritant hazard determination for mixtures is involved. Irritation data is a common data set.

HCS Criteria	GHS Criteria
Definition/Criteria "*Irritant*:" A chemical, which is not corrosive, but which causes a reversible inflammatory effect on living tissue by chemical action at the site of contact. A chemical is a skin irritant if, when tested on the intact skin of albino rabbits by the methods of 16 CFR 1500.41 for four hours exposure or by other appropriate techniques, it results in an empirical score of five or more. For mixtures: Untested mixtures are assumed to present the same health hazards as components present at ≥ 1% (by weight or volume).	Definition Skin irritation means the production of reversible damage to the skin following the application of a test substance for up to 4 hours. Criteria Substances and mixtures of this hazard class are assigned to a single irritant category. Category 2 1. *For Substances and Tested Mixtures* • Human experience or data showing reversible damage to the skin following exposure of up to 4 hours; • Structure/activity or structure property relationship to a substance or mixture already classified as an irritant; • Positive results in a valid and accepted *in vitro* skin irritation test; or • Animal experience or test data that indicate that the substance/mixture causes reversible damage to the skin following exposure of up to 4 hours , mean value of ≥ 2.3 < 4.0 for erythema/eschar or for oedema , or inflammation that persists to the end of the observation period, in 2 of 3 tested animals (Table3.2.2). 2. *If data for a mixture are not available*, use bridging principles in 3.2.3.2. 3. *If bridging principles do not apply*, classify as an irritant if: (a) For mixtures where substances can be added: the sum of concentrations of corrosive substances in the mixture is ≥ 1% but < 5%; the sum of the concentrations of irritant substances (Cat2) is ≥ 10%; or the sum of (10 x the concentrations of corrosive ingredients) + (the concentrations of irritant ingredients(Cat2)) is ≥ 10%; or (b) For mixtures where substances cannot be added: ≥ 3% an irritant substance(Cat2). (See 3.2.3.3.4) For those authorities wanting more than one designation for skin irritation, an additional mild irritant category is provided: Category 3 1. *For Substances and Tested Mixtures* • Animal experience or test data that

	indicates that the substance/mixture causes reversible damage to the skin following exposure of up to 4 hours, mean value of ≥ 1.5 < 2.3 for erythema/eschar in 2 of 3 tested animals (See Table 3.2.2) 2. *If data for a mixture are not available* and the bridging principles in 3.2.3.2. 3. *If bridging principles do not apply*, classify as mild irritant if: • For mixtures where substances can be added the sum of the concentrations of irritant substances(Cat2) in the mixture is ≥ 1% but < 10%; • the sum of the concentrations of mild irritant substances(Cat3) is ≥ 10%; • the sum of (10 x the concentrations of corrosive substances) + (the concentrations of irritant substances(Cat2)) is ≥ 1% but < 10%; or • the sum of (10 x the concentrations of corrosive substances) + (the concentrations of irritant substances(Cat2)) + (the concentrations of mild irritant substances (Cat3)) is ≥ 10%.

Serious eye damage

Comparison

A single harmonized GHS hazard category is provided for substances that have the potential to Seriously Damage the Eyes. In the GHS Skin Corrosives are considered to have serious eye damage. The HCS does not have a quantitative definition. The untested mixture hazard determination is different in the HCS and GHS.

HCS Criteria	GHS Criteria
Definition/Criteria "*Corrosive*:" A chemical that causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the site of contact. "*Irritant*:" A chemical, which is not corrosive, but which causes a reversible inflammatory effect on living tissue by chemical action at the site of contact. A chemical is an eye irritant if so determined under the procedure listed in 16 CFR 1500.42 or other appropriate techniques. For mixtures: Untested mixtures are assumed to present the same health hazards as components present at ≥ 1% (by weight or volume).	Definition Serious eye damage means the production of tissue damage in the eye, or serious physical decay of vision, following application of a test substance to the anterior surface of the eye, which is not fully reversible within 21 days of application. Criteria Substances and mixtures of this hazard class are assigned to a single harmonized hazard category. Category 1 – Irreversible Effects 1. *For Substances and Tested Mixtures* • Classification as corrosive to skin; • Human experience or data showing damage to the eye which is not fully reversible within 21 days; • Structure/activity or structure property relationship to a substance or mixture already classified as corrosive; • pH extremes of < 2 and > 11.5 including buffering capacity; • Positive results in a valid and accepted in vitro test to assess serious damage to eyes; or • Animal experience or test data that the substance or mixture produces either (1) in at least one animal, effects on the cornea, iris or conjunctiva that are not expected to reverse or have not reversed; or (2) in at least 2 of 3 tested animals a positive response of corneal opacity ≥ 3 and/or iritis >1.5. (See Table3.3.1) 2. *If data for a mixture are not available*, use bridging principles in 3.3.3.2. 3. *If bridging principles do not apply*, (a) For mixtures where substances can be added: Classify as Category 1 if the sum of the concentrations of substances classified as corrosive to the skin and/or eye Category 1 substances in the mixture is ≥ 3% or (b) For mixtures where substances cannot be added: ≥ 1%.See 3.3.3.3.4.

Eye irritation

Comparison

A single GHS Eye Irritant category (Cat 2A) is provided. An additional Mild Eye Irritant category (Cat 2B) is available for authorities that want to have more than one Eye Irritant category. The HCS has one Eye Irritation hazard category. In the GHS skin irritants can be considered to be eye irritants. The untested mixture hazard determination is different in the HCS and GHS. The GHS Eye Irritant hazard determination for mixtures is involved. Irritation data is a common data set.

HCS Criteria	GHS Criteria
Definition/Criteria "*Irritant*:" A chemical, which is not corrosive, but which causes a reversible inflammatory effect on living tissue by chemical action at the site of contact. A chemical is an eye irritant if so determined under the procedure listed in 16 CFR 1500.42 or other appropriate techniques. For mixtures: Untested mixtures are assumed to present the same health hazards as components present at ≥ 1% (by weight or volume).	Definition Eye irritation means the production of changes in the eye following the application of test substance to the anterior surface of the eye, which are fully reversible within 21 days of application. Criteria Substances of this hazard class are assigned to a single harmonized hazard category or for authorities wanting more than one designation for eye irritation one of two subcategories depending on whether effects are reversible in 21 or 7 days. For those authorities wanting more than one designation for eye irritation, two subcategories are provided within the eye irritation category: Category 2A – Irritant 1. *Substances and tested mixtures* • Classification as (severe) skin irritant; • Human experience or data showing production of changes in the eye which are fully reversible within 21 days; • Structure/activity or structure property relationship to a substance or mixture already classified as an eye irritant; • Positive results in a valid and accepted in vitro eye irritation test; or • Animal experience or test data that indicate that the substance/mixture produces a positive response in at least 2 of 3 tested animals of : corneal opacity ≥1, iritis ≥1, or conjunctival edema (chemosis) ≥2 (Table 3.3.2). 2. *If data for a mixture are not available*, use bridging principles in 3.3.3.2. 3. *If bridging does not apply*, classify as an irritant (2A) if: (a) For mixtures where substances can be added: the sum of the concentrations of skin and/or eye Category 1 substances in the mixture is ≥ 1% but < 3%; the sum of the concentrations of eye irritant substances (Cat2/2A) is ≥ 10%; or the sum of (10 x the concentrations of skin and/or eye category 1 substances) + (the concentrations of eye irritants(2A/2B)) is > 10% skin Cat1 + eye Cat1 is > 1% but < 3%; or (10 x eye category 1) + eye cat 2A/2B is > 10%

	(b) For mixtures where substances cannot be added: the sum of the concentrations of eye irritant ingredients(Cat2) is ≥ 3% (See 3.3.3.3.4) Category 2B – Mild Irritant An eye irritant is considered mildly irritating to eyes (Category 2B) when the effects listed above (Cat 2A) are fully reversible within 7 days of observation.

Respiratory sensitizer

Comparison The untested mixture hazard determination may be different in the HCS and GHS. OSHA will need to determine how to implement the mixture cut-off values.	
HCS Criteria	GHS Criteria
Definition/Criteria "*Sensitizer*:" A chemical that causes a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical. For mixtures: Untested mixtures are assumed to present the same health hazards as components present at ≥ 1% (by weight or volume).	Definition Respiratory sensitizer means a substance that induces hypersensitivity of the airways following inhalation of the substance. Criteria Substances and mixtures of this hazard class are assigned to one hazard category. 1. *For Substances and Tested Mixture* If there is human evidence that the individual substance induces specific respiratory hypersensitivity, and/or Where there are positive results from an appropriate animal test 2. *If these mixture meets the criteria* set forth in the "Bridging Principles" through one of the following: (a) Dilution (b) Batching (c) Substantially Similar Mixture *3. If bridging principles do not apply:* Mixtures containing ≥ 0.1% or ≥ 1.0 % (solid/liquid) (0.2% gas) of such a substance. See Notes Table 3.4.1, Chapter 3.4.

Skin sensitizer

Comparison

The untested mixture hazard determination may be different in the HCS and GHS. OSHA will need to determine how to implement the mixture cut-off values.

HCS Criteria	GHS Criteria
Definition/Criteria "*Sensitizer*:" A chemical that causes a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical. For mixtures: Untested mixtures are assumed to present the same health hazards as components present at ≥ 1% (by weight or volume).	Definition Skin sensitizer means a substance that will induce an allergic response following skin contact. The definition for "skin sensitizer" is equivalent to "contact sensitizer"; Criteria Substances and mixtures of this hazard class are assigned to one hazard category. 1. *For Substances and tested mixture* If there is evidence in humans that the individual substance can induce sensitization by skin contact in a substantial number of persons, or Where there are positive results from an appropriate animal test 2. *If the mixture meets the criteria* set forth in the "Bridging Principles" through one of the following: (a) Dilution (b) Batching (c) Substantially similar mixture *3. If bridging principles do not apply* Mixtures containing ≥ 0.1% or ≥ 1.0 % of such a substance. See Notes Table 3.4.1, Chapter 3.4.

Mutagenicity

Comparison

Since they have a positive or negative result rather than a statistically significant finding, the HCS does not generally consider *In vitro* studies alone to form the basis for a definitive finding of hazard. The HCS addresses chromosomal damage under reproductive toxins. The HCS allows test data on mixtures to be used for all hazard classes. The untested mixture hazard determination may be different in the HCS and GHS.

The GHS provides for two hazard categories to accommodate the weight of evidence. Since this hazard class is not an exact match with the HCS, consideration could be given as to how to implement this hazard class/categories.

HCS Criteria	GHS Criteria
Definition/Criteria Chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis). In vitro studies alone generally do not form the basis for a definitive finding of hazard under the HCS since they have a positive or negative result rather than a statistically significant finding. For mixtures: Untested mixtures are assumed to present the same health hazards as components present at ≥ 1% (by weight or volume).	Definition Mutagen means an agent giving rise to an increased occurrence of mutations in populations of cells and /or organisms. Criteria Substances and mixtures of this hazard class are assigned to one of two hazard categories. Category 1 has two subcategories. Category 1 Subcategory 1A Known to induce heritable mutations in the germ cells of humans • Positive evidence from human epidemiological studies. Subcategory 1B Regarded as if it induces heritable mutations in the germ cells of humans • Positive *in vivo* heritable germ cell mutagenicity tests in mammals; or • Positive *in vivo* somatic cell mutagenicity tests in mammals and evidence for potential germ cells mutations; or • Tests showing mutagenic effects in human germ cells without demonstration of transmission to progeny. See criteria in 3.5.2. Mixtures containing ≥ 0.1 % of such a substance. Category 2 Causes concern for man owing to the possibility that it may induce heritable mutations in the germ cells of humans • Evidence in mammals and/or *in vitro*: • *In vivo* Somatic cell mutagenicity tests, in mammals; or • *In vivo* somatic cell genotoxicity with *in vitro* mutagenicity assays. See criteria in 3.5.2. Mixtures containing ≥ 1.0 % of such a substance.

Carcinogenicity

Comparison

The HCS allows test data on mixtures to be used for all hazard classes. The GHS allows the HCS provision for inclusion on Safety Data Sheets of positive results in any carcinogenicity study performed according to good scientific principles with statistically significant results. The HCS will need to determine the implementation of the GHS mixture cut-off values.

HCS Criteria	GHS Criteria
Definition/Criteria "*Carcinogen*:" A chemical is considered to be a carcinogen if: (a) It has been evaluated by the International Agency for Research on Cancer (IARC), and found to be a carcinogen or potential carcinogen; or (b) It is listed as a carcinogen or potential carcinogen in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or, (c) It is regulated by OSHA as a carcinogen. OSHA has issued guidance how on IARC classifications apply to the HCS. Similar guidance for the GHS categories would be useful. For mixtures: Untested mixtures are assumed to present a carcinogenic hazard if components present at ≥ 0.1 % are considered to be a carcinogen.	Definition Carcinogen means a chemical substance or a mixture of chemical substances which induce cancer or increase its incidence. Criteria Substances and mixtures of this hazard class are assigned to one of two hazard categories. Category 1 has two subcategories. Category 1 : Known or Presumed Human Carcinogen Category 1A : Known Human Carcinogen • Based on human evidence Category 1B : Presumed Human Carcinogen • Strength of evidence with additional considerations • Evidence of animal carcinogenicity (presumed human carcinogen). • On a case by case basis, limited evidence of carcinogenicity in humans together with limited evidence of carcinogenicity in animals. Including mixtures containing ≥ 0.1% of such a substance. Category 2: Suspected human carcinogen • Evidence from human and/or animal studies, • Strength of evidence together with additional considerations. Including mixtures containing more than ≥ 0.1 or ≥ 1.0 % of such a substance.(See Notes 1 and 2 in Table 3.6.1 of Chapter 3.6.

Reproductive Toxicity

Comparison
The HCS allows test data on mixtures to be used for all hazard classes. The untested mixture hazard determination is different in the HCS and GHS. The HCS will need to determine the implementation of the GHS mixture cut-off values.

HCS Criteria	GHS Criteria
Definition/Criteria Reproductive toxins: Chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis) Signs & Symptoms: Birth defects; sterility Chemicals: Lead; DBCP For mixtures: Untested mixtures are assumed to present the same health hazards as components present at ≥ 1% (by weight or volume).	Criteria Effects on reproductive ability or capacity, and on development are considered separate issues. Substances and mixtures of this hazard class are assigned to one of two hazard categories. Category 1 has two subcategories. Category 1 Known or presumed human reproductive/ developmental toxicants Category 1A 1 Known human reproductive or developmental toxicants • Human evidence Category 1B Presumed human reproductive/ developmental toxicants • Evidence from experimental animals See criteria in 3.7.2.2.1 to 3.7.2.6.0 of Chapter 3.7.Mixtures containing ≥ 0.1% or ≥0.3 % of such a substance. See notes 1 and 2 of Table 3.7.1, Chapter 3.7. Category 2 :Suspected human reproductive/ developmental toxicants • Evidence from humans or experimental animals, possibly supplemented with other information. See criteria in 3.7.2.2.1 to 3.7.2.6.0 of Chapter 3.7. Mixtures containing ≥ 0.1% or ≥3.0 % of such a substance. See Notes 3 and 4 of Table 3.7.1, Chapter 3.7.

Effects on or via lactation

Comparison This special category is not specifically addressed in the HCS.	
HCS Criteria	GHS Criteria
Definition Criteria	Criteria Effects on or via lactation are assigned to a separate single category. Special Category Substances which cause concern for the health of breastfed children • Absorption, metabolism, distribution and excretion studies indicating likelihood the substance present in potentially toxic levels in breast milk; • Evidence from one or two generation studies of adverse effect in the offspring due to transfer in the milk or adverse effect on the quality of the milk; • Human evidence indicating a hazard to babies during the lactation period. See criteria in 3.7.2.2.1 to 3.7.2.6.0 and 3.7.3.4 of Chapter 3.7.

Target organ systemic toxicity following single exposure

Comparison The HCS does not distinguish between single and repeat exposure for Target Organ Effects. The GHS provides guidance on dose/concentration value ranges. The untested mixture hazard determination is different in the HCS and GHS. The HCS will need to determine the implementation of the GHS mixture cut-off values.	
HCS Criteria	GHS Criteria
Definition/Criteria *“Target organ effects."* The following is a target organ categorization of effects which may occur, including examples of signs and symptoms and chemicals which have been found to cause such effects. These examples are presented to illustrate the range and diversity of effects and hazards found in the workplace, and the broad scope employers must consider in this area, but are not intended to be all-inclusive. a. Hepatotoxins: Chemicals which produce liver damage Signs & Symptoms: Jaundice; liver enlargement Chemicals: Carbon tetrachloride; nitrosamines b. Nephrotoxins: Chemicals which produce kidney damage Signs & Symptoms: Edema; proteinuria Chemicals: Halogenated hydrocarbons; uranium c. Neurotoxins: Chemicals which produce their primary toxic effects on the nervous system Signs & Symptoms: Narcosis; behavioral changes; decrease in motor functions Chemicals: Mercury; carbon disulfide d. Agents which act on the blood or hematopoietic system: Decrease hemoglobin function; deprive the body tissues of oxygen Signs & Symptoms: Cyanosis; loss of consciousness Chemicals: Carbon monoxide; cyanides e. Agents which damage the lung: Chemicals which irritate or damage pulmonary tissue Signs & Symptoms: Cough; tightness in chest; shortness of breath Chemicals: Silica; asbestos	Criteria All significant health effects that can impair function, both reversible and irreversible, immediate and/or delayed are included in the non lethal target organ/systemic toxicity class. Substances and mixtures of this hazard class are assigned to one of two hazard categories based on evidence for substance or mixture (including bridging). Category 1 Significant toxicity in humans Adverse effect on specific organ/systems: • human cases or epidemiological studies • animal studies with severe effects at low dose • guidance values in Table 3.8.1 as part of weight of evidence evaluation. Mixture that lacks sufficient data, but contains Category 1 ingredient at a concentration of > 1% to < 10% for some authorities; and contains Category 1 ingredient at a concentration ≥10% for all authorities(See Notes of Table 3.8.2). Category 2 Harmful to humans Adverse effect on specific organ/systems: • animal studies with significant toxicity at moderate dose, considering weight of evidence and guidance values in Table 3.8.1 Mixture that lacks sufficient data, but contains Category 1 ingredient: > 1% but <10% for some authorities and ≥ 10% for all authorities (See Notes of Table 3.8.2); and /or contains Category 2 ingredient: : > 1% but <10% for some authorities and ≥ 10% for all authorities (See Notes of Table 3.8.2).

f. Reproductive toxins: Chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis) Signs & Symptoms: Birth defects; sterility Chemicals: Lead; DBCP g. Cutaneous hazards: Chemicals which affect the dermal layer of the body Signs & Symptoms: Defatting of the skin; rashes; irritation Chemicals: Ketones; chlorinated compounds h. Eye hazards: Chemicals which affect the eye or visual capacity Signs & Symptoms: Conjunctivitis; corneal damage Chemicals: Organic solvents; acids For mixtures: Untested mixtures are assumed to present the same health hazards as components present at ≥ 1% (by weight or volume).	

Target organ systemic toxicity following repeat exposure

Comparison

The HCS does not distinguish between single and repeat exposure for Target Organ Effects. The GHS provides guidance on dose/concentration value ranges. The untested mixture hazard determination may be different in the HCS and GHS. The HCS will need to determine the implementation of the GHS mixture cut-off values.

HCS Criteria	GHS Criteria
Definition/Criteria *"Target organ effects."* The following is a target organ categorization of effects which may occur, including examples of signs and symptoms and chemicals which have been found to cause such effects. These examples are presented to illustrate the range and diversity of effects and hazards found in the workplace, and the broad scope employers must consider in this area, but are not intended to be all-inclusive. a. Hepatotoxins: Chemicals which produce liver damage Signs & Symptoms: Jaundice; liver enlargement Chemicals: Carbon tetrachloride; nitrosamines b. Nephrotoxins: Chemicals which produce kidney damage Signs & Symptoms: Edema; proteinuria Chemicals: Halogenated hydrocarbons; uranium c. Neurotoxins: Chemicals which produce their primary toxic effects on the nervous system Signs & Symptoms: Narcosis; behavioral changes; decrease in motor functions Chemicals: Mercury; carbon disulfide d. Agents which act on the blood or hematopoietic system: Decrease hemoglobin function; deprive the body tissues of oxygen Signs & Symptoms: Cyanosis; loss of consciousness Chemicals: Carbon monoxide; cyanides e. Agents which damage the lung: Chemicals which irritate or damage pulmonary tissue Signs & Symptoms: Cough; tightness in chest; shortness of breath Chemicals: Silica; asbestos f. Reproductive toxins: Chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis) Signs & Symptoms: Birth defects; sterility Chemicals: Lead; DBCP	Criteria All significant health effects that can impair function, both reversible and irreversible, immediate and/or delayed are included in the non lethal target organ/systemic toxicity class. Substances and mixtures of this hazard class are assigned to one of two hazard categories based on evidence for substance or mixture (including bridging). Category 1 Significant toxicity in humans Adverse effect on specific organ/systems: • human cases or epidemiological studies • animal studies with severe effects at low dose • guidance values in Table 3.9.1, as part of weight of evidence evaluation. Mixture that lacks sufficient data, but contains Category 1 ingredient at a concentration of > 1% to < 10% for some authorities; and contains Category 1 ingredient at a concentration ≥ 10.0% for all authorities (See Notes of Table 3.9.3) Category 2 Harmful to humans Adverse effect on specific organ/systems: • animal studies with significant toxicity at moderate dose, considering weight of evidence and guidance values in Table 3.9.1 Mixture that lacks sufficient data, but contains Category 1 ingredient: > 1% but <10% for some authorities and ≥ 10% for all authorities (See Note 3 of Table 3.9.3); and /or contains Category 2 ingredient: : > 1% but <10% for some authorities and ≥ 10% for all authorities (See Notes of Table 3.9.3)

g. Cutaneous hazards: Chemicals which affect the dermal layer of the body Signs & Symptoms: Defatting of the skin; rashes; irritation Chemicals: Ketones; chlorinated compounds h. Eye hazards: Chemicals which affect the eye or visual capacity Signs & Symptoms: Conjunctivitis; corneal damage Chemicals: Organic solvents; acids For mixtures: Untested mixtures are assumed to present the same health hazards as components present at ≥ 1% (by weight or volume).	

III. Comparison of Physical Hazards

General Comments

In the GHS physical hazards are defined by criteria that specifies a test method. Physical hazard data may not be available or may not have been obtained by the specified test method. For several physical hazard endpoints the HCS criteria is a definition. The GHS has multiple subcategories within an endpoint. These subcategories lead to specific signal words, hazard phrases and pictograms. For substances previously classified under the HCS, existing data should be accepted when the substances are classified under the GHS.

Comparison of OSHA HCS and GHS Criteria

Explosives

Comparison
The HCS has only one hazard category for Explosives and the GHS has 6 hazard categories. The value of multiple hazard categories for the workplace should be addressed. The HCS does not require testing nor specify test methods.

HCS Criteria	GHS Criteria
Test Method HCS has no Test Method. Definition "Explosive" means a chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.	Test Method UN Manual of Tests and Criteria Part I Test Series 2 to 7 Recommended tests for Explosives (incl. Articles) 2(a) UN Gap test 2(b) Koenen test 2(c) Time/Pressure test 3(a)(ii) BAM Fallhammer 3(b)(i) BAM Friction apparatus 3(c) Thermal Stability test at 75°C 3(d) Small-scale burning test 4(a) Thermal Stability test for unpackaged articles and packaged articles 4(b)(i) Steel tube drop test for liquids 4(b)(ii) Twelve metre drop test for unpackaged articles, packaged articles and packaged substances 5(a) Cap sensitivity test 5(b)(ii) USA DDT test 5(c) External fire test for Division 1.5 6(a) Single package test 6(b) Stack test 6(c) External fire (bonfire) test 7(a) EIDS cap test 7(b) EIDS gap test 7(c)(ii) Friability test 7(d)(i) EIDS bullet impact test 7(e) EIDS external fire test 7(f) EIDS slow cook-off test 7(g) 1.6 Article external fire test 7(h) 1.6 Article slow cook-off test 7(j) 1.6 Article bullet impact-off test 7(k) 1.6 Article stack test Definition Explosive substance means a solid or liquid substance (or mixture of substances) which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings. Pyrotechnic substances are included even when they do not evolve gases. Criteria Substances, mixtures and articles of this class are assigned to one of six divisions 1.1 to 1.6 depending on the type of hazard they present: Division 1.1 Substances and articles which have a mass explosion hazard (a mass explosion

	one which affects almost the entire load virtually instantaneously); Division 1.2 Substances and articles which have a projection hazard but not a mass explosion hazard; Division 1.3 Substances and articles which have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard: 1. combustion of which gives rise to considerable radiant heat; or (ii) which burn one after another, producing minor blast or projection effects or both; Division 1.4 Substances and articles which present no significant hazard: Substances and articles which present only a small hazard in the event of ignition or initiation. The effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected. An external fire shall not cause virtually instantaneous explosion of almost the entire contents of the package; 1.5 Very insensitive substances which have a mass explosion hazard: substances which have a mass explosion hazard but are so insensitive that there is very little probability of initiation or of transition from burning to detonation under normal conditions; Division 1.6 Extremely insensitive articles which do not have a mass explosion hazard: articles which contain only extremely insensitive detonating substances and which demonstrate a negligible probability of accidental initiation or propagation. NOTE: Substances that are too unstable for allocation to the above divisions are also to be classified as explosive.

Flammable Gases

<u>Comparison</u>
The HCS has one hazard category for Flammable Gases. The GHS has 2 hazard categories. The HCS does not require testing nor specify test methods.

HCS Criteria	GHS Criteria
<u>Test Method</u> HCS has no test method. <u>Definition</u> "Gas, flammable" means: (A) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of thirteen (13) percent by volume or less; or (B) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than twelve (12) percent by volume, regardless of the lower limit;	<u>Test Method</u> ISO 10156:1996 <u>Definition</u> Flammable gas means a gas having a flammable range with air at 20 °C and a standard pressure of 101.3 kPa. <u>Criteria</u> Substances and mixtures of this hazard class are assigned to one of two hazard categories on the basis of the outcome of the test or calculation method: 1 Gases, which at 20°C and a standard pressure of 101.3kPa: (a) are ignitable when in a mixture of 13% or less by volume in air; or 1. have a flammable range with air of at least 12 percentage points regardless of the lower flammable limit. 2 Gases, other than those of category 1, which, at 20°C and a standard pressure of 101.3kPa, have a flammable range while mixed in air.

Flammable Aerosols

Comparison

The HCS has one hazard class/category for Flammable Aerosols. The GHS has 2 hazard categories. The HCS does not require testing.

HCS Criteria	GHS Criteria
Test Method 16 CFR 1500.45 Definition "Aerosol, flammable" means an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;	Test Method GHS Document Annex 11 Definition Aerosols means any non-refillable receptacles made of metal, glass or plastics and containing a gas compressed, liquefied or dissolved under pressure, with or without a liquid, paste or powder, and fitted with a release device allowing the contents to be ejected as solid or liquid particles in suspension in a gas, as a foam, paste or powder or in a liquid state or in a gaseous state. Aerosol includes aerosol dispensers. Criteria Substances and mixtures of this hazard class are assigned to one of two hazard categories on the basis of their components, i.e.: flammable liquids (see GHS Chapter 2.6); flammable gases (see GHS Chapter 2.2). flammable solids (see GHS Chapter 2.7); and, if applicable, the results of the foam test (for foam aerosols) and of the ignition distance test and enclosed space test (for spray aerosols): NOTE: Flammable components do not cover pyrophoric, self-heating or water-reactive substances because such components are never used as aerosol contents. The chemical heat of combustion (ΔHc), in kilojoules per gram (kJ/g), is the product of the theoretical heat of combustion (ΔHcomb), and a combustion efficiency, usually less than 1.0 (a typical combustion efficiency is 0.95 or 95%.). For a composite aerosol formulation, the chemical heat of combustion is the summation of the weighted heats of combustion for the individual components, as follows: $\Delta H_c \text{ (product)} = \Sigma \, [\, I\% \times \Delta H_{c(I)}]$ where: ΔH_c = chemical heat of combustion (kJ/g) $I\%$ = weight fraction of component I in the product $\Delta H_{c(I)}$ = chemical heat of combustion of component I (kJ/g). The chemical heats of combustion can be found in literature, calculated or determined by tests (see ASTM D 240, ISO/FDIS 13943:1999 (E/F) 86.l to 86.3 and NFPA 30B).

Oxidizing Gases

Comparison
The HCS covers Oxidizers as a class of chemicals with one category. The GHS covers Oxidizers by physical state with 1 hazard category for gases. The HCS does not require testing nor specify test methods.

HCS Criteria	GHS Criteria
Test Method HCS has no Test Method. Definition "Oxidizer" means a chemical other than a blasting agent or explosive as defined in 1910.109(a), that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.	Test Method ISO 10156:1996 Definition Oxidizing gas means any gas which may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does. Criteria Substances and mixtures of this hazard class are assigned to a single hazard category on the basis that, generally by providing oxygen, they cause or contribute to the combustion of other material more than air does.

Gases under Protection

Comparison

The HCS has one hazard class/category for Compressed Gases. The GHS uses physical state as a basis for 4 groups. The HCS does not require testing nor specify test methods.

HCS Criteria	GHS Criteria
Test Method HCS has no test method. Definition "Compressed gas" means: (i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70 deg. F (21.1 deg. C); or (ii) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130 deg. F (54.4 deg. C) regardless of the pressure at 70 deg. F (21.1 deg. C); or (iii) A liquid having a vapor pressure exceeding 40 psi at 100 deg. F (37.8 deg. C) as determined by ASTM D-323-72.	Test Method For this group of gases, the following information is required to be known: • The vapour pressure at 50°C • The physical state at 20°C at standard ambient pressure • The critical temperature. Data can be found in literature, calculated or determined by testing. Most pure gases are already classified in the UN Model Regulations. Criteria Gases are classified, according to their physical state when packaged, into one of four groups as follows: Compressed gases; A gas which when packaged under pressure is entirely gaseous at –50°C; including all gases with a critical temperature < –50°C. *Liquefied gases*; A gas which when packaged under pressure, is partially liquid at temperatures above –50°C. A distinction is made between: i) High pressure liquefied gas: a gas with a critical temperature between –50°C and –+65°C; and ii) Low pressure liquefied gas: a gas with a critical temperature above +65°C *Refrigerated liquefied gases* A gas which when packaged is made partially liquid because of its low temperature. *Dissolved gases* A gas which when packaged under pressure is dissolved in a liquid phase solvent. NOTE: The critical temperature is the temperature above which a pure gas cannot be liquefied, regardless of the degree of compression.

Flammable Liquids

Comparison

The HCS has two hazard categories for Flammable Liquids that cover the same flash point range as the 4 GHS categories. The HCS does not require testing.

HCS Criteria	GHS Criteria
Test Method Flashpoint: (i) Tagliabue Closed Tester (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24-1979 (ASTM D 56-79)) for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100 deg. F (37.8 deg. C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or (ii) Pensky-Martens Closed Tester (see American National Standard Method of Test for Flash Point by Pensky-Martens Closed Tester, Z11.7-1979 (ASTM D 93-79)) for liquids with a viscosity equal to or greater than 45 SUS at 100 deg. F (37.8 deg. C), or that contain suspended solids, or that have a tendency to form a surface film under test; or (iii) Setaflash Closed Tester (see American National Standard Method of Test for Flash Point by Setaflash Closed Tester (ASTM D 3278-78)). Definition "Liquid, flammable" means any liquid having a flashpoint below 100 deg. F (37.8 deg. C), except any mixture having components with flashpoints of 100 deg. F (37.8 deg. C) or higher, the total of which make up 99 percent or more of the total volume of the mixture.	Test Method Flash Point is determined by closed cup methods as provided in GHS Chapter 2.5, paragraph 11. Initial Boiling Point is also required Definition Flammable liquid means a liquid having a flash point of not more than 93 °C. Criteria Substances and mixtures of this hazard class are assigned to one of four hazard categories on the basis of the flash point and boiling point: 1 Flash point < 23°C & initial boiling point ≤ 35°C 2 Flash point < 23°C & initial boiling point > 35°C 3 Flash point ≥ 23°C and ≤ 60°C 4 Flash point > 60°C and ≤ 93°C NOTE 1 Gas oils, diesel and light heating oils in the flash point range of 55°C to 75°C may be regarded as a special group for some regulatory purposes. NOTE 2: Liquids with a flash point of more than 35°C may be regarded as non-flammable liquids for some regulatory purposes (e.g. transport) if negative results have been obtained in the sustained combustibility test L.2 of the UN Manual of Tests and Criteria Part III. NOTE 3: Viscous flammable liquids such as paints, enamels, lacquers, varnishes, adhesives and polishes may be regarded as a special group for some regulatory purposes (e.g. transport). The classification or the decision to consider these liquids as non-flammable may be determined by the pertinent regulation or competent authority.

Flammable Solids

Comparison

The HCS has one hazard class/category for Flammable Solids. The GHS has 2 hazard categories. The HCS does not require testing.

HCS Criteria	GHS Criteria
Test Method 16 CFR 1500.44 Definition "Solid, flammable" means a solid, other than a blasting agent or explosive as defined in 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.	Test Method UN Manual of Tests and Criteria Part III Test N.1 Definition Flammable solid means a solid which is readily combustible, or may cause or contribute to fire through friction. Criteria Substances and mixtures of this hazard class are assigned to one of two hazard categories on the basis of the outcome of the test: 1 Burning rate test: Substances other than metal powders: - wetted zone does not stop fire and - burning time < 45 seconds or burning rate > 2.2 mm/second Metal powders: - burning time ≤ 5 minutes 2 Burning rate test: Substances other than metal powders: - wetted zone stops the fire for at least 4 minutes and - burning time < 45 seconds or burning rate > 2.2 mm/second Metal powders: - burning time > 5 minutes and ≤ 10 minutes

Self Reactive Substances

Comparison

The HCS has only one hazard category for Self-Reactive (Unstable/Reactive) Substances. The GHS has 7 hazard categories. The value of multiple hazard categories for the workplace should be addressed. The HCS does not require testing nor specify test methods.

HCS Criteria	GHS Criteria
Test Method HCS has no Test Method. Definition "Unstable (reactive)" means a chemical which in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature.	Test Method UN Manual of Tests and Criteria Part II Test Series A to H Recommended tests for Self Reactive Substance A.6 UN Detonation test B 1 Detonation test in package C.1 Time/Pressure test C.2 Deflagration test D.1 Deflagration test in the package E.1 Koenen test E.2 Dutch pressure vessel test F.4 Modified Trauzl test G.1 Thermal explosion test in package H.1 United States SADT test (for packages) H.2 Adiabatic storage test (for packages etc) H.4 Heat accumulation storage test (for packages IBCs and small tanks)) Preliminary Safety Assessment Tests - Falling weight test for impact sensitivity - Friction or impacted friction test for friction sensitivity - test to assess thermal stability and the exothermic decomposition energy - test to assess the effect of ignition Definition Self-reactive substance means a thermally unstable liquid or solid substance liable to undergo a strongly exothermic decomposition even without participation of oxygen (air). This definition excludes substances or mixtures classified under the GHS as explosive, organic peroxides or as oxidizing. Criteria Substances and mixtures of this hazard class are assigned to one of the seven 'Types' A to G on the basis of the outcome of the tests. Any self-reactive substance should be considered for classification in this class unless: (a) They are explosives, according to the GHS criteria of Chapter 2.1; (b) They are oxidizing substances, according to the GHS criteria of Chapters 2.13 or 2.14; (c) They are organic peroxides, according to the GHS criteria of Chapter 2.15; (d) Their heat of decomposition is < 300 J/g; or (e) Their self-accelerating decomposition temperature (SADT) is > 75°C for 50kg package. Self-reactive substances are classified in one of the seven categories of "types A to G" for this class, according to the following principles:

	(A) Any self-reactive substance which can detonate or deflagrate rapidly, as packaged, will be defined as self-reactive substance **Type A** (B) Any self-reactive substance possessing explosive properties and which, as packaged, neither detonates nor deflagrates rapidly, but is liable to undergo a thermal explosion in that package will be defined as self-reactive substance **TYPE B**; (C) Any self-reactive substance possessing explosive properties when the substance as packaged cannot detonate or deflagrate rapidly or undergo a thermal explosion will be defined as self-reactive substance **TYPE C**; (D) Any self-reactive substance which in laboratory testing: (i) detonates partially, does not deflagrate rapidly and shows no violent effect when heated under confinement; or (ii) does not detonate at all, deflagrates slowly and shows no violent effect when heated under confinement; or (iii) does not detonate or deflagrate at all and shows a medium effect when heated under confinement; will be defined self-reactive substance **TYPE D**; (E) Any self-reactive substance which, in laboratory testing, neither detonates nor deflagrates at all and shows low or no effect when heated under confinement will be defined as self-reactive substance **TYPE E**; (F) Any self-reactive substance which, in laboratory testing, neither detonates in the cavitated state nor deflagrates at all and shows only a low or no effect when heated under confinement as well as low or no explosive power will be defined self-reactive substance **TYPE F**; **1.** Any self-reactive substance which, in laboratory testing, neither detonates in the cavitated state nor deflagrates at all and shows no effect when heated under confinement nor any explosive power, provided that it is thermally stable (self-accelerating decomposition temperature is 60°C to 75°C for a 50kg package), and, for liquid mixtures, a diluent having a boiling point not less than 150°C is used for desensitisation will be defined as self-reactive substance **TYPE G**. If the mixture is not thermally stable or a diluent having a boiling point less than 150°C is used for desensitisation, the mixture shall be defined self-reactive substance **TYPE F**

Pyrophoric Liquids

Comparison The HCS has one hazard class/category for Pyrophorics. The GHS covers Pyrophorics by physical state with one hazard category for Pyrophoric liquids. The HCS does not require testing nor specify test methods.	
HCS Criteria	GHS Criteria
Test Method HCS has no Test Method. Definition "Pyrophoric" means a chemical that will ignite spontaneously in air at a temperature of 130 deg. F (54.4 deg. C) or below.	Test Method UN Manual of Tests and Criteria Part III Test N.3 Definition Pyrophoric liquid means a liquid which, even in small quantities, is liable of igniting within five minutes after coming into contact with air. Criteria Substances and mixtures of this hazard class are assigned to a single hazard category on the basis of the outcome of the test: The liquid ignites within 5 minutes when added to an inert carrier and exposed to air, or it ignites or chars a filter paper on contact with air within 5 minutes.

Pyrophoric Solids

Comparison **The HCS has one hazard class/category for Pyrophorics. The GHS covers Pyrophorics by physical state with one hazard category for Pyrophoric solids. The HCS does not require testing nor specify test methods.**	
HCS Criteria	GHS Criteria
Test Method HCS has no Test Method. Definition "Pyrophoric" means a chemical that will ignite spontaneously in air at a temperature of 130 deg. F (54.4 deg. C) or below.	**Test Method** UN Manual of Tests and Criteria Part III Test N.2 **Definition** Pyrophoric solid means a solid which, even in small quantities, is liable of igniting within five minutes after coming into contact with air. Criteria Substances and mixtures of this hazard class are assigned to a single hazard category on the basis of the outcome of the test: The solid ignites within 5 minutes of coming into contact with air.

Self Heating Substances

Comparison

The HCS does not have this exact hazard class. According to the GHS building blocks, OSHA will need to determine if this hazard class will be in the HCS. The HCS does not require testing nor specify test methods.

HCS Criteria	GHS Criteria
Test Method HCS has no Test Method. Definition "Unstable (reactive)" means a chemical which in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature. Or "Pyrophoric" means a chemical that will ignite spontaneously in air at a temperature of 130 deg. F (54.4 deg. C) or below.	Test Method UN Manual of Tests and Criteria Part III Test N.4 Definition Self-heating substance means a solid or liquid substance, other than a pyrophoric substance, which, by reaction with air and without energy supply, is liable to self-heat; this substance differs from a pyrophoric substance in that it will ignite only when in large amounts (kilograms) and after long periods of time (hours or days). Criteria Substances and mixtures of this hazard class are assigned to one of two hazard categories on the basis of the outcome of the test: 1 A positive result is obtained in a test using a 25 mm sample cube at 140°C 2 (a) A positive result is obtained in a test using a 100 mm sample cube at 140°C and a negative result is obtained in a test using a 25 mm cube sample at 140°C and the substance is to be packed in packages with a volume of more than 3 m^3; or (b) A positive result is obtained in a test using a 100 mm sample cube at 140°C and a negative result is obtained in a test using a 25 mm cube sample at 140°C, a positive result is obtained in a test using a 100 mm cube sample at 120°C and the substance is to be packed in packages with a volume of more than 450 litres; or (c) A positive result is obtained in a test using a 100 mm sample cube at 140°C and a negative result is obtained in a test using a 25 mm cube sample at 140°C and a positive result is obtained in a test using a 100 mm cube sample at 100°C.

Substances which on Contact with Water emits Flammable Gases

Comparison
The HCS has one hazard class/category for Water Reactive. The GHS has 3 hazard categories. The HCS does not require testing nor specify test methods.

HCS Criteria	GHS Criteria
Test Method HCS has no test method. Definition "Water-reactive" means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.	Test Method UN Manual of Tests and Criteria Part III Test N.5 Definition Substance which, in contact with water, emit flammable gases means a solid or liquid substance or mixture which, by interaction with water, is liable to become spontaneously flammable or to give off flammable gases in dangerous quantities. Criteria Substances and mixtures of this hazard class are assigned to one of three hazard categories on the basis of the outcome of the test: 1 Any substance which reacts vigorously with water at ambient temperatures and demonstrates generally a tendency for the gas produced to ignite spontaneously, or which reacts readily with water at ambient temperatures such that the rate of evolution of flammable gas is equal to or greater than 10 litres per kilogram of substance over any one minute. 2 Any substance which reacts readily with water at ambient temperatures such that the maximum rate of evolution of flammable gas is equal to or greater than 20 litres per kilogram of substance per hour, and which does not meet the criteria for category 1. 3 Any substance which reacts slowly with water at ambient temperatures such that the maximum rate of evolution of flammable gas is equal to or greater than 1 litre per kilogram of substance per hour, and which does not meet the criteria for categories 1 and 2.

Oxidizing Liquids

Comparison The HCS covers Oxidizers as a class of chemicals with one category. The GHS covers Oxidizers by physical state with 3 hazard categories for liquids. The HCS does not require testing nor specify test methods.	
HCS Criteria	GHS Criteria
Test Method HCS has no Test Method. Definition "Oxidizer" means a chemical other than a blasting agent or explosive as defined in 1910.109(a), that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.	Test Method UN Manual of Tests and Criteria Part III Test O.2 Definition Oxidizing liquid means a liquid which, while in itself not necessarily combustible, may, generally by yielding oxygen, cause, or contribute to, the combustion of other material. Criteria Substances and mixtures of this hazard class are assigned to one of three hazard categories on the basis of the outcome of the test: 1. Any substance which, in the 1:1 mixture, by mass, of substance and cellulose tested, spontaneously ignites; or the mean pressure rise time of a 1:1 mixture, by mass, of substance and cellulose is less than that of a 1:1 mixture, by mass, of 50% perchloric acid and cellulose 2. Any substance which, in the 1:1 mixture, by mass, of substance and cellulose tested, exhibits a mean pressure rise time less than or equal to the mean pressure rise time of a 1:1 mixture, by mass, of 40% aqueous sodium chlorate solution and cellulose; and the criteria for category 1 are not met 3. Any substance which, in the 1:1 mixture, by mass, of substance and cellulose tested, exhibits a mean pressure rise time less than or equal to the mean pressure rise time of a 1:1 mixture, by mass, of 65% aqueous nitric acid and cellulose; and the criteria for category 1 and 2 are not met

Oxidizing Solids

Comparison

The HCS covers Oxidizers as a class of chemicals with one category. The GHS covers Oxidizers by physical state with 3 hazard categories for solids. The HCS does not require testing nor specify test methods.

HCS Criteria	GHS Criteria
Test Method HCS has no Test Method. Definition "Oxidizer" means a chemical other than a blasting agent or explosive as defined in 1910.109(a), that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.	Test Method UN Manual of Tests and Criteria Part III Test O.1 Definition Oxidizing solid means a solid which, while in itself not necessarily combustible, may, generally by yielding oxygen, cause, or contribute to, the combustion of other material. Criteria Substances and mixtures of this hazard class are assigned to one of three hazard categories on the basis of the outcome of the test: 1. Any substance which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning time less than the mean burning time of a 3:2 mixture, by mass, of potassium bromate and cellulose. 2. Any substance which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning time equal to or less than the mean burning time of a 2:3 mixture (by mass) of potassium bromate and cellulose and the criteria for category 1 are not met. 3. Any substance which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning time equal to or less than the mean burning time of a 3:7 mixture (by mass) of potassium bromate and cellulose and the criteria for categories 1 and 2 are not met.

Organic Peroxides

Comparison
The HCS covers Organic Peroxides as a class of chemicals with one category. The GHS has 7 hazard categories for Organic Peroxides. The value of multiple hazard categories for the workplace should be addressed. The HCS does not require testing nor specify test methods.

HCS Criteria	GHS Criteria
Test Method HCS has no Test Method. Definition "Organic peroxide" means an organic compound that contains the bivalent -O-O-structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.	Test Method UN Manual of Tests and Criteria Part II Test Series A to H Recommended tests for Organic Peroxides A.6 UN Detonation test B 1 Detonation test in package C.1 Time/Pressure test C.2 Deflagration test D.1 Deflagration test in the package E.1 Koenen test E.2 Dutch pressure vessel test F.4 Modified Trauzl test G.1 Thermal explosion test in package H.1 United States SADT test (for packages) H.2 Adiabatic storage test (for packages etc) H.4 Heat accumulation storage test (for packages IBCs and small tanks)) Preliminary Safety Assessment Tests - Falling weight test for impact sensitivity - Friction or impacted friction test for friction sensitivity - test to assess thermal stability and the exothermic decomposition energy - test to assess the effect of ignition Definition Organic peroxide means a liquid or solid organic substance which contains the bivalent -0-0-structure and may be considered a derivative of hydrogen peroxide, where one or both of the hydrogen atoms have been replaced by organic radicals. The term also includes organic peroxide formulation (mixtures). Criteria Substances and mixtures of this hazard class are assigned to one of the seven 'Types' A to G on the basis of the outcome of the tests: Any organic peroxide is considered for classification in this class, unless it contains: (a) Not more than 1.0% available oxygen from the organic peroxides when containing not more than 1.0% hydrogen peroxide; or (b) Not more than 0.5% available oxygen from the organic peroxides when containing more than 1.0% but not more than 7.0% hydrogen peroxide NOTE: The available oxygen content (%) of an organic peroxide mixture is given by the formula: $16 \times \Sigma (n_i \times c_i/m_i)$ where: n_i = number of peroxygen groups per molecule of organic peroxide i;

	c_i = concentration (mass %) of organic peroxide i; m_i= molecular mass of organic peroxide i Organic peroxides are classified in one of the seven hazard categories of "types A to G" for this class, according to the following principles: (A) Any organic peroxide mixture which can detonate or deflagrate rapidly, as packaged, will be defined as organic peroxide **TYPE A**; (B) Any organic peroxide mixture possessing explosive properties and which, as packaged, neither detonates nor deflagrates rapidly, but is liable to undergo a thermal explosion in that package will be defined as organic peroxide **TYPE B**; (C) Any organic peroxide mixture possessing explosive properties when the substance as packaged cannot detonate or deflagrate rapidly or undergo a thermal explosion will be defined as organic peroxide **TYPE C**; (D) Any organic peroxide mixture which in laboratory testing: (i) detonates partially, does not deflagrate rapidly and shows no violent effect when heated under confinement; or (ii) does not detonate at all, deflagrates slowly and shows no violent effect when heated under confinement; or (iii) does not detonate or deflagrate at all and shows a medium effect when heated under confinement; will be defined as organic peroxide **TYPE D**; (E) Any organic peroxide mixture which, in laboratory testing, neither detonates nor deflagrates at all and shows low or no effect when heated under confinement will be defined as organic peroxide **TYPE E**; (F) Any organic peroxide mixture which, in laboratory testing, neither detonates in the cavitated state nor deflagrates at all and shows only a low or no effect when heated under confinement as well as low or no explosive power will be defined as organic peroxide **TYPE F**; (G) Any organic peroxide mixture which, in laboratory testing, neither detonates in the cavitated state nor deflagrates at all and shows no effect when heated under confinement nor any explosive power, provided that it is thermally stable (self-accelerating decomposition temperature is 60°C or higher for a 50 kg package), and, for liquid mixtures, a diluent having a boiling point of not less than 150°C is used for desensitisation, will be defined as organic peroxide **TYPE G**. If the mixture is not thermally stable or a diluent having a boiling point less than 150°C is used for desensitisation, the mixture shall be defined as organic peroxide **TYPE F**.

	NOTE 1: Type G has no hazard communication elements assigned but should be considered for properties belonging to other hazard classes. NOTE 2: Types A to G may not be necessary for all systems.

Substances Corrosive to Metal

Comparison

The HCS does not regulate Substances Corrosive to Metal. According to the GHS building block approach, OSHA needs to determine if the HCS will cover this hazard class in the future. The HCS does not have required testing or specified test methods.

HCS Criteria	GHS Criteria
Test Method HCS has no Test Method or Criteria/Definition. Definition HCS does not cover this classification. HCS Appendix A states: This term shall not refer to action on inanimate surfaces.	Test Method: Steel: ISO 9328 (II): 1991 - Steel type P235 Aluminium: ASTM G31-72 (1990) – non-clad types 7075-T6 or AZ5GU-T66 Definition *Corrosive to metal* means a substance or a mixture which by chemical action will materially damage, or even destroy, metals. Criteria Corrosion rate on steel or aluminum surfaces exceeding 6.25 mm per year at a test temperature of 55°C. A substance that is corrosive to metal is classified in a single hazard category for this class on the basis of the test.

IV. Comparison of Label Elements

General Comments

- The HCS label requirements are totally performance – oriented.
- The GHS labeling requirements are specified: signal words, hazard statements, and pictograms.
- The use of pictograms is a significant change for USA workplace labeling.
- If the HCS retains NTP/OSHA/IARC carcinogens, guidance on labeling could be a useful tool.
- USA liability concerns are a label consideration.
- As part of the HCS – GHS label comparison, a table of GHS pictograms and several examples of ANSI Z129.1 Hazardous Industrial Chemicals-Precautionary Labeling and GHS labels are provided.

Label elements

Comparison
For each GHS hazard class detailed GHS label elements (symbol, signal word, hazard statement) have been assigned to the hazard categories (subcategories). Hazard categories reflect the harmonized classification criteria. A summary of the allocation of label elements is provided in GHS Annex 1. There are special arrangements, which apply to the use of certain mixture concentrations in the GHS.

The performance - oriented nature of the OSHA HCS is particularly relevant in the labeling provisions. Implementation of specified GHS elements for all hazard classes and categories will be a major change to the HCS. The HCS requires the “identity” on labels. See the competent authority allowances discussion on product identifier.

HCS	GHS
(f)(1)(i) Identity of the hazardous chemical(s) "Identity" means any chemical or common name which is indicated on the material safety data sheet (MSDS) for the chemical. The identity used shall permit cross-references to be made among the required list of hazardous chemicals, the label and the MSDS. "Chemical name" means the scientific designation of a chemical in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS) rules of nomenclature, or a name which will clearly identify the chemical for the purpose of conducting a hazard evaluation. "Common name" means any designation or identification such as code name, code number, trade name, brand name or generic name used to identify a chemical other than by its chemical name.	Product identifier (i) A product identifier should be used on a GHS label and it should match the product identifier used on the SDS. Where a substance or mixture is covered by the UN Model Regulations on the Transport of Dangerous Goods, the UN proper shipping name should also be used on the package; (ii) The label for a substance should include the chemical identity of the substance. For mixtures or alloys, the label should include the chemical identities of all ingredients or alloying elements that contribute to acute toxicity, skin corrosion or serious eye damage, germ cell mutagenicity, carcinogenicity, reproductive toxicity, skin or respiratory sensitisation, or Target Organ Systemic Toxicity (TOST), when these hazards appear on the label. Alternatively, the Competent Authority may require the inclusion of all ingredients or alloying elements that contribute to the hazard of the mixture or alloy; (iii) Where a substance or mixture is supplied exclusively for workplace use, the competent authority may choose to give suppliers discretion to include chemical identities on the SDS, in lieu of including them on labels; (iv) The competent authority rules for CBI take priority over the rules for product identification. This means that where an ingredient would normally be included on the label, if it meets the competent authority criteria for CBI, its identity does not have to be included on the label.
	Signal word A signal word means 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 the GHS are “Danger” and “Warning”. “Danger” is used for the more severe hazard categories (i.e. in the main for hazard categories 1 and 2), while “Warning” is used for the less severe. The tables for each hazard class detail the signal words that have been assigned to each of the hazard categories of the GHS.
(f)(1)(ii) Appropriate hazard warnings; "Hazard warning" means 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), including target organ effects, of the chemical(s) in the container(s).	Hazard statement A hazard statement means a phrase assigned to a hazard class and category that describes the nature of the hazards of a hazardous product, including, where appropriate, the degree of hazard. The tables of label elements for each hazard class detail the hazard statements that have been assigned to each of the hazard categories of the GHS.
	Hazard pictogram A pictogram means a graphical composition that includes a symbol plus other graphic elements, such as a border, background pattern or colour that is intended to convey specific information. There are 9 symbols used in the pictograms: flame, flame over circle, exploding bomb, corrosion, gas cylinder, skull and crossbones, exclamation point, environment, new health hazard. See table. All hazard pictograms used in the GHS should be in the shape of a square set at a point. Pictograms prescribed by the GHS but not the UN Recommendations on the Transport of Dangerous Goods, Model Regulations, should have a black symbol on a white background with a red frame sufficiently wide to be clearly visible. However, when such a pictogram appears on a label for a package which will not be exported, the Competent Authority may choose to give suppliers and employers discretion to use a black border. In addition, Competent Authorities may allow the use of UN Recommendations on the Transport of Dangerous Goods, Model Regulations pictograms in other use settings where the package is not covered by the Model Regulations. Pictograms prescribed by the UN Recommendations on the Transport of Dangerous Goods, Model Regulations, will use a background and symbol colour as specified by those regulations.
	Precautionary statements and pictograms A precautionary statement means a phrase (and/or pictogram) that describes recommended measures that

	should be taken to minimise or prevent adverse effects resulting from exposure to a hazardous product, or improper storage or handling of a hazardous product. The GHS label should include appropriate precautionary information, the choice of which is with the labeller or the competent authority. Annex 3 contains examples of precautionary statements, which can be used, and also examples of precautionary pictograms, which can be used.
(f)(1)(iii) Name and address of the chemical manufacturer, importer, or other responsible party.	Supplier identification The name, address and telephone number of the manufacturer or supplier of the substance or mixture should be provided on the label.

IV. Comparison of Label Elements

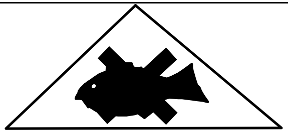
GHS & Transport Pictograms

General Comments

- The GHS pictograms are provided to assist in evaluating the GHS label elements.
- The transport pictograms are included to show the variation in background and color.

<table>
<tr><th colspan="3">GHS Pictograms & Hazard Classes</th></tr>
<tr>
<td>
• Explosives
• Self-reactives
• Organic peroxides</td>
<td>
• Flammables
• Self-reactives
• Pyrophorics
• Self-heating
• Emits flammable gas</td>
<td>
• Oxidizers
• Organic peroxides</td>
</tr>
<tr>
<td>
• Gases under pressure</td>
<td>
• Acute toxicity</td>
<td>
• Acute toxicity
• Skin irritation
• Eye irritation
• Skin sensitizers</td>
</tr>
<tr>
<td>
• Carcinogens
• Respiratory sensitizers
• Reproductive toxicity
• Target organ toxicity
• Germ cell mutagens</td>
<td>
• Eye corrosion
• Skin corrosion
• Corrosive to metal</td>
<td>
• Aquatic toxicity</td>
</tr>
</table>

Physical & Environmental Hazard Symbols

Hazard	**Transport Symbols**
Explosive	   
Flammability: Liquid, Solid, Gas, Pyrophoric, Emit Flammable Gas	   …..  …. 
Oxidizer Organic peroxide	 ………. 
Gasses under Pressure	
Corrosive to Metals	
Environmental	

IV. Comparison of Label Elements

Label Examples

Label Examples

The GHS label requirements are a significant change from performance-oriented HCS labels. Examples can be useful visual illustrations to understand what is being described verbally. Several label examples are included in this comparison. The ANSI Z 129.1, Hazardous Industrial Chemicals-Precautionary Labeling, label format has been used for the OSHA HCS label format.

EXAMPLE 1: Label for small workplace container (10 litre) packaged inside an outer shipping container – for workplace audience

Hazards (Liquid): flammable liquid, flash point = 120°F; oral LD50 = 275 mg/kg

EXAMPLE 2

Hazards (Liquid): moderate skin and eye irritant, possible cancer hazard by inhalation

EXAMPLE 3: large container (200 litre drum) for transport, emergency response and workplace audiences

Hazards (Liquid mixture): classified under GHS as toxic to reproduction, category 1B and flammable liquid, category 3. UN RTDG classification is flammable liquid - UN 1263.
** Competent Authorities may choose not to require disclosure of ingredient identities on the label of products intended only for for workplace use.

EXAMPLE 1

GHS Label

ToxiFlam

Danger!

Toxic if swallowed

Flammable liquid and vapour

Contains: XYZ

Do not taste or swallow. Get medical attention. 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, induce vomiting immediately, as directed by medical personnel. Never give anything by mouth to an unconscious person.

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

Company name, Address, Phone number

HAZARDS (Liquid): flammable liquid, flash point = 120°F; oral LD_{50} = 275 mg/kg

EXAMPLE1

ANSI/OSHA (HCS) Label

ToxiFlam

WARNING!

HARMFUL IF SWALLOWED

FLAMMABLE LIQUID AND VAPOR

Do not taste or swallow. Get medical attention. 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, induce vomiting immediately, as directed by medical personnel. Never give anything by mouth to an unconscious person.

IN CASE OF FIRE, use water fog, CO_2, 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 this container.

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

Company name, Address, Phone number

HAZARDS (Liquid): flammable liquid, flash point = 120°F; oral LD_{50} = 275 mg/kg

EXAMPLE 2

GHS Label

My Product
Warning!
Cause Skin And Eye Irritation
Suspected of causing cancer by inhalation
Contains: XYZ

Do not breathe vapors or mist. Use only with adequate ventilation. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling

FIRST AID
EYES: Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.
SKIN: In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Get medical attention if irritation develops and persists.

Company name, Address, Phone number

HAZARDS (Liquid): moderate skin and eye irritant, possible cancer hazard by inhalation

EXAMPLE 2

ANSI/OSHA (HCS) Label

My Product

CAUTION!

MAY CAUSE SKIN AND EYE IRRITATION

ATTENTION! POSSIBLE CANCER HAZARD - CONTAINS MATERIAL THAT MAY CAUSE CANCER BASED ON ANIMAL DATA

Do not breathe vapors or mist.
Use only with adequate ventilation.
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.

FIRST AID
EYES: Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.
SKIN: In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Get medical attention if irritation develops and persists.
INHALED: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
INGESTION: If swallowed, DO NOT induce vomiting unless directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

SPILL OR LEAK
Take steps to contain liquid and avoid runoff to waterways and sewer.

FIRE
In case of fire, use water spray, foam, dry chemical or CO_2.

HANDLING AND STORAGE
Keep away from strong acids and oxidizers. Do not apply air pressure, puncture or weld on or near this container.

For additional information, read Material Safety Data Sheet for this product.

24-hour emergency phone number

Company name
Address
Phone number

HAZARDS (Liquid): moderate skin and eye irritant, possible cancer hazard by inhalation

GHS Label for large container (200 litre drum) for transport, emergency response and workplace audiences

ZZZ Red Paint

Danger!
May damage fertility or the unborn child
Highly flammable liquid and vapor
** Contains lead pigments and cellosolve acetate

Keep away from heat and ignition sources. Keep away from food and drink. Avoid contact with skin and eyes and inhalation of vapor. Wash hands thoroughly after use and before eating

FIRST AID
For skin contact, remove contaminated clothing and wash affected area thoroughly with water. If irritation develops, seek medical attention. For eye contact, immediately flush eyes with flowing water for at least 15 minutes and seek medical attention.

GHS Example PLC, Leeds, England. Telephone 44 999 999 9999

UN 1263 **Paint**

** Competent Authorities may choose not to require disclosure of ingredient identities on the label of products intended only for for workplace use.

V. Comparison of MSDS Elements

General Comments

The GHS MSDS has more extensive information requirements than the HCS, e.g., transportation classifications and other pertinent product regulatory requirements. In general medium and large companies are using a 16 section MSDS format to comply with ANSI and ISO MSDS standards, EU directive and other global MSDS requirements. The GHS 16 section MSDS has information requirements that smaller companies may not currently be providing on MSDSs. However, information such as transportation classifications and other product regulatory information, should be available.

MSDS Comparison by Section

Comparison

The MSDS information required by the HCS can be provided in any format. OSHA Form 174 is optional. The GHS SDS requires 16 sections with a specified sequence and minimum specified information. The GHS SDS has minimum information requirements. The few HCS elements that are not specifically covered could be added: medical conditions aggravated; and protective measures during maintenance & repair. The component disclosure requirements are different in the HCS and GHS. A key difference is the GHS requirement for information that OSHA would not usually regulate: transport information, ecological information and the other pertinent regulatory information in Section 15.

GHS MSDS Sections	GHS SDS	OSHA HCS	OSHA Form 174
1. Product and company identification	- GHS product identifier - Other means of identification. - Recommended use of the chemical and restrictions on use. - Supplier's details (including name, address, phone number etc). - Emergency phone number.	- Product identity same as on label - Name address and telephone number of the manufacturer, distributor, employer or other responsible party	- IDENTITY (as Used on Label and List) - Manufacturer's name - Address (Number, Street, City, State and ZIP Code) - Emergency telephone number - Telephone number for information - Date prepared - Signature of preparer

2. Hazards identification	- GHS classification of the substance/mixture and any regional information.
	- GHS label elements, including precautionary statements. (Hazard symbols may be provided as a graphical reproduction of the symbols in black and white or the name of the symbol, e.g. flame, skull
		- health hazards including acute and chronic effects, listing target organs or systems
		- signs & symptoms of exposure
		- conditions generally recognized as aggravated by exposure
		- primary routes of exposure
		- if listed as a carcinogen by OSHA, IARC, NTP
			- Route(s) of Entry
			  - Inhalation
			  - Skin
			  - Ingestion
			- Health Hazards (Acute and Chronic)
			- Carcinogenicity
			- NTP
			- IARC
			- OSHA
			- Signs and Symptoms of Exposure

Hazards identification con't	and crossbones.) - Other hazards which do not result in classification (e.g. dust explosion hazard) or are not covered by the GHS.	- See Sections 5,9,10 for physical hazards	- Medical Conditions Generally Aggravated by Exposure
3. Composition/ information on ingredients	<u>Substance</u> - Chemical identity - Common name, synonyms etc. - CAS number, EC number, etc. - Impurities and stabilizing additives that are themselves classified and which contribute to the classification of the substance. <u>Mixture</u> - The chemical identity and concentration or concentration ranges of all ingredients which are hazardous within the meaning of the GHS and are present above their cut-off levels. Note: For information on ingredients, the competent authority rules for CBI take priority over the rules for product identification	- Chemical and common name of ingredients contributing to known hazards - For untested mixtures, the chemical & common name of ingredients at 1% or more that present a health hazard and those that present a physical hazard in the mixture - Ingredients at 0.1% or greater, if listed carcinogens	- Hazardous Components (Specific Chemical Identity, Common Name(s)) - OSHA PEL - ACGIH TLV - Other Recommended Limits - % (optional)

4. First-aid measures	• Description of necessary measures, subdivided according to the different routes of exposure, i.e. inhalation, skin and eye contact and ingestion. • Most important symptoms/effects, acute and delayed. • Indication of immediate medical attention and special treatment needed, if necessary	- emergency & first aid procedures	- Emergency and First Aid Procedures
5. Fire-fighting measures	- Suitable (and unsuitable) extinguishing media. - Specific hazards arising from the chemical (e.g. nature of any hazardous combustion products). - Special protective equipment and precautions for fire-fighters	- flammable property information such as flashpoint - physical hazards - generally applicable control measures	- Flash Point (Method Used) - Flammable Limits - LEL, UEL - Extinguishing Media - Special Fire Fighting Procedures - Unusual Fire and Explosion Hazards
6. Accidental release measures	- Personal precautions, protective equipment and emergency procedures. - Environmental precautions. - Methods and materials for containment and cleaning up.	- procedures for clean up of spills and leaks	- Steps to Be Taken in Case Material Is Released or Spilled

7. Handling and storage	• Precautions for safe handling. • Conditions for safe storage, including any incompatibilities	- precautions for safe handling & use, including appropriate hygienic practices	- Precautions to Be Taken in Handling and Storing - Other Precautions
8. Exposure controls/ personal protection	- Control parameters e.g. occupational exposure limit values or biological limit values. - Appropriate engineering controls. - Individual protection measures, such as personal protective equipment	- General applicable control measures - appropriate engineering controls and work practices - protective measures during maintenance & repair - personal protective equipment - permissible exposure levels, threshold limit values, listed by OSHA, ACGIH, or established company limits.	- Respiratory Protection (Specify Type) - Ventilation - Local Exhaust - Special - Mechanical (General) - Other - Protective Gloves - Eye Protection - Other Protective Clothing or Equipment - Work/Hygienic Practices
9. Physical and chemical properties	- Appearance (physical state, colour etc) - Odour - Odour 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 - vapour pressure - vapour density - relative density: - solubility(ies)	- physical & chemical characteristics of hazardous chemicals such as vapor pressure & density.	- Boiling Point - Specific Gravity (H20 = 1) - Vapor Pressure (mm Hg) - Melting Point - Vapor Density (AIR = 1) - Evaporation Rate (Butyl Acetate = 1) - Solubility in Water - Appearance and Odor

. Physical and chemical properties con't	- partition coefficient: n-octanol/water: - auto-ignition temperature - decomposition temperature		

10. Stability and reactivity	- Chemical stability.
	- Possibility of hazardous reactions.
	- Conditions to avoid (e.g. static discharge, shock or vibration)
	- Incompatible materials
	- Hazardous decomposition products
		- organic peroxides, pyrophoric, unstable(reactive), or water-reactive hazards
		- physical hazards, including reactivity and hazardous polymerization
			- Stability (Unstable / Stable)
			  - Conditions to Avoid
			- Incompatibility (Materials to Avoid)
			- Hazardous Decomposition or Byproducts
			- Hazardous Polymerization
			  - Conditions to Avoid

11. Toxicological information	- Concise but complete and comprehensible description 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 eye contact); - Symptoms related to the physical, chemical and toxicological characteristics; - Delayed and immediate effects and also chronic effects from short- and	- See also Section 2 - [health hazards including acute and chronic effects, listing target organs or systems - signs & symptoms of exposure - primary routes of exposure - if listed as a carcinogen by OSHA, IARC, NTP]	- See section2

Toxicological information con't	long-term exposure. - Numerical measures of toxicity (such as acute toxicity estimates)		
12. Ecological information	- Ecotoxicity (aquatic and terrestrial, where available). - Persistence and degradability - Bioaccumulative potential - Mobility in soil - Other adverse effects	- No present requirements	
13. Disposal considerations	- Description of waste residues and information on their safe handling and methods of disposal, including any contaminated packaging.	- See section 7 - No present requirements	- Waste Disposal Method
14. Transport information	- UN number - UN Proper shipping name. - Transport Hazard class(es). - Packing group, if applicable. - Marine pollutant (Y/N). - Special precautions which a user needs to be aware of or needs to comply with in connection with transport or conveyance either within or outside their premises.	- No present requirements	-

15. Regulatory information	- Safety, health and environmental regulations specific for the product in question.	- No present requirements	
16. Other information	- Other information including information on preparation and revision of the SDS	- Date of preparation of MSDS or date of last change	- See section 1

Comparison of MSDS Elements

Comparison

The GHS SDS has minimum information requirements. The few HCS elements that are not specifically covered could be added: medical conditions aggravated; and protective measures during maintenance & repair. The component disclosure requirements are different in the HCS and GHS. A key MSDS difference is the GHS requirement for information that OSHA does not regulate: transport information, ecological information and the other pertinent regulatory information in Section 15.

OSHA HCS	GHS
• Identity	• GHS product identifier. • Other means of identification.
	• Recommended use of the chemical and restrictions on use.
• Chemical & common names of substances	Substance • Chemical identity. • Common name, synonyms, etc. • CAS number, EC number, etc. • Impurities and stabilizing additives that are themselves classified and which contribute to the classification of the substance. • ***NOTE**: For information on ingredients, the competent authority rules for CBI take priority over the rules for product identification.*
Mixture • If the hazardous chemical is a mixture which has been tested as a whole to determine its hazards, the chemical and common name(s) of the ingredients which contribute to these known hazards, and the common name(s) of the mixture itself; or, If the hazardous chemical is a mixture which has not been tested as a whole: • The chemical and common name(s) of all ingredients which are health hazards, and are present at ≥ 1%, except carcinogens shall be listed at ≥ 0.1%; and, • The chemical and common name(s) of all ingredients which are health hazards, and are present at < 1% (< 0.1% for carcinogens) , if there is evidence that the ingredient(s) could be released from the mixture in concentrations which would exceed an established OSHA PEL or ACGIH TLV, or could present a health risk to employees; and, • The chemical and common name(s) of all ingredients which have been determined to present a physical hazard when present in the mixture;	Mixture • The chemical identity and concentration or concentration ranges of all ingredients which are hazardous within the meaning of the GHS and are present above their cut-off levels. See individual health hazards for cutoff values. • ***NOTE**: For information on ingredients, the competent authority rules for CBI take priority over the rules for product identification.*

• Chemical & physical characteristics (vapor pressure, flash point, etc.)	• Appearance (physical state, colour etc). • Odour. • Odour 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. • vapour pressure. • vapour density. • relative density. • solubility(ies). • partition coefficient: n-octanol/water. • auto-ignition temperature. • decomposition temperature.
• Physical hazards (fire, explosion, reactivity)	• GHS classification of the substance/mixture and any national or regional information. • Chemical stability. • Possibility of hazardous reactions. • Conditions to avoid (e.g. static discharge, shock or vibration). • Incompatible materials. • Hazardous decomposition products.
• OSHA, IARC, NTP Carcinogen	
• Health hazards	• GHS classification of the substance/mixture and any national or regional information. • Concise but complete and comprehensible description of the various toxicological (health) effects and the available data used to identify those effects, including: • Delayed and immediate effects and also chronic effects from short- and long-term exposure;
	• Numerical measures of toxicity (such as acute toxicity estimates). • available data used to identify those toxicological (health) effects,
• Signs & symptoms of exposure	• Most important symptoms/effects, acute and delayed. • Symptoms related to the physical, chemical and toxicological characteristics;
• Medical conditions aggravated	
• Primary route of entry	• information on the likely routes of exposure (inhalation, ingestion, skin and eye contact);
• First aid procedures	• Description of necessary first aid measures, subdivided according to the different routes of exposure, i.e. inhalation, skin and eye contact

	and ingestion. - Indication of immediate medical attention and special treatment needed, if necessary.
- Protective measures during maintenance	
- Precautions for safe handling	- Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging. - Other hazards which do not result in classification (e.g. dust explosion hazard) or are not covered by the GHS. - Environmental precautions.
- Hygienic practices	- Personal precautions, protective equipment and emergency procedures - Individual protection measures, such as personal protective equipment.
- Personal protective equipment	- Individual protection measures, such as personal protective equipment.
- OSHA PEL, ACGIH TLV, other limits	- Control parameters e.g. occupational exposure limit values or biological limit values.
- General applicable control measures	- Control parameters
- Engineering controls	- Appropriate engineering controls.
- Clean up procedures for spills or leaks	- Personal precautions, protective equipment and emergency procedures. - Methods and materials for containment and cleaning up.
- Date of preparation/changes to MSDS	- information on preparation and revision of the SDS
- Name/address/phone for additional information	- Supplier’s details (including name, address, phone number etc).
	- GHS label elements, including precautionary statements. (Hazard symbols may be provided as a graphical reproduction of the symbols in black and white or the name of the symbol, e.g., flame, skull and crossbones.)
- Emergency procedures	- Suitable (and unsuitable) extinguishing media. - Specific hazards arising from the chemical (e.g. nature of any hazardous combustion products). - Special protective equipment and precautions for fire-fighters. - Emergency phone number
	- Ecotoxicity (aquatic and terrestrial, where available) - Persistence and degradability. - Bioaccumulative potential. - Mobility in soil. - Other adverse effects.
	- UN number

	• UN Proper shipping name • Transport Hazard class(es) • Packing group, if applicable • Marine pollutant (Yes/No) • Special precautions which a user needs to be aware of or needs to comply with in connection with transport or conveyance either within or outside their premises
	• Safety, health and environmental regulations specific for the product in question
	• Other information including information on preparation and revision of the SDS

VI. GHS Competent Authority Allowances & Building Block Discussion

Competent Authority Allowances

The GHS includes areas where the competent authorities, such as OSHA, need to make decisions or choices about implementing the GHS within their national regulations. These GHS competent authority allowances are identified in this Section. For each allowance or building block the related HCS provisions are cited.

Building Block Approach.

The harmonized elements of the GHS can be seen as a collection of building blocks from which a regulatory system may be formed. All the harmonized GHS elements are available to the competent authorities. The full range of harmonized elements will not be adopted by all competent authorities. Building blocks that are related to the HCS and GHS implementation are discussed in this Section.

Numbering

The numbering in this Section allows cross-reference with the GHS. The numbers (x.x.x.x) refer to the paragraph numbers in the Globally Harmonized System of Classification and Labelling of Chemicals Master Document, Third Session, 10 -12 July 2002.

GHS Competent Authority Allowances & Building Block Discussion

1.1.1 Purpose, Scope & Application of the GHS

1.1.3.1.1 Application
Competent authorities will decide how to apply the various elements of the GHS based on the needs of the competent authority and the target audience. (See also *Hazard Communication: Labelling* (Chapter 1.4, paragraph 1.4.10.5.4.2) and *Consumer Product Labelling Based on the Likelihood of Injury*, Annex 4.)

Comment:
In implementing the GHS elements within the HCS the practical accommodations and interpretations of 17 years of experience with the HCS should be taken into account. The clarification of the GHS scope at 1.1.2.4 accommodates the current exceptions/exemptions of the HCS. However, going from a performance-oriented regulation to a specification regulation will require changes to individual elements of the HCS (criteria, labels, MSDS).

1.1.3.1.4 For the consumer sector, it is expected that labels will be the primary focus of GHS application. These labels will include the core elements of the GHS, subject to some sector-specific considerations in certain systems. (See also *Hazard Communication: Labelling* (Chapter 1.4, paragraph 1.4.10.5.4.2) and *Consumer Product Labelling Based on the Likelihood of Injury*, Annex 4)

Comment:
The current HCS labeling exception for CPSC labeled products is a pragmatic approach for consumer sector labeling.
CPSC - 29 CFR 1910.1200 (b)(5)(v) This section does not require labeling of the following chemicals: Any consumer product or hazardous substance as those terms are defined in the Consumer Product Safety Act (15 U.S.C. 2051 et seq.) and Federal Hazardous Substances Act (15 U.S.C. 1261 et seq.) respectively, when subject to a consumer product safety standard or labeling requirement of those Acts, or regulations issued under those Acts by the Consumer Product Safety Commission;

1.1.3.1.5.1 Consistent with the building block approach, countries are free to determine which of the *building blocks* will be applied in different parts of their systems.

Comment:
The building block approach gives competent authorities implementation options for the GHS. These options include:

- *Not using a GHS class*
- Not using a GHS category (normally at the beginning or end of a class, e.g., AcuteToxicity cat. 5)
- *Combining categories (e.g., AcuteToxicity cat.1 and 2)*
- *Inclusion or non-inclusion of non-harmonised classes/categories in addition to the GHS.*

Although the ultimate goal is harmonization, the value of the building blocks for each use setting should be considered. Harmonization may be a process where complete harmonization is not accomplished in the first stage. There may be situations where USGA need to coordinate GHS implementation, e.g., EPA'S EPCRA (MSDS) requirements. See individual building blocks for specific discussion.

1.3 Classification of Hazardous Substances & Mixtures

1.3.2.4.9.5
However, a single positive study performed according to good scientific principles and with statistically and biologically significant positive results may justify classification.

Comment:
Appendix B of the HCS currently uses this single-positive-study criteria for hazard determination and reporting on material safety data sheets.
29CFR 1910.1200 APPENDIX B (4). "Adequacy and reporting of data." The results of any studies which are designed and conducted according to established scientific principles, and which report statistically significant conclusions regarding the health effects of a chemical, shall be a sufficient basis for a hazard determination and reported on any material safety data sheet. In vitro studies alone generally do not form the basis for a definitive finding of hazard under the HCS since they have a positive or negative result rather than a statistically significant finding. The chemical manufacturer, importer, or employer may also report the results of other scientifically valid studies which tend to refute the findings of hazard.

1.3.3.2.2
However, if the classifier has information that the hazard of an ingredient will be evident below the generic cut-off values/concentration limits, the mixture containing that ingredient should be classified accordingly.

Comment:
The HCS has a similar provision.
Hazard Determination - 29 CFR 1910.1200 (d)(5)(iv) *If the chemical manufacturer, importer, or employer has evidence to indicate that a component present in the mixture in concentrations of less than one percent (or in the case of carcinogens, less than 0.1 percent) could be released in concentrations which would exceed an established OSHA permissible exposure limit or ACGIH Threshold Limit Value, or could present a health risk to employees in those concentrations, the mixture shall be assumed to present the same hazard.*

1.3.3.2.3 On occasion, conclusive data may show that the hazard of an ingredient will not be evident when present at a level above the generic GHS cut-off values/concentration limit(s). In these cases the mixture could be classified according to those data.

Comment:
The HCS addresses this in tested mixtures only.
Mixtures - 29 CFR 1910.**1200 (d)(5)(i)** *If a mixture has been tested as a whole to determine its hazards, the results of such testing shall be used to determine whether the mixture is hazardous;*

1.3.3.2.4 Adequate documentation supporting the use of any values other than the generic cut-off values/ concentration limits should be retained and made available for review on request.

Comment:
The HCS requires that the hazard determination procedure be described in writing.
Hazard Determination - 29 CFR 1910.1200 (d)(6) *Chemical manufacturers, importers, or employers evaluating chemicals shall describe in writing the procedures they use to determine the hazards of the chemical they evaluate. The written procedures are to be made available, upon request, to employees, their designated representatives, the Assistant Secretary and the Director. The written description may be incorporated into the written hazard communication program required under paragraph (e) of this section.*

1.4 Hazard Communication: Labeling

1.4.1.5
Therefore the UN Sub-Committee of Experts on the Transport of Dangerous Goods may choose not to include signal words and hazard statements as part of the information provided on the label under the Model Regulations.

Comment:
Although the UNCEDTG/DOT regulations may not include signal words and hazard statements per se, it would seem useful to coordinate OSHA and DOT coverage so that all employees are aware of the symbols, signal words and hazard statements that could be on containers of shipped material. The HCS addresses sealed containers. Sealed Containers - 29 CFR 1910.1200 (b)(4) In work operations where employees only handle chemicals in sealed containers which are not opened under normal conditions of use (such as are found in marine cargo handling, warehousing, or retail sales), this section applies to these operations only as follows:
(b)(4)(i) *Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced;* ***(b)(4)(ii)*** *Employers shall maintain copies of any material safety data sheets that are received with incoming shipments of the sealed containers of hazardous chemicals, shall obtain a material safety data sheet as soon as possible for sealed containers of hazardous chemicals received without a material safety data sheet if an employee requests the material safety data sheet, and shall ensure that the material safety data sheets are readily accessible during each work shift to employees when they are in their work area(s); and,* ***(b)(4)(iii)*** *Employers shall ensure that employees are provided with information and training in accordance with paragraph (h) of this section (except for the location and availability of the written hazard communication program under paragraph (h)(2)(iii) of this section), to the extent necessary to protect them in the event of a spill or leak of a hazardous chemical from a sealed container.*

1.4.6.3 Use of Non-Standardized or Supplemental Information
1.4.6.3.1
Competent authorities may require additional information, or suppliers may choose to add supplementary information on their own initiative.

Comment:
This provision for supplemental information could accommodate issues such as the OSHA specific chemical standards or hazards not covered in the GHS.. Supplemental information is particularly important in the USA where compliance with a regulation does ***NOT*** *mitigate liability. Allowing labellers the discretion to add additional information could be a key provision for implementation of the GHS in the USA. Guidance and examples would be a useful implementation tool. Since the HCS is performance-oriented, there are no restrictions for information on labels. It could be important to allow some current non-standardized information to be on GHS labels.*

1.4.6.3.2 The labeller should have the option of providing supplementary information related to the hazard, such as physical state or route of exposure, with the hazard statement rather than in the supplementary information section on the label, see also paragraph 1.4.10.5.4.1.

Comment:
In the USA the placement of supplementary information in another section of the label/container might be construed as being less noticeable and present an issue from a liability standpoint. The target audience might not always notice information in a different location. Guidance and examples would be useful implementation tools.

1.4.7.2.2 Updating should be carried out promptly on receipt of the information that necessitates the revision. The competent authority may choose to specify a time limit within which the information should be revised.

Comment:
The HCS has updating requirements for Labels and MSDSs. At this time it seem appropriate to continue with the current HCS requirements. See below. At some future point there might be global agreement on updating requirements for the GHS.

Labels - 29 CFR 1910.1200(f)(11) *Chemical manufacturers, importers, distributors, or employers who become newly aware of any significant information regarding the hazards of a chemical shall revise the labels for the chemical within three months of becoming aware of the new information. Labels on containers of hazardous chemicals shipped after that time shall contain the new information. If the chemical is not currently produced or imported, the chemical manufacturer, importers, distributor, or employer shall add the information to the label before the chemical is shipped or introduced into the workplace again.*

MSDS - 29 CFR 1910.1200 (g)(5) *The chemical manufacturer, importer or employer preparing the material safety data sheet shall ensure that the information recorded accurately reflects the scientific evidence used in making the hazard determination. If the chemical manufacturer, importer or employer preparing the material safety data sheet becomes newly aware of any significant information regarding the hazards of a chemical, or ways to protect against the hazards, this new information shall be added to the material safety data sheet within three months. If the chemical is not currently being produced or imported the chemical manufacturer or importer shall add the information to the material safety data sheet before the chemical is introduced into the workplace again.*

1.4.7.2.3
The competent authority may choose to specify a time (typically 3 – 5 years) from the date of original preparation, within which suppliers should review the labels and SDS information.

Comments:
The present HCS requirements for updating labels and MSDSs ensure that attention and resources are prioritized to provide the most recent significant information for a product. Updating every 3-5 years for all products may not be a wise use of limited resources. In the hopes of pursuing more global harmonization, future consideration might be given to MSDSs being reviewed at least every 10 years. A rationale being that technology, science, systems, regulations, etc. will have changed in 10 years.

1.4.8.2 Where a system chooses to provide for protection of confidential business information, competent authorities should establish appropriate mechanisms**,** in accordance with national law and practice ……

Comments:
*The trade secret provisions of the HCS (**29 CFR 1910.1200(i) and Appendix D**) are in accordance with USA law and the CBI principles listed in the GHS. The HCS trade secret provisions are based on USA law, practical considerations and legal determinations. It is a realistic system. Further harmonization in this area may be desirable but it will be very difficult due to national laws.*

1.4.9
…... Systems should identify the appropriate education and training for GHS target audiences who are required to interpret label and/or SDS information and to take appropriate action in response to chemical hazards….. In

addition, systems should consider strategies required for educating consumers in interpreting label information on products that they use.

Comments:
The HCS training requirements ***29 CFR1910.1200(h)(3)*** *are more comprehensive than those in the GHS.. Educating consumers is a worthy consideration but wouldn't seem to be in OSHA's area of responsibility.*

1.4.10.4.2.3 Pictograms prescribed by the GHS but not the UN Recommendations on the Transport of Dangerous Goods, Model Regulations, should have a black symbol on a white background with a red frame sufficiently wide to be clearly visible. However, when such a pictogram appears on a label for a package which will not be exported, the Competent Authority may choose to give suppliers and employers discretion to use a black border.
In addition, Competent Authorities may allow the use of UN Recommendations on the Transport of Dangerous Goods, Model Regulations pictograms in other use settings where the package is not covered by the Model Regulations.

Comments:
The use of symbols/pictograms in USA workplaces is a major change for the HCS and stakeholders. To ease the transition and regulatory impact, practical considerations could be important. While red frames help make the pictograms more noticeable, they also increase the cost of printing labels. Allowing stakeholders (e.g., small businesses) to use a black border domestically, could lessen the regulatory impact.

While the GHS symbols are similar to the transport symbols (except for the exclamation point, environmental and chronic hazard symbols), the transport pictograms have different backgrounds and colors. While it seems a good practical accommodation to allow the use of the transport pictograms in use settings where the package is not covered by DOT, the pictograms would have to follow the transport regulations to avoid confusion. The transport pictograms would need to correctly identify the hazards. The major complexity is in the area of flammability. The "flame" symbol and GHS "flame" pictogram designate multiple hazards: self-reactive, self-heating, pyrophoric, emits flammable in contact with water and flammable liquids, solids, gases and aerosols. These hazards have transport pictograms with different backgrounds. See Section IV for pictograms and GHS Annex 1.

There has been discussion in the EU that they might allow transport pictograms for GHS physical hazards.

1.4.10.5.2 Information required on a GHS label
(c) Precautionary statements and pictograms
The GHS label should include appropriate precautionary information, the choice of which is with the labeller or the competent authority. GHS Annex 3 contains examples of precautionary statements, which can be used, and also examples of precautionary pictograms, which can be used where allowed by the Competent Authority.

Comments:
The HCS does not require precautionary information on labels. Until it is standardized by the GHS, precautionary information on labels could continue to be performance-oriented with guidance and examples provided. The ANSI Z129.1 Standard has precautionary and first aid statements and criteria for use. The EU Safety (S) Phrases are another source of precautionary statements, as well as the GHS Annex 3. Precautionary pictograms could be optional information to be included in addition to the precautionary text.

1.4.10.5.2 Information required on a GHS label
(d) Product identifier (ii)
The label for a substance should include the chemical identity of the substance. For mixtures or alloys, the label should include the chemical identities of all ingredients or alloying elements that contribute to acute toxicity, skin

corrosion or serious eye damage, germ cell mutagenicity, carcinogenicity, reproductive toxicity, skin or respiratory sensitisation, or Target Organ Systemic Toxicity (TOST), when these hazards appear on the label. Alternatively, the Competent Authority may require the inclusion of all ingredients or alloying elements that contribute to the hazard of the mixture or alloy;

Comments:
See also below 1.4.10.5.2 (d) (iii) Product identifier. The HCS allows the use of an "identity" on labels and disclosure of hazardous components on the MSDS. On labels the HCS allows the use of any designation or identification such as code name, code number, trade name, brand name or generic name used to identify a chemical other than by its chemical name. This "identity" must be used on the MSDS and permit cross-references to be made among the required list of hazardous chemicals, the label and the MSDS. This is a practice which is in common use in the USA.

Labels - 29 CFR 1910.1200(f)(1) *The chemical manufacturer, importer, or distributor shall ensure that each container of hazardous chemicals leaving the workplace is labeled, tagged or marked with the following information:* ***(f)(1)(i)*** *Identity of the hazardous chemical(s);* ***(f)(1)(ii)*** *Appropriate hazard warnings; and* ***(f)(1)(iii)*** *Name and address of the chemical manufacturer, importer, or other responsible party.*

1.4.10.5.2 Information required on a GHS label
(d) Product identifier (iii)
Where a substance or mixture is supplied exclusively for workplace use, the competent authority may choose to give suppliers discretion to include chemical identities on the SDS, in lieu of including them on labels;

Comments:
On the label the HCS allows the use of any designation or identification such as code name, code number, trade name, brand name or generic name used to identify a chemical other than by its chemical name. This "identity" must be used on the MSDS and permit cross-references to be made among the required list of hazardous chemicals, the label and the MSDS. This is a practice which is in common use in the USA.

Labels - 29 CFR 1910.1200(f)(1) *The chemical manufacturer, importer, or distributor shall ensure that each container of hazardous chemicals leaving the workplace is labeled, tagged or marked with the following information:* ***(f)(1)(i)*** *Identity of the hazardous chemical(s);* ***(f)(1)(ii)*** *Appropriate hazard warnings; and* ***(f)(1)(iii)*** *Name and address of the chemical manufacturer, importer, or other responsible party.*

1.4.10.5.3.1 Precedence for the allocation of symbols
For substances and mixtures covered by the UN Recommendations on the Transport of Dangerous Goods, Model Regulations, the precedence of symbols for physical hazards should follow the rules of the UN Model Regulations. In workplace situations, the Competent Authority may require all symbols for physical hazards to be used.

Comments:
Simple precedence rules have been established for health hazard symbols. Having precedence rules for physical hazard symbols would provide consistency and comprehensibility. Unless the material is transported, using the transport rules may be complex and the data may not be available for classification into packing groups. A simple rule for physical hazard symbol precedence could be used which would seem to be consistent with the EU workplace regulations. "If the explosive symbol applies, the flame and oxidizer symbols are optional".

1.4.10.5.3.3 Precedence for allocation of hazard statements

All assigned hazard statements should appear on the label. The Competent Authority may choose to specify the order in which they appear.

Comments:
The ANSI Z129.1 Standard offers the following guidance on hazard precedence. "Because immediate hazards are more likely to be the result of single exposures, they usually precede the statements of hazards for delayed/chronic hazards. In general, the most serious immediate hazard shall be placed first, followed by all other immediate hazards. It is also desirable to group delayed/chronic hazards." Due to USA liability concerns with labels, the precedence of hazard statements could be left to the discretion of the labeller with guidance and examples provided.

1.4.10.5.4.1 Location of GHS information on the label

The GHS hazard pictograms, signal word and hazard statements should be located together on the label. The Competent Authority may choose to provide a specified layout for the presentation of these and for the presentation of precautionary information, or allow supplier discretion.

Comments:
The specified layout for the presentation of hazard pictograms, signal word and hazard statements and for the presentation of precautionary information could be left to the discretion of the labeller with guidance and examples provided. This could help with implementation costs for label design & printing and USA liability concerns with label.

1.4.10.5.4.2 Supplemental information

The competent authority has the discretion to allow the use of supplemental information subject to the parameters outlined in 1.4.6.3. The competent authority may choose to specify where this information should appear on the label or allow supplier discretion.

Comments:
Supplemental information can cover hazards or precautions that are not part of the standardized GHS. Having all hazard/precautionary information together could benefit comprehensibility. The target audience might not always notice information in a different location. In the USA supplemental information and its location on the label could have liability implications. Compliance with laws/regulations is not a defense against liability issues. Removing information which has historically been on a label or having information "appear" to be less prominent could be a liability issue.

1.4.10.5.4.3 Use of colour outside pictograms

In addition to its use in pictograms, colour can be used on other areas of the label to implement special labelling requirements such as the use of the pesticide bands in the FAO Labelling Guide, for signal words and hazard statements or as background to them, or as otherwise provided for by the competent authority.

Comments:
In some cases it has become practice to use color for signal words and poison/skull & bone symbols on labels. The continuing use of colors could be allowed as long as the colors don't interfere with GHS implementation. This could help with USA liability concerns. There has been discussion by some regional systems to have signal words be on a colored background.

1.4.10.5.5 Special labelling arrangements

The competent authority may chose to allow communication of certain hazard information for carcinogens, reproductive toxicity and target organ systemic toxicity repeat exposure on the label and on the SDS, or through the SDS alone (see specific chapters for details of relevant cut-offs for these classes).

Comments:

To facilitate implementation and transition, consideration should be given to options that are aligned with existing HCS requirements. See individual health hazards for options.

Similarly, for metals and alloys, the competent authority may chose to allow communication of the hazard information through the SDS alone when they are supplied in the massive, non-dispersible, form.

Comments:

The current HCS requirements are practical and workable.

Solid Metals - 29 CFR 1910.1200(f)(2)(i) *For solid metal (such as a steel beam or a metal casting), solid wood, or plastic items that are not exempted as articles due to their downstream use, or shipments of whole grain, the required label may be transmitted to the customer at the time of the initial shipment, and need not be included with subsequent shipments to the same employer unless the information on the label changes;* ***(f)(2)(ii)*** *The label may be transmitted with the initial shipment itself, or with the material safety data sheet that is to be provided prior to or at the time of the first shipment; and,* ***(f)(2)(iii)*** *This exception to requiring labels on every container of hazardous chemicals is only for the solid material itself, and does not apply to hazardous chemicals used in conjunction with, or known to be present with, the material and to which employees handling the items in transit may be exposed (for example, cutting fluids or pesticides in grains).*

1.4.10.5.5.1 Workplace labelling

Products falling within the scope of the GHS will carry the GHS label at the point where they are supplied to the workplace, and that label should be maintained on the supplied container in the workplace. The GHS label or label elements should also be used for workplace containers. However, the competent authority can allow employers to use alternative means of giving workers the same information in a different written or displayed format when such a format is more appropriate to the workplace and communicates the information as effectively as the GHS label. For example, label information could be displayed in the work area, rather than on the individual containers.

Comments:

The current HCS requirements are practical and workable.

Labels - 29 CFR 1910.1200(f)(6) *The employer may use signs, placards, process sheets, batch tickets, operating procedures, or other such written materials in lieu of affixing labels to individual stationary process containers, as long as the alternative method identifies the containers to which it is applicable and conveys the information required by paragraph (f)(5) of this section to be on a label. The written materials shall be readily accessible to the employees in their work area throughout each work shift.* ***(f)(7)*** *The employer is not required to label portable containers into which hazardous chemicals are transferred from labeled containers, and which are intended only for the immediate use of the employee who performs the transfer. For purposes of this section, drugs which are dispensed by a pharmacy to a health care provider for direct administration to a patient are exempted from labeling.* ***(f)(8)*** *The employer shall not remove or deface existing labels on incoming containers of hazardous chemicals, unless the container is immediately marked with the required information.*

1.4.10.5.5.2 Consumer product labelling based on the likelihood of injury

All systems should use the GHS classification criteria based on hazard, however competent authorities may authorize consumer labelling systems providing information based on the likelihood of harm (risk based labelling)……

Comments:

In the HCS OSHA has a labeling exception for consumer products.

CPSC - 29 CFR 1910.1200 (b)(5) *This section does not require labeling of the following chemicals:* ***(b)(5)(v)*** *Any consumer product or hazardous substance as those terms are defined in the Consumer Product Safety Act (15 U.S.C. 2051 et seq.) and Federal Hazardous Substances Act (15 U.S.C. 1261 et seq.) respectively, when subject to a consumer product safety standard or labeling requirement of those Acts, or regulations issued under those Acts by the Consumer Product Safety Commission;,*

1.4.10.5.5.3 Tactile warnings:If tactile warnings are used, the technical specifications should conform with EN ISO standard 11683 (1997 edition) relating to tactile warnings of danger.

Comments:
If tactile warnings are used, conforming to a recognized standard is practical.

1.5 Hazard Communication: Safety Data Sheets

1.5.2 Criteria for determining whether an SDS should be produced

The competent authority may choose also to require SDSs for mixtures not meeting the criteria for classification as hazardous but which contain hazardous substances in certain concentrations (see paragraph 1.5.3.1).

Comments:
In order to finalize the GHS several hazard categories have alternatives where a single harmonized option was not agreed to. To ease the transition to the GHS and minimize the regulatory impact in the USA, the option closest to the existing HCS could be selected as the regulatory requirement. OSHA could also allow the use of both alternatives. The HCS will need to determine how to implement these options. See specific hazard classes/categories

1.5.3.1.2 As noted in the *Classification of Hazardous Substances and Mixtures* (see 1.3.3.2), there may be some cases when the available hazard data may justify classification on the basis of other cut-off values/concentration limits than the generic ones specified in the health and environment hazard class chapters (Chapters 3.2 to 3.10). When such specific cut-off values are used for classification, they should also apply to the obligation to compile an SDS.

Comments:
The HCS addresses this.
Hazard determination** - **29 CFR 1910.1200(d)(5)(iv) *If the chemical manufacturer, importer, or employer has evidence to indicate that a component present in the mixture in concentrations of less than one percent (or in the case of carcinogens, less than 0.1 percent) could be released in concentrations which would exceed an established OSHA permissible exposure limit or ACGIH Threshold Limit Value, or could present a health risk to employees in those concentrations, the mixture shall be assumed to present the same hazard.*

1.5.3.1.3 Some competent authorities (CA) may require SDSs to be compiled for mixtures which are not classified for acute toxicity or aquatic toxicity as a result of application of the additivity formula, but which contain acutely toxic substances or substances toxic to the aquatic environment in concentrations equal to or greater than 1 %. [….. *Component substances are taken into consideration for application of the formula when the concentration is equal to or greater than 1 %. Some competent authorities (CA) may use this cut-off as a basis of obligation to compile a SDS]*

Comments:
This requirement is similar to the HCS requirement for mixtures. Consideration could be given to this simple(1%) approach for the hazard determination for mixtures with acute toxicity or aquatic toxicity and requiring an MSDS. The additivity calculation is detailed. This is a conservative approach but might appeal to small businesses.

1.5.3.1.4 In accordance with the building block principle, some competent authorities may choose not to regulate certain categories within a hazard class. In such situations, there would be no obligation to compile an SDS.

Comments:
OSHA would only require MSDSs for those health hazard categories and classes which will be regulated. OSHA will need to determine which GHS health hazard categories and classes it will regulate. This raises the issue that the GHS 16 section MSDS includes information that is not usually regulated by OSHA (transport, environment). Although environmental/aquatic hazards are covered under the GHS, OSHA does not regulate environmental issues.

1.5.3.3 SDS content
1.5.3.3.1 …... Additional information may be required by competent authorities.

Comments:
Global harmonization of hazard communication requirements is a major benefit for stakeholders. However, if OSHA's past experience with the HCS has shown additional information which would be valuable to be in the MSDS, then this information should be considered.

Table 1.5.2 Minimum information for an SDS

Section 2. Hazards identification
(Hazard symbols may be provided as a graphical reproduction of the symbols in black and white or the name of the symbol, e.g., flame, skull and crossbones.)

Comments:
Depicting the actual symbol/pictogram should be an option on MSDSs. The printing/storage of symbols as graphics requires more sophisticated systems to accomplish. The same information can be conveyed as text and is more easily handled by all systems and stakeholders.

Section 3. Composition/ Information on Ingredients
Mixture
The chemical identity and concentration or concentration ranges of all ingredients which are hazardous within the meaning of the GHS and are present above their cut-off levels.
NOTE: For information on ingredients, the competent authority rules for CBI take priority over the rules for product identification.

Comments:
Concentration ranges provide insight on the level of a hazardous component. Disclosing exact formulation information could give away trade secret information. Using ranges could eliminate the need for some trade secret claims.

Section 16. Other information including information on preparation and revision of the SDS.

Comments:
While not requiring any additional information in this Section 16, guidance could be given that supports the ANSI and ISO MSDS standards.

2.1 Explosives

2.1.2.2
Note 1: Explosive substances or mixtures in packaged form and articles may be classified under divisions 1.1 to 1.6 and, for some regulatory purposes, are further subdivided into compatibility groups A to S to distinguish technical requirements.

Comments
For the workplace further subdivision of explosives into compatibility groups A-S may not be required. The GHS has 6 divisions for explosives while the HCS does not have subdivisions. Harmonization is the goal of the GHS. However, the implementation of all 6 divisions in all use settings is an important consideration. Should there be a domestic or site-limited exception and for what circumstances/situations. Unless the material is transported, the test data for classification may not be available.

The GHS physical hazard criteria include the concept of testing to determine classification. The HCS requires no testing. The GHS explosive classification is based on specified test methods. To ease transition and facilitate implementation consideration should be given to recognition/acceptance of other test methods. Existing test data is acceptable in the GHS.

2.1.2.2
Some explosive substances and mixtures are wetted with water or alcohols or diluted with other substances to suppress their explosives properties. They may be treated differently from explosive substances and mixtures (as desensitised explosives) for some regulatory purposes (e.g. transport).

Comment
For the workplace, explosives that are wetted with water or alcohol or otherwise diluted could utilize the transport classification or conform to the testing criteria.

2.1.3 Hazard Communication
The explosive label elements are provided in GHS Table 2.1.2 and Annex 3.

Comment
The appropriate label elements for the explosive hazard class can be selected from GHS Table 2.1.2 and Annex 3.

2.2 Flammable Gases

2.2.2 A flammable gas is classified in one of the two categories for this class.

Comment

The GHS has 2 hazard categories for flammable gases while the HCS does not have subcategories. Harmonization is the goal of the GHS. However, the implementation of all hazard categories in all use settings is an important consideration. Should there be a domestic or site-limited exception and for what circumstances/situations. Unless the material is transported, the test data for classification may not be available. A calculation method is provided in guidance. The implementation of 2 hazard categories in the workplace would seem feasible.

The GHS physical hazard criteria include the concept of testing to determine classification. The HCS requires no testing. The GHS flammable gas classification is based on specified test methods. To ease transition and facilitate implementation consideration should be given to recognition/acceptance of other test methods. Existing test data is acceptable in the GHS.

2.2.2
NOTE 1: Ammonia and methyl bromide may be regarded as special cases for some regulatory purposes.

Comment
Classification of Ammonia and Methyl Bromide in GHS hazard category 2 should be considered. They are flammable gases using the test methods and criteria, but have derogations under the EU system and for transport under the UNRTDG.

2.2.3 Hazard Communication
The flammable gas label elements are provided in GHS Table 2.2.1 and Annex 3.

Comment
The appropriate label elements for the flammable gas hazard categories can be selected from GHS Table 2.2.1 and Annex 3.

2.2.4.2 Guidance
Flammability should be determined by tests or by calculation in accordance with methods adopted by ISO (see ISO 10156:1996 Gases and gas mixtures – Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets). Where insufficient data are available to use these methods, tests by a comparable method recognized by the competent authority may be used.

Comment
The GHS physical hazard criteria include the concept of testing to determine classification. The HCS requires no testing. The GHS flammable gas classification is based on specified test methods. The GHS uses ISO 10156 which is under revision, and could lead to a need to revise the GHS examples. To ease transition and facilitate implementation consideration should be given to recognition/acceptance of other test methods. Existing test data is acceptable in the GHS.

2.3 Flammable Aerosols

2.3.2.2 Classification
A flammable aerosol is classified in one of the two categories.

Comments

The GHS has 2 hazard categories for flammable aerosols while the HCS does not have subcategories. Harmonization is the goal of the GHS. However, the implementation of all hazard categories in all use settings is an important consideration. Should there be a domestic or site-limited exception and for what circumstances/situations. Unless the material is transported, the test data for classification may not be available. A calculation is provided in guidance.

The GHS physical hazard criteria include the concept of testing to determine classification. The HCS requires no testing. The GHS flammable aerosols classification is based on specified test methods. To ease transition and facilitate implementation consideration should be given to recognition/acceptance of other test methods. Existing test data is acceptable in the GHS..

2.3.3 Hazard Communication

The flammable aerosols label elements are provided in GHS Table 2.3.1 and Annex 3.

Comment

The appropriate label elements for the flammable aerosols hazard categories can be selected from GHS Table 2.3.1 and Annex 3.

2.4 Oxidizing Gases

2.4.2 Classification

NOTE**:** *Artificial air containing up to 23.5% vol % oxygen may be regarded as not oxidizing for some regulatory purposes (e.g. transport).*

Comment

For the workplace, artificial air containing up to 23.5% vol % oxygen could utilize the transport classification or conform to the testing criteria. A calculation method is provided in guidance.

The GHS physical hazard criteria include the concept of testing to determine classification. The HCS requires no testing. The GHS oxidizing gas classification is based on specified test methods. The GHS uses ISO 10156 which is under revision, and could lead to a need to revise the GHS examples. To ease transition and facilitate implementation consideration should be given to recognition/acceptance of other test methods. Existing test data is acceptable in the GHS..

2.4.3 Hazard Communication

The oxidizing gas label elements are provided in GHS Table 2.4.2 and Annex 3.

Comment

The appropriate label elements for the oxidizing gas hazard category can be selected from GHS Table 2.4.2 and Annex 3.

2.5 Gases Under Pressure

2.5.2 Classification

Gases are classified, according to their physical state when packaged, in one of four groups.

Comment
The properties characterized are not intrinsic properties. Clarification is needed on the intended scope of this hazard class. Is it intended to only apply to gases that are not otherwise classified under the GHS, or is it also intended to apply to gases already classified under the GHS, e.g., flammable gases, toxic gases, oxidizing gases.

The GHS has 4 hazard groups for gases under pressure while the HCS does not have subcategories. Harmonization is the goal of the GHS. However, the implementation of all hazard groups in all use settings is an important consideration. Should there be a domestic or site-limited exception and for what circumstances/situations. Unless the material is transported, the data for classification may not be easily available.

2.5.4.2
In order to classify gases under pressure, the following data are needed: vapor pressure at 50 C; physical state at 20 C and standard ambient pressure; and the critical temperature. Data can be found in literature, calculated or determined by testing. Most pure gases are already classified in the *UN Recommendations on the Transport of Dangerous Goods, Model Regulations*. Most mixtures require additional calculations that can be very complex.

Comment
Guidance on calculations for mixtures would be a useful tool.

2.5.3 Hazard Communication
The gases under pressure label elements are provided in GHS Table 2.5.2 and Annex 3.

Comment
The appropriate label elements for the gases under pressures hazard groups can be selected from GHS Table 2.5.2 and Annex 3.

2.6 Flammable Liquids

2.6.2 Classification
A flammable liquid is classified in one of the four categories for this class.

Comment
The HCS covers the full range of GHS flammable liquid hazard categories based on flash point but with 2 hazard categories instead of 4 categories. The flammable liquid classification criteria are based on flash point. The HCS includes various flash point test methods.

The GHS has quantitative definitions for liquids and gases. There is an issue to do with the border between solids and liquids, and the use of the UN Penetrometer test to differentiate between liquids and solids. Solids having a flash point may not be classified under the GHS, or it may be more appropriate to undertake a flash point test rather than the burning test for flammable solids.

2.6.1 Table
NOTE 1: Gas oils, diesel and light heating oils in the flash point range of 55°C to 75 C may be regarded as a special group for some regulatory purposes.

NOTE 2: Liquids with a flash point of more than 35 C may be regarded as non-flammable liquids for some regulatory purposes (e.g. transport) if negative results have been obtained in the sustained combustibility test L.2 of the UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria.

NOTE 3: Viscous flammable liquids such as paints, enamels, lacquers, varnishes, adhesives and polishes may be regarded as a special group for some regulatory purposes (e.g. transport). The classification or the decision to consider these liquids as non-flammable may be determined by the pertinent regulation or competent authority.

Comment
For the workplace, the above materials could utilize the transport classification for consistency or conform to the testing criteria.

2.6.3 Hazard Communication
The flammable liquid label elements are provided in GHS Table 2.6.2 and Annex 3.

Comment
The appropriate label elements for the flammable liquid hazard categories can be selected from GHS Table 2.6.2 and Annex 3.

2.7 Flammable Solids

2.7.2 Classification
2.7.2.4 A flammable solid is classified in one of the two categories for this class using Method N.1 as described in 33.2.1 of the UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria.

Comment
The GHS has 2 hazard categories for flammable solids while the HCS does not have subdivisions. Harmonization is the goal of the GHS. However, the implementation of 2 hazard categories in all use settings is an important consideration. Should there be a domestic or site-limited exception and for what circumstances/situations. Unless the material is transported, the test data for classification may not be available.

The GHS physical hazard criteria include the concept of testing to determine classification. The HCS requires no testing. The GHS flammable solids classification is based on specified test methods. To ease transition and facilitate implementation consideration should be given to recognition/acceptance of other test methods. Existing test data is acceptable in the GHS.

The GHS has quantitative definitions for liquids and gases. There is an issue with the border between solids and liquids, and the use of the UN Penetrometer test to differentiate between liquids and solids. Solids having a flash point may not be classified under the GHS, or it may be more appropriate to undertake a flash point test rather than the burning test for flammable solids.

2.7.2.4 NOTE: For classification tests on solid substances or mixtures, the tests should be performed on the substance or mixture as presented. If for example, for the purposes of supply or transport, the same chemical is to be presented in a physical form different from that which was tested and which is considered likely to materially alter its performance in a classification test, the substance must also be tested in the new form.

Comment

The GHS physical hazard criteria include the concept of testing to determine classification. The HCS has no required testing.

2.7.3 Hazard Communication
The flammable solid label elements are provided in GHS Table 2.7.1 and Annex 3.

Comment
The appropriate label elements for the flammable solid hazard categories can be selected from GHS Table 2.7.1 and Annex 3.

2.8 Self-Reactive Substances

2.8.2.2 Classification
Self-reactive substances and mixtures are classified in one of the seven categories of "types A to G" for this class. NOTE 2: Types A to G may not be necessary for all systems.

Comments
The GHS has 7 hazard categories for self-reactive substances while the HCS does not have subdivisions. Harmonization is the goal of the GHS. However, the implementation of 7 hazard categories in all use settings is an important consideration. Should there be a domestic or site-limited exception and for what circumstances/situations. Unless the material is transported, the test data for classification may not be available.

2.8.4.1 To classify a self-reactive substance or mixture test series A to H as described in Part II of the UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria should be performed.

Comment
The GHS physical hazard criteria include the concept of testing to determine classification. The HCS requires no testing. The GHS self-reactive classification is based on specified test methods. To ease transition and facilitate implementation consideration should be given to recognition/acceptance of other test methods. Existing test data is acceptable in the GHS..

2.8.3 Hazard Communication
The self-reactive substances label elements are provided in GHS Table 2.8.1 and Annex 3.

Comment
The appropriate label elements for the self-reactive substances hazard categories can be selected from GHS Table 2.8.1 and Annex 3.

2.9 Pyrophoric Liquids

2.9.2 Classification

A pyrophoric liquid is classified in a single category for this class using test N.3 in 33.3.1.5 of the UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria.

Comment
The GHS physical hazard criteria include the concept of testing to determine classification. The HCS requires no testing. The GHS pyorphoric liquid classification is based on specified test methods. To ease transition and facilitate implementation consideration should be given to recognition/acceptance of other test methods. Existing test data is acceptable in the GHS.

2.9.3 Hazard Communication
The pyrophoric liquid label elements are provided in GHS Table 2.9.2 and Annex 3.

Comment
The appropriate label elements for the pyrophoric liquid hazard category can be selected from GHS Table 2.9.2 and Annex 3.

2.10 Pyrophoric Solids

2.10.2 Classification
A pyrophoric solid is classified in a single category for this class using test N.2 in 33.3.1.4 of the UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria.
NOTE: For classification tests on solid substances or mixtures, the tests should be performed on the substance or mixture as presented. If for example, for the purposes of supply or transport, the same chemical is to be presented in a physical form different from that which was tested and which is considered likely to materially alter its performance in a classification test, the substance or mixture must also be tested in the new form.

Comment
The GHS physical hazard criteria include the concept of testing to determine classification. The HCS requires no testing. The GHS pyorphoric solid classification is based on specified test methods. To ease transition and facilitate implementation consideration should be given to recognition/acceptance of other test methods. Existing test data is acceptable in the GHS.

2.10.3 Hazard Communication
The pyrophoric solid label elements are provided in GHS Table 2.10.2 and Annex 3.

Comment
The appropriate label elements for the pyrophoric solid hazard category can be selected from GHS Table 2.10.2 and Annex 3.

2.11 Self-Heating Substances

2.11.2.2 Classification

A self-heating substance or mixture is classified in one of the two categories for this class, based on tests performed in accordance with test method N. 4 in 33.3.1.6 of the UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria.

Comment
The GHS has 2 hazard categories for self-reactive substances while the HCS does not have subdivisions. Harmonization is the goal of the GHS. However, the implementation of 2 hazard categories in all use settings is an important consideration. Should there be a domestic or site-limited exception and for what circumstances/situations. Unless the material is transported, the test data for classification may not be available.

2.11.2.2 NOTE 1: For classification tests on solid substances or mixtures, the tests should be performed on the substance or mixture as presented. If for example, for the purposes of supply or transport, the same chemical is to be presented in a physical form different from that which was tested and which is considered likely to materially alter its performance in a classification test, the substance or mixture must also be tested in the new form.

Comment
The GHS physical hazard criteria include the concept of testing to determine classification. The HCS requires no testing. The GHS self-heating substances classification is based on specified test methods. To ease transition and facilitate implementation consideration should be given to recognition/acceptance of other test methods. Existing test data is acceptable in the GHS.

2.11.3 Hazard Communication
The self-hearing substances label elements are provided in GHS Table 2.11.2 and Annex 3.

Comment
The appropriate label elements for the self-heating substances hazard categories can be selected from GHS Table 2.11.2 and Annex 3.

2.12 Substances Which, In Contact With Water, Emit Flammable Gas

2.12.2 Classification
A substance or mixture which, in contact with water, emit flammable gases is classified in one of the three categories for this class, using test N.5 in 33.4.1.4 of the UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria.

Comment
The GHS has 3 hazard categories for Substances Which, In Contact With Water, Emit Flammable Gas. Harmonization is the goal of the GHS. However, the implementation of 3 hazard categories in all use settings is an important consideration. Should there be a domestic or site-limited exception and for what circumstances/situations. Unless the material is transported, the test data for classification may not be available.

2.11.2.1 NOTE 2: For classification tests on solid substances or mixtures, the tests should be performed on the substance or mixture as presented. If for example, for the purposes of supply or transport, the same chemical is to be presented in a physical form different from that which was tested and which is considered likely to materially alter its performance in a classification test, the substance or mixture must also be tested in the new form.

Comment
The GHS physical hazard criteria include the concept of testing to determine classification. The HCS requires no testing. The GHS Substances Which, In Contact With Water, Emit Flammable Gas classification is based on specified test methods. To ease transition and facilitate implementation consideration should be given to recognition/acceptance of other test methods. Existing test data is acceptable in the GHS.

2.12.3 Hazard Communication
The Substances Which, In Contact With Water, Emit Flammable Gas label elements are provided in GHS Table 2.12.2 and Annex 3.

Comment
The appropriate label elements for the Substances Which, In Contact With Water, Emit Flammable Gas hazard categories can be selected from GHS Table 2.12.2 and Annex 3.

2.13 Oxidizing Liquids

2.13.2 Classification
An oxidizing liquid is classified in one of the three categories for this class using test O.2 in 34.4.2 of the UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria.

Comment
Comment
The GHS has 3 hazard categories for oxidizing liquids while the HCS has no subdivisions. Harmonization is the goal of the GHS. However, the implementation of 3 hazard categories in all use settings is an important consideration. Should there be a domestic or site-limited exception and for what circumstances/situations. Unless the material is transported, the test data for classification may not be available.

2.13.4.1 To classify an oxidizing liquid test method O.2 as described in 34.4.2 of the UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria should be performed.

Comment
The GHS physical hazard criteria include the concept of testing to determine classification. The HCS requires no testing. The GHS oxidizing liquid classification is based on specified test methods. To ease transition and facilitate implementation consideration should be given to recognition/acceptance of other test methods. Existing test data is acceptable in the GHS.

2.13.3 Hazard Communication
The oxidizing liquid label elements are provided in GHS Table 2.13.2 and Annex 3.

Comment
The appropriate label elements for the oxidizing liquid hazard categories can be selected from GHS Table 2.13.2 and Annex 3.

2.14 Oxidizing Solids

2.14.2 Classification
An oxidizing liquid is classified in one of the three categories for this class using test O.1 in 34.4.1 of the UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria.

Comment
The GHS has 3 hazard categories for oxidizing solids while the HCS has no subdivisions. Harmonization is the goal of the GHS. However, the implementation of 3 hazard categories in all use settings is an important consideration. Should there be a domestic or site-limited exception and for what circumstances/situations. Unless the material is transported, the test data for classification may not be available.

2.14.4.1 To classify an oxidizing solid test method O.1 as described in 34.4.1 of the UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria should be performed.

Comment
The GHS physical hazard criteria include the concept of testing to determine classification. The HCS requires no testing. The GHS oxidizing solid classification is based on specified test methods. To ease transition and facilitate implementation consideration should be given to recognition/acceptance of other test methods. Existing test data is acceptable in the GHS.

2.14.3 Hazard Communication
The oxidizing solid label elements are provided in GHS Table 2.14.2 and Annex 3.

Comment
The appropriate label elements for the oxidizing solid hazard categories can be selected from GHS Table 2.14.2 and Annex 3.

2.15 Organic Peroxides

2.15.2.2 Classification
Organic peroxides are classified in one of the seven categories of "Types A to G" for this class.
NOTE 2: Types A to G may not be necessary for all systems.

Comments
The GHS has 7 hazard categories for oxidizing solids while the HCS has no subdivisions. Harmonization is the goal of the GHS. However, the implementation of 7 hazard categories in all use settings is an important consideration. Should there be a domestic or site-limited exception and for what circumstances/situations. Unless the material is transported, the test data for classification may not be available.

2.15.4.1 To classify an organic peroxide test series A to H as described in Part II of the *UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria,* should be performed.

Comment
The GHS physical hazard criteria include the concept of testing to determine classification. The HCS requires no testing. The GHS organic peroxide classification is based on specified test methods. To ease transition and facilitate

implementation consideration should be given to recognition/acceptance of other test methods. Existing test data is acceptable in the GHS.

2.15.3 Hazard Communication
The organic peroxide label elements are provided in GHS Table 2.15.1 and Annex 3.

Comment
The appropriate label elements for the organic peroxide hazard categories can be selected from Table GHS 2.15.1 and Annex 3.

2.16 Corrosive to Metals

2.16.2 Classification
A substance or a mixture which is corrosive to metal is classified in a single category for this class.

Comment
Harmonization is the goal of the GHS. However, the HCS does not cover corrosive to metals. As allowed by the building block principle, consideration should be given to whether the workplace should regulate this hazard class.

The GHS physical hazard criteria include the concept of testing to determine classification. The HCS requires no testing. The GHS corrosive to metals classification is based on specified test methods. To ease transition and facilitate implementation consideration should be given to recognition/acceptance of other test methods. Existing test data is acceptable in the GHS.

2.16.3 Hazard Communication
The corrosive to metals label elements are provided in GHS Table 2.16.2 and Annex 3.

Comment
The appropriate label elements for the corrosive to metals hazard category can be selected from GHS Table 2.16.2 and Annex 3.

3.1 Acute Toxicity

3.1.2 Classification
3.1.2.1 Chemicals can be allocated to one of five toxicity categories based on acute toxicity by the oral, dermal or inhalation route according to LD50 (oral, dermal) or LC50 (inhalation) values.
3.1.2.2 The harmonized classification system for acute toxicity has been developed in such a way as to accommodate the needs of existing systems. A basic principle set by the IOMC Coordinating Group/Harmonization of Chemical Classification Systems (CG/HCCS) is that "harmonization means establishing a common and coherent basis for chemical hazard classification and communication from which the appropriate elements relevant to means of transport, consumer, worker and environment protection can be selected." To that end, five categories have been included in the acute toxicity scheme.

Comment

The GHS has 5 hazard categories for acute toxicity while the HCS has 2 subdivisions (toxic and highly toxic). Harmonization is the goal of the GHS. However, is the implementation of 5 hazard categories appropriate for all use setting? GHS Acute Toxicity Category 5 was intended for the consumer sector (relatively low acute toxicity hazard but …. may present a danger to vulnerable populations). GHS Acute Toxicity Category 1 was developed to accommodate the needs of the transportation sector for packaging.

GHS Acute toxicity categories 1-3 approach the HCS categories of toxic and highly toxic. In evaluating the GHS "protection will not be reduced" principle, the GHS requirements should be considered as a whole rather than each end-point individually. The HCS hazard categories, including toxic and highly toxic, are linked to EPA'S EPCRA (MSDS) requirements.

A voluntary or guidance approach could be taken for acute toxicity categories 4-5. OSHA wouldn't regulate categories 4-5 but would suggest appropriate harmonized GHS hazard communication elements for stakeholders to use if so desired.

3.1.4 Hazard Communication
The acute toxicity label elements are provided in GHS Table 3.1.3 and Annex 3.

Comment
The appropriate label elements for the acute toxicity hazard categories can be selected from GHS Table 3.1.3 and Annex 3.

3.2 Skin Corrosion/Irritation

3.2.2.4.2 Corrosion
A single harmonized GHS skin corrosion category is provided. For those authorities wanting more than one designation for skin corrosivity, up to three subcategories are provided within the corrosive category.

Comment
The GHS has up to 3 hazard categories for skin corrosion while the HCS has no subdivisions. Only some authorities will use the subcategories in corrosive category 1. Harmonization is the goal of the GHS. However, the implementation of 3 hazard categories in all use settings is an important consideration. Should there be a domestic, workplace or site-limited exception and for what circumstances/situations. Unless the material is transported, the test data for classification may not be available.

3.2.2.5.4 Irritation
A single GHS skin *irritant category* (category 2) is provided. An additional mild irritant category (category 3) is available for those authorities that want to have more than one skin irritant category.

Comment
The GHS has up to 2 hazard categories for skin irritation while the HCS has no subdivisions. Only some authorities will use category 3. Harmonization is the goal of the GHS. The mild skin irritation category is not covered by the HCS. So the implementation of 2 hazard categories would be an important consideration.

A voluntary or guidance approach could be taken for the mild skin irritation category. OSHA wouldn't regulate the category but would suggest appropriate harmonized GHS hazard communication elements for stakeholders to use if so desired.

3.2.4 Hazard Communication
The skin corrosion/irritation label elements are provided in GHS Table 3.2.5 and Annex 3.

Comment
The appropriate label elements for the skin corrosion/irritation hazard categories can be selected from GHS Table 3.2.5 and Annex 3.

3.3 Serious Eye Damage/Eye Irritation

3.3.2.2 The proposals for classification of eye irritation and serious damage to the eye include elements that are harmonized and will be used by all authorities as well as optional subcategories that will be applied by only some authorities (e.g. authorities classifying pesticides).
3.3.2.9 A single category is adopted for substances that have the potential to induce reversible eye irritation. This single hazard category provides the option to identify within the category a sub-category for substances inducing eye irritant effects reversing within an observation time of 7 days.

Comments
The GHS has up to 2 hazard categories for eye irritation while the HCS has no eye irritation subdivisions. Only some authorities will use category 2B. Harmonization is the goal of the GHS. The mild eye irritation category is not covered by the HCS. So the implementation of 2 hazard categories would be an important consideration.

A voluntary or guidance approach could be taken for the mild eye irritation category. OSHA wouldn't regulate the category but would suggest appropriate harmonized GHS hazard communication elements for stakeholders to use if so desired.

3.3.4 Hazard Communication
The eye corrosion/irritation label elements are provided in GHS Table 3.3.5 and Annex 3.

Comment
The appropriate label elements for the eye corrosion/irritation hazard categories can be selected from GHS Table 3.3.5 and Annex 3.

3.4 Respiratory or Skin Sensitization
3.4.3.3 Classification criteria for mixtures
Skin Sensitizers
Table 3.4.1 NOTE 1: If a skin sensitizer is present in the mixture as an ingredient at a concentration between 0.1% and 1.0%, both an SDS and a label would generally be expected. The label warning for skin sensitizers between 0.1% and 1.0% may differ from the label warning for skin sensitizers ≥ 1.0%, depending on competent authority requirements. While the current cut-off values reflect existing systems, all recognize that special cases may require information to be conveyed below that level. [In addition, some competent authorities may require a special labeling phrase for all mixtures containing sensitisers above 0.1%.]

Comment
The HCS regulates skin sensitizers in mixtures at ≥ 1.0%. Requiring a MSDS and label between 0.1% and 1.0% as indicated in the GHS is a significant change. Harmonization is the goal of the GHS. To ease transition and

facilitate implementation consideration could be given to a different label warning for skin sensitizers between 0.1% and 1.0%. In evaluating the GHS "protection will not be reduced" principle, the GHS requirement/protections should be considered as a whole rather than each end-point individually.

Respiratory Sensitizers
NOTE 3: If a solid or liquid respiratory sensitizer is present in the mixture as an ingredient at a concentration between 0.1% and 1.0%, both an SDS and a label would generally be expected. The label warning for solid or liquid respiratory sensitizers between 0.1% and 1.0% may differ from the label warning for solid or liquid respiratory sensitizers > 1.0%, depending on competent authority requirements. While the current cut-off values reflect existing systems, all recognize that special cases may require information to be conveyed below that level. [In addition, some competent authorities may require a special labelling phrase for all mixtures containing sensitizers above 0.1%.].

Comment
The HCS regulates respiratory sensitizers in mixtures at ≥ 1.0%. Requiring a MSDS and label between 0.1% and 1.0% as indicated in the GHS is a significant change. Harmonization is the goal of the GHS. To ease transition and facilitate implementation consideration could be given to a different label warning for respiratory sensitizers between 0.1% and 1.0%. In evaluating the GHS "protection will not be reduced" principle, the GHS requirements/protection should be considered as a whole rather than each end-point individually.

NOTE 5: If a gaseous respiratory sensitizer is present in the mixture as an ingredient at a concentration between 0.1% and 0.2%, both an SDS and a label would generally be expected. The label warning for a gaseous respiratory sensitizers between 0.1% and 0.2% may differ from the label warning for a gaseous respiratory sensitizers > 0.2%, depending on competent authority requirements. While the current cut-off values reflect existing systems, all recognise that special cases may require information to be conveyed below that level. [In addition, some competent authorities may require a special labelling phrase for all mixtures containing sensitizers above 0.1%.].

Comment
The HCS regulates respiratory sensitizers in mixtures at ≥ 1.0%. Requiring a MSDS and label between 0.1% (or 0.2%) and 1.0% as indicated in the GHS is a significant change. Harmonization is the goal of the GHS. To ease transition and facilitate implementation consideration could be given to a different label warning for respiratory sensitizers between 0.1% and 0.2%. In evaluating the GHS "protection will not be reduced" principle, the GHS requirements/protection should be considered as a whole rather than each end-point individually.

3.4.4 Hazard Communication
The respiratory or skin sensitization label elements are provided in GHS Table 3.4.2 and Annex 3.

Comment
The appropriate label elements for the respiratory or skin sensitization hazard category can be selected from GHS Table 3.4.2 and Annex 3.

3.5 Germ Cell Mutagenicity

3.5.2.1 The GHS classification system provides for two different categories of germ cell mutagens to accommodate the weight of evidence available.

Comment

The GHS building block approach gives flexibility to authorities in implementing the hazard classes/categories. Since this Germ Cell Mutagenicity hazard class is not an exact match with the HCS, consideration could be given in how to implement this hazard class/categories.

3.5.3.1 Classification Of Mixtures When Data Are Available For The Complete Mixture
Classification of mixtures will be based on the available test data for the individual ingredients of the mixture using cut-off values/concentration limits for the ingredients classified as germ cell mutagens. The classification may be modified on a case-by-case basis based on the available test data for the mixture as a whole. In such cases, the test results for the mixture as a whole must be shown to be conclusive taking into account dose and other factors such as duration, observations and analysis (e.g. statistical analysis, test sensitivity) of germ cell mutagenicity test systems. Adequate documentation supporting the classification should be retained and made available for review upon request

Comment
The HCS allows test data for mixtures to take precedence over component data for all health hazard classes. ***Hazard determination - 29 CFR 1910/1200 (d)(5)*** *The chemical manufacturer, importer or employer shall determine the hazards of mixtures of chemicals as follows:* ***(d)(5)(i)*** *If a mixture has been tested as a whole to determine its hazards, the results of such testing shall be used to determine whether the mixture is hazardous;*

3.5.4 Hazard Communication
The germ cell mutagenicity label elements are provided in GHS Table 3.5.2 and Annex 3.

Comment
The appropriate label elements for the germ cell mutagenicity hazard categories can be selected from GHS Table 3.5.2 and Annex 3.

3.6 Carcinogenicity

3.6.2.1 For the purpose of classification for carcinogenicity, chemical substances are allocated to one of two categories based on strength of evidence and additional considerations (weight of evidence). In certain instances, route specific classification may be warranted.

Comment
The HCS does not have route specific classification for carcinogenicity.

3.6.2.6 It is realized that some regulatory authorities may need flexibility beyond that developed in the hazard classification scheme. For inclusion into Safety Data Sheets positive results in any carcinogenicity study performed according to good scientific principles with statistically significant results may be considered.

Comments
In Appendix B the HCS addresses adequacy and reporting of data.
29 CFR 1910.1200 Appendix B *"Adequacy and reporting of data." The results of any studies which are designed and conducted according to established scientific principles, and which report statistically significant conclusions regarding the health effects of a chemical, shall be a sufficient basis for a hazard determination and reported on any material safety data sheet. In vitro studies alone generally do not form the basis for a definitive finding of hazard under the HCS since they have a positive or negative result rather than a statistically significant finding.*

The chemical manufacturer, importer, or employer may also report the results of other scientifically valid studies which tend to refute the findings of hazard.

3.6.3.1 Classification of Mixtures When Data Are Available for the Complete Mixture
Classification of mixtures will be based on the available test data of the individual ingredients of the mixture using cut-off values/concentration limits for those ingredients. The classification may be modified on a case-by case basis based on the available test data for the mixture as a whole. In such cases, the test results for the mixture as a whole must be shown to be conclusive taking into account dose and other factors such as duration, observations and analysis (e.g. statistical analysis, test sensitivity) of carcinogenicity test systems. Adequate documentation supporting the classification should be retained and made available for review upon request.

Comment
The HCS allows test data for mixtures to take precedence over component data for all health hazard classes.
Hazard determination - 29 CFR 1910.1200 (d)(5) *The chemical manufacturer, importer or employer shall determine the hazards of mixtures of chemicals as follows:* ***(d)(5)(i)*** *If a mixture has been tested as a whole to determine its hazards, the results of such testing shall be used to determine whether the mixture is hazardous;*

3.6.3.3 Mixture Classification
Table 3.6.1 Note 1: If a Category 2 carcinogen ingredient is present in the mixture at a concentration between 0.1% and 1%, every regulatory authority would require information on the SDS for a product. However, a label warning would be optional. Some authorities will choose to label when the ingredient is present in the mixture between 0.1% and 1%, whereas others would normally not require a label in this case.

Comment
Per CPL 2-2.38D the HCS does not require label warnings for IARC Group 2B and Group 3; one positive animal study; and multiple animal studies depending on the evidence. In evaluating the GHS "protection will not be reduced" principle, the GHS requirements should be considered as a whole rather than each end-point individually.

3.6.4 Hazard Communication
The carcinogenicity label elements are provided in GHS Table 3.6.2 and Annex 3.

Comment
The appropriate label elements for the carcinogenicity hazard categories can be selected from GHS Table 3.6.2 and Annex 3.

3.7 Reproductive Toxicity

3.7.2.3.1 However, a single, positive study performed according to good scientific principles and with statistically or biologically significant positive results may justify classification .

Comment
In Appendix B the HCS addresses adequacy and reporting of data.
29 CFR 1910.1200 Appendix B *"Adequacy and reporting of data." The results of any studies which are designed and conducted according to established scientific principles, and which report statistically significant conclusions regarding the health effects of a chemical, shall be a sufficient basis for a hazard determination and reported on*

any material safety data sheet. In vitro studies alone generally do not form the basis for a definitive finding of hazard under the HCS since they have a positive or negative result rather than a statistically significant finding. The chemical manufacturer, importer, or employer may also report the results of other scientifically valid studies which tend to refute the findings of hazard.

3.7.3.1 Classification of mixtures will be based on the available test data of the individual constituents of the mixture using cut-off values/concentration limits for the components of the mixture. The classification may be modified on a case-by case basis based on the available test data for the mixture as a whole. In such cases, the test results for the mixture as a whole must be shown to be conclusive taking into account dose and other factors such as duration, observations and analysis (e.g. statistical analysis, test sensitivity) of reproduction test systems. Adequate documentation supporting the classification should be retained and made available for review upon request.

Comment
The HCS allows test data for mixtures to take precedence over component data for all health hazard classes. ***Hazard determination - 29 CFR 1910.1200 (d)(5)*** *The chemical manufacturer, importer or employer shall determine the hazards of mixtures of chemicals as follows:* ***(d)(5)(i)*** *If a mixture has been tested as a whole to determine its hazards, the results of such testing shall be used to determine whether the mixture is hazardous;*

3.7.3.3 Classification of Mixtures
Table 3.7.1 Note 1: If a Category 1 reproductive toxicant is present in the mixture as an ingredient at a concentration between 0.1% and 0.3%, every regulatory authority would require information on the SDS for a product. However, a label warning would be optional. Some authorities will choose to label when the ingredient is present in the mixture between 0.1% and 0.3%, whereas others would normally not require a label in this case.

Comment
The HCS regulates reproductive toxicants in mixtures at ≥ 1.0%. Requiring a MSDS and label between 0.1% and 0.3% as indicated in the GHS is a significant change. Harmonization is the goal of the GHS. To ease transition and facilitate implementation consideration could be given to a different label warning for reproductive toxicants between 0.1% and 0.3%. Could there be a domestic or site-limited exception. In evaluating the GHS "protection will not be reduced" principle, the GHS requirements should be considered as a whole rather than each end-point individually.

Table 3.7.1 Note 3: If a Category 2 reproductive toxicant is present in the mixture as an ingredient at a concentration between 0.1% and 3.0%, every regulatory authority would require information on the SDS for a product. However, a label warning would be optional. Some authorities will choose to label when the ingredient is present in the mixture between 0.1% and 3.0%, whereas others would normally not require a label in this case.

Comment
The HCS regulates reproductive toxicants in mixtures at ≥ 1.0%. Requiring a MSDS and label between 0.1% and 0.3% as indicated in the GHS is a significant change. Harmonization is the goal of the GHS. To ease transition and facilitate implementation consideration could be given to a different label warning for reproductive toxicants between 0.1% and 0.3%. Could there be a domestic or site-limited exception. In evaluating the GHS "protection will not be reduced" principle, the GHS requirements should be considered as a whole rather than each end-point individually.

3.7.4 Hazard Communication
The reproductive toxicity label elements are provided in GHS Table 3.7.2 and Annex 3.

Comment
The appropriate label elements for the reproductive toxicity hazard categories can be selected from GHS Table 3.7.2 and Annex 3.

3.8 Specific Target Organ Systemic Toxicity – Single Exposure

3.8.2.1 Substances are classified for immediate or delayed effects separately, by the use of expert judgement on the basis of the weight of all evidence available, including the use of recommended guidance values. Then substances are placed in one of two categories, depending upon the nature and severity of the effect(s) observed.

Comment
The GHS building block approach gives flexibility to authorities in implementing the hazard classes/categories. Although the HCS covers target organ effects this hazard class is not an exact match with the HCS. Consideration could be given in how to implement this hazard class/categories.

3.8.2.10.4 It is recognised that saturated vapour concentration may be used as an additional element by some regulatory systems to provide for specific health and safety protection.

Comments
To be consistent with transportation consideration may be given to saturated vapor concentration.

Table 3.8.2 Note 1: If a Category 1 target organ/systemic toxicant is present in the mixture as an ingredient at a concentration between 1.0% and 10%, every regulatory authority would require information on the SDS for a product. However, a label warning would be optional. Some authorities will choose to label when the ingredient is present in the mixture between 1.0% and 10%, whereas others would normally not require a label in this case.
Table 3.8.2 Note 3: If a Category 1 target organ/systemic toxicant is present in the mixture as an ingredient at a concentration between 1.0% and 10%, some authorities classify this mixture as a Category 2 target organ/systemic toxicant, whereas others would not.
Table 3.8.2 Note 4: If a Category 2 target organ/systemic toxicant is present in the mixture as an ingredient at a concentration between 1.0% and 10%, every regulatory authority would require information on the SDS for a product. However, a label warning would be optional. Some authorities will choose to label when the ingredient is present in the mixture between 1.0% and 10%, whereas others would normally not require a label in this case.

Comment
The HCS regulates target organ effects in mixtures at ≥ 1.0%. In evaluating the GHS "protection will not be reduced" principle, the GHS requirements should be considered as a whole rather than each end-point individually.

3.8.4 Hazard Communication
The label single exposure target organ effects label elements are provided in GHS Table 3.8.3 and Annex 3.

Comment
The appropriate label elements for the single exposure target organ effects hazard categories can be selected from GHS Table 3.8.3 and Annex 3.

3.9 Specific Target Organ Systemic Toxicity –Repeat Exposure

3.9.2.1 Substances are classified as specific target organ/systemic toxicant by expert judgement on the basis of the weight of all evidence available, including the use of recommended guidance values which take into account the duration of exposure and the dose/concentration which produced the effect(s), (see 3.9.2.9), and are placed in one of two categories, depending upon the nature and severity of the effect(s) observed.

Comment
The GHS building block approach gives flexibility to authorities in implementing the hazard classes/categories. Although the HCS covers target organ effects this hazard class is not an exact match with the HCS. Consideration could be given in how to implement this hazard class/categories.

3.9.2.10.4 It is recognised that saturated vapour concentration may be used as an additional element by some regulatory systems to provide for specific health and safety protection.

Comments
To be consistent with transportation consideration may be given to saturated vapor concentration.

Table 3.9.3 Note 1: If a Category 1 target organ/systemic toxicant is present in the mixture as an ingredient at a concentration between 1.0% and 10%, every regulatory authority would require information on the SDS for a product. However, a label warning would be optional. Some authorities will choose to label when the ingredient is present in the mixture between 1.0% and 10%, whereas others would normally not require a label in this case.
Table Note 3: If a Category 1 target organ/systemic toxicant is present in the mixture as an ingredient at a concentration between 1.0% and 10%, some authorities classify this mixture as a Category 2 target organ/systemic toxicant, whereas others would not.
Table Note 4: If a Category 2 target organ/systemic toxicant is present in the mixture as an ingredient at a concentration between 1.0% and 10%, every regulatory authority would require information on the SDS for a product. However, a label warning would be optional. Some authorities will choose to label when the ingredient is present in the mixture between 1.0% and 10%, whereas others would normally not require a label in this case.

Comment
The HCS regulates target organ effects in mixtures at ≥ 1.0%. In evaluating the GHS "protection will not be reduced" principle, the GHS requirements should be considered as a whole rather than each end-point individually.

3.9.4 Hazard Communication
The label repeated exposure target organ effects label elements are provided in GHS Table 3.9.4 and Annex 3.

Comment
The appropriate label elements for the repeated *exposure target organ effects hazard categories can be selected from GHS Table 3.9.4 and Annex 3.*