

What Not to Do When Converting to the Globally Harmonized System

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Introduction

The Globally Harmonized System of the Classification and Labeling of Chemicals, or the “GHS,” has been on the safety professional’s radar screen for at least a decade. The GHS was first issued by the United Nations Economic Commission for Europe (UNECE) in 2003 and has been revised every two years since then. On May 25, 2012, the revised version of the OSHA Hazard Communication Standard, 29 CFR 1910.1200, incorporating elements of the GHS Revision 3, became effective. Compliance deadlines include training employees on the new GHS elements of labels and Safety Data Sheets by December 1, 2013, complying with all modified sections by June 1, 2015, except that distributors must not ship products received from the manufacturer or supplier without the GHS labels after December 1, 2015 and employers must update workplace labels and written hazard communication plans, and train employees on newly identified physical or health hazards by June 1, 2016.

This phase-in of compliance deadlines allows manufacturers, distributors and employers time to plan how best to convert their existing hazard communication programs, including labels on shipped containers and the new “Safety Data Sheet” information. During the phase-in period, employers may elect to start complying with the revised standard as of the May 25, 2012 effective date, or they may elect to comply with the previous standard until the compliance deadline for the various activities described above.

Manufacturers, importers and distributors of chemicals deemed hazardous under the GHS and the revised OSHA standard must classify the hazards of their products under the new system and to create new Safety Data Sheets and labels accordingly. This will require an understanding of numerous calculations and thresholds that differ from the previous method of hazard determination, and the use of pictograms, signal words and specific wording for hazard and precautionary statements. Employers who use hazardous chemicals, but do not manufacture, import or distribute them, will also be affected as their employees will be seeing different formats in Safety Data Sheets and labels, which may spark questions to their supervisors and HSE support specialists.

In this article, we will briefly describe the major changes that have taken place in the OSHA Hazard Communication Standard under the influence of the GHS and then discuss some of the key points to consider in planning a transition or conversion to the GHS.

HCS 1994

The familiar version of the Hazard Communication Standard, has not been subject to major revisions since 1994. In this article, we will refer to the pre-GHS Hazard Communication Standard as HCS 1994. This is a “performance oriented” standard – it delineates WHAT should be accomplished, while leaving much of the HOW to the safety professional working in concert with the organization’s operating or executive management, often with employee involvement. The process of selecting which chemicals are under the control of the HCS 1994 is termed “hazard *determination*,” and relies upon the use of Appendix A (Definitions) and Appendix B (Hazard Determination) of the standard for making this decision.

HCS 2012 and GHS

In this article, we will refer to the revised version of the Hazard Communication Standard that incorporates many of the elements of GHS Revision 3 as HCS 2012. This is a “specification oriented” standard that provides detailed instructions on HOW to decide if a chemical substance or mixture is hazardous and if so, what graphical and written information must be present on either a label or a Safety Data Sheet. The process of making this decision under HCS 2012 is termed “hazard *classification*,” and relies upon Appendix A (Health Hazard Criteria) and Appendix B (Physical Criteria) which are sometimes different from HCS 1994. These appendices have been borrowed liberally from the official text of the GHS Revision 3, a document called “the Purple Book.” This document may be purchased in hard copy for \$110 USD, or downloaded in digital version from the UNECE web site for free. Both hard copy and digital versions of Revision 3 are available at http://www.unece.org/trans/danger/publi/ghs/ghs_rev03/03files_e.html (Note however, that the current version of the GHS is Revision 4, which is available at: http://www.unece.org/trans/danger/publi/ghs/ghs_rev04/04files_e.html and a new Revision 5 is expected sometime in 2013. Changes from Revision 3 are generally minor, and a detailed discussion of them is beyond the scope of this article. OSHA’s intent is to engage in the public rulemaking process to incorporate changes that occur as the UN continues to revise the GHS.

The GHS Revision 3 defines 16 classes of physical hazards, 10 classes of health hazards and 2 classes of environmental hazards. Each hazard class can have several hazard categories which depend on the severity of the hazard. OSHA has not found it necessary or appropriate to adopt every hazard category. Also, OSHA has not adopted the environmental hazards because they are not under OSHA’s jurisdiction. However, OSHA has added 3 hazard classes that are not defined in GHS: combustible dust, simple asphyxiants and pyrophoric gases. OSHA has also added a classification for “Hazards Not Otherwise Classified” or “HNOC.” This is defined in 1910.1200(c) as “an adverse physical or health effect identified through evaluation of scientific evidence during the classification process that does not meet the specified criteria for the physical and health hazard classes identified in this section. This does not extend coverage to adverse physical and health effects for which there is a hazard class addressed in this section, the effect either falls below the cut-off value/concentration limit of the hazard class or is under a GHS

hazard category that has not been adopted by OSHA (e.g., acute toxicity Category 5).” The intent of the HNOC definition is to cover the gaps that might occur due to the determination of a hazard under the “Performance-oriented” HCS 1994, but for which a GHS Hazard Class had not been developed under Revision 3 of the GHS. It may take quite some time for the GHS to develop a harmonized definition for such a situation, so this allows OSHA to ensure that workers are alerted to the hazard. For example, under HCS 1994, a “water reactive” chemical is one that reacts with water to release a gas that is either flammable or presents a health hazard. But under GHS, the physical hazard of “chemicals which, in contact with water, emit flammable gases” has been defined as a Hazard Class, but there is not corresponding GHS Hazard Class for a potential health hazard that might exist if the gases generated was toxic. The chemical which releases a toxic gas in reaction with water would be an HNOC under OSHA HCS 2012.

The rationale for the GHS was to reduce the impediment to international trade which would occur if a chemical would be considered hazardous in one country, but not in another. Each country (“state” in UN-speak) has the authority to adopt which “building blocks” within GHS it sees fit, and is not under an obligation to adopt the whole system into its national legal codes. Although many countries have stated their intention to adopt much of the GHS, the time frames and the degree of adoption and variation from the GHS has resulted in a patchwork quilt of hazard communication requirements around the world. It is often light heartedly stated that the GHS is not actually “global” or “harmonized” though it is a “system.” Even so, the GHS provides a common foundation for hazard classification throughout the world.

What Not to do: Sales and Marketing

Not only employees, but some customers may be surprised by the appearance of visual elements such as pictograms on the labels and Safety Data Sheets that will be required as of June 1, 2015. Don’t forget to educate your sales force and marketing team on these important changes which will soon be in place. Your sales and marketing people can bolster the image of your company by being “in the know” and providing assurance to your customers that their ability to comply with OSHA will be advanced by the chemical hazard communications that they will receive with your products.

What Not to do: Hazard Classification

The most important mistake to avoid is not performing a careful hazard classification according to Appendices A and B of HCS 2012. Even though HCS 2012 has no requirement for testing chemicals, don’t just assume that the hazard determination that was made under HCS 1994 will translate directly over to HCS 2012 and GHS. For example, the HCS 1994 determination of acute toxicity results in a chemical being considered Highly Toxic or Toxic, depending on the LD₅₀ for rats for oral ingestion and for rabbits or rats for dermal contact or the LC₅₀ for rats for inhalation based on a 1 hour exposure period. HCS 2012 uses similar criteria and test animal species, but the classification of inhalation hazard is based on a 4 hour exposure period. This requires different conversion factors depending on whether the chemical substance is present as a dust, mist or fume. In addition, there is no longer a designation as “Highly Toxic” or “Toxic.” Instead, chemicals are placed in the Acute Toxicity hazard class and then designated as Category 1 (most toxic) down to Category 4 (toxic, but with a higher LD₅₀ or LC₅₀ than the other hazard

categories.) HCS 1994 defined target organ toxicity by describing various signs and symptoms that might occur in a qualitative manner, and typical chemicals that might be associated with them. For example, hepatotoxins are defined as “chemicals which produce liver damage,” with signs and symptoms such as “jaundice and liver enlargement” typically caused by “carbon tetrachloride or nitrosamines.” HCS 2012 provides a comprehensive discussion of considerations for classification based on a single exposure in Appendix A.8 and based on repeated exposures in Appendix A.9, both of which include guidance value ranges for toxicity test results according to ingestion, dermal contact and inhalation, and a detailed discussion of matters that may be relevant based on human experience and animal testing.

The need for careful hazard classification applies to physical hazards as well as health hazards. For example, HCS 1994 defined the term “physical hazard” as “a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water reactive.” HCS 1994 provided additional definitions of each of these specific physical hazards referring to various laboratory tests or chemical properties, and sometimes referencing another, related OSHA Standard. At the time, “flammable and combustible liquids” were defined for general industry in 29 CFR 1910.106. Under HCS 2012, four categories of Flammable Liquids are defined according to flash point and boiling point, and the term “combustible liquid” is no longer used as a hazard category – but must be used on the label for a Class 4 Flammable Liquid (see below under Labels). HCS 2012 defines Category 1 Flammable Liquids as those with a flash point less than 23°C(73°F) and an initial boiling point equal to or less than 35°C(95°F); Category 2 Flammable Liquids have a flash point less than 23°C(73°F) but an initial boiling point above 35°C(95°F); Category 3 Flammable Liquids have a flash point greater than or equal to 23°C(73°F) and less than or equal to 60°C(140°F) and Category 4 Flammable Liquids have a flash point greater than 60°C(140°F) and less than or equal to 93°C(199.4°F). OSHA revised 1910.106 to be compatible with HCS 2012 by making the definitions in 1910.106 match the definitions in HCS 2012. However, further review of the revised 1910.106 reveals another factor to consider in converting to GHS, as discussed in the next paragraph.

What Not to do: Interplay of other OSHA Standards with HCS 2012

Don’t ignore OSHA standards other than Hazard Communication that may be relevant to a given situation or to safety and health procedures or guidelines that may be in effect in your organization. A careful reading of the revised 1910.106 reveals another consideration in 1910.106(a)(19)(v) whereby a liquid with a flash point greater than 93°C (199.4°F) which is heated for use within 16.7°C (30°F) of its flash point, shall also be handled in accordance with the requirements for a Category 4 Flammable Liquid, even though HCS 2012 would not classify it as such. 1910.106(a)(19)(iv) specifies that when a Category 4 Flammable Liquid is heated within 16.7°C (30°F) of its flash point, it shall be treated as a Category 3 Flammable Liquid with a flash point at or above 37.8°C (100°F). HCS 2012 or GHS do not have any different requirements for Category 3 Flammable Liquids with a flash point at or above 37.8°C (100°F), but there are storage and other requirements in 1910.106 that do make this distinction. 1910.106(a)(19)(iii) makes a similar distinction for Category 3 Flammable Liquids with a flash point above 100°F is heated within 30°F of its flash point it is to be handled in accordance with requirements for a Category 3 Flammable Liquid with a flash point below 100°F.

The wording required by OSHA for signs and labels in “substance specific” health standards (e.g., asbestos, 13 carcinogens, lead, arsenic, cadmium, benzene, hexavalent chromium, etc.) have been made compatible with HCS 2012 as well. These changes may seem to be subtle, but they will require investment in obtaining and posting the new signs and removing the old ones by June 1, 2016. For example, the general industry standard for asbestos, 1910.1001 has been modified to require the following HCS 2012 conformant language for (j)(4)(i):

DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
AUTHORIZED PERSONNEL ONLY

The legend required by 1901.1001(j)(4)(i) prior to HCS 2012 is as follows, and may be used until June 1, 2016:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE
HAZARD
AUTHORIZED PERSONNEL ONLY.

Similar changes are required in the OSHA Asbestos Standard for signage regarding respirators and protective clothing and for labels of bags or containers of protective clothing and equipment, scrap, waste and debris containing asbestos fibers.

What Not to do: Material Safety Data Sheets

The OSHA 2012 Appendix D and GHS Revision 3 Annex 4 provide guidance on the preparation of Safety Data Sheets. The name of the familiar “Material Safety Data Sheet” has changed by dropping the first word, “Material.” The format of the Safety Data Sheet or “SDS,” includes a mandatory 16 sections. The ANSI Z400.1 standard for the Preparation of MSDSs also includes 16 sections, but the GHS version has switched the order of Sections 2 and 3. Section 2 is now Hazard Identification and Section 3 is now Composition/Information on Ingredients. However, DON’T just switch these two sections around in your MSDS and consider it converted to an SDS. There is new information that must be added to Section 2 to make it an SDS. In particular, the appropriate hazard class and category, for example Flammable Liquid, Category 1 or Specific Target Organ Toxicity, Category 2 must be stated. This means that the substance or mixture must be classified and categorized under the new rules detailed in the Appendices A, B and F of HCS 2012. Based on the classification, the appropriate signal words (“Danger” or “Warning”) and the hazard statements and precautionary statements that would appear on the label must be shown. Pictograms may be shown as either their graphical symbols or their defined names (“Flame” or “Skull and Crossbones”). Any hazard not otherwise classified that has been discovered as part of the classification process should also be listed (for example, formation of air contaminants during hardening). If the substance is a mixture and the acute toxicity of the mixture as a whole has not

been tested, if any ingredient at greater than or equal to 1% is of unknown acute toxicity, a statement to that effect must also be made in Section 2.

Don't copy "legacy" warnings into the SDS from an existing MSDS if the underlying data do not support classification under GHS/HCS 2012. For example, an existing MSDS may have stated that the product "may be harmful if swallowed," but the animal testing data and/or human experience do not support classification under acute oral toxicity or any specific target organ toxicity. Inquiry should be made as to the origin of the "may be harmful if swallowed" warning, and if after considering the weight of evidence, the warning is not validated, it should be removed.

What Not to do: Labels for Shipped Containers

Don't ignore the helpful and MANDATORY Appendix C, Allocation of Label Elements, in designing revised labels for shipped containers. This may contain some surprises. For example, a Category 4 Flammable Liquid must be labeled with the words, "Combustible Liquid," even though GHS and HCS 2012 does not use the word "Combustible" to describe the hazard category of a liquid with a flash point greater than 60°C (140°F) and less than 93°C (199.4°F).

Hazards not otherwise classified (HNOCs) do not have to be addressed on the container per 1901.1200 (f)(1), but they do have to be listed in Section 2 of the SDS, and they must be covered in employee training.

Don't assume every label has to have a pictogram...some hazard categories do not require one, and it is not allowed to show a pictogram "just in case." For example, a material categorized as Eye Irritation, Category 2B, would be labeled with the signal word "Warning," and the hazard statement "Causes eye irritation," but would have no pictogram.

Also, Appendix C dictates that DOT labels for the same hazard class and category take precedence over a GHS pictogram. For example, acetone has a flash point of -17°C (1.4° F) and a boiling point of 56°C (133° F). Acetone is listed as a Flammable Liquid, Class 3, Packing Group II by the Hazardous Material Table in 40 CFR 172.101 should be labeled with the red diamond DOT Flammable Liquid label and not with the Flame pictogram for Flammable Liquid, Class 3, Hazard Category 2. The GHS/HCS 2012 label would show the signal word "Danger" and the hazard statement "Highly flammable liquid and vapor," along with the precautionary statements required by Appendix C.4.19.

What Not to do: Training

Don't miss the mandatory compliance date of December 1, 2013 for training employees on the new label elements and the SDS format. Don't fail to take advantage of the updated training materials that OSHA provides on its website, including a Fact Sheet with specific guidance on what must be covered at: <https://www.osha.gov/Publications/OSHA3642.pdf> OSHA expects that this training will explain not only what standardized information is in each SDS and label format, but how that information can be important to the employee, such as precautions to be used during handling or storage, and how the information on the label is consistent with the SDS.

If a computerized training tool is to be used, ensure that all employees who may encounter hazardous chemicals do in fact have access to computers and are able to read or understand oral instruction in the language that they speak, if they don't speak English. Make sure that the vocabulary used is appropriate to their level of education. Although a quiz is not required by HCS 2012, it is a useful tool to assess the degree of comprehension, and provides a record of training.

What Not to do: Workplace Labels including NFPA 704 and HMIS

HCS 2012 maintains the flexibility of HCS 1994 in labels and other forms of warning for chemicals that are not shipped outside of the facility, but are used within the workplace. A label which contains all the information as the label that came in on the shipped container can be used if desired. But at a minimum, one must show a product identifier and words, pictures, symbols which provide at least general information regarding the hazards of the chemical and which are supplemented by other information immediately available to employees under the facility's hazard communication program. The most frequent question about workplace labels and signs seems to be "What about the NFPA 704 diamond? My local fire marshal and Hazmat Response teams are trained to look for them outside our storage buildings or at our front gate. And what about the HMIS labels? All our employees have been trained for years on how to interpret them." OSHA does not prohibit their use, as long as the information does not conflict with the GHS/HCS 2012 hazard class and warning information. NFPA 704 or HMIS both use a scale whereby 4 indicates the most severe hazard and 0 indicates no hazard for flammability, health hazards, and reactivity. Please continue to use the 4 for an extremely flammable liquid and vapor on the NFPA 704 diamond or HMIS sign, even though the GHS/HCS 2012 Flammable Liquid would be considered Category 1 under GHS. This should not be confusing for labels, because the GHS Hazard Category itself is not a required GHS label element. The signal word, pictogram(s), hazard statement(s) and precautionary statements that must be shown on the label are determined by the Hazard Category, but the Hazard Category is only required to be on the SDS, but not on the label. The NFPA 704 and/or HMIS hazard rankings may appear in Section 16, Other Information, of the SDS if desired.

It is important to remember that there may be other legal requirements or logical reasons for marking or labeling process vessels, storage tanks, piping systems, propane bullets, and the like with hazard warnings. For example, 29 CFR 1910.6 incorporates by reference the ANSI - A13.1-56 standard for identification of piping systems for oxygen and fuel gas cutting and welding (1910.253). The state of Oregon requires specific labeling for pipes and piping systems containing hazardous substances or that are insulated by asbestos. (See Division 2, Subdivision Z, 437-002-0378, Oregon rules for pipe labeling.)

What Not to do: Hazards Classified by OSHA but not by GHS

Even though OSHA has not yet issued a Combustible Dust standard, the reasonable possibility of a deflagration or explosion due to generation, confinement and ignition of a combustible dust has been included among the hazard classes defined by OSHA but not by GHS. OSHA requires manufacturers and importers who ships a chemical in dust form and which presents a hazard when used downstream to label the chemical with a signal word of "Warning" and a hazard

statement of “May form combustible dust concentrations in air.” The same is required for chemicals that are not shipped in dust form but under normal conditions of use, are processed in such a way that they present a combustible dust hazard. If such a condition is present in the workplace, either the label on the shipped container or the product identifier, and symbols, words or pictures that along with information immediately available to employees in the hazard communication program must be present in the workplace.

OSHA also added Pyrophoric Gases as a Hazard Class, to round out the Pyrophoric Solids and Liquids already included in GHS. Simple Asphyxiants such as nitrogen or argon had been included in the Hazard Determination process under HCS 1994, but had not been specifically designated as a GHS Hazard Class, so OSHA created that Hazard Class to ensure that HCS 2012 was as protective as the earlier version.

What Not to do: DOT, EPA and CPSC

Of the three Federal governmental agencies within the United States other than OSHA that have jurisdiction over the chemicals typically encountered in occupational workplaces, the Department of Transportation (DOT) and in particular, its Pipeline and Hazardous Materials Safety Administration (PHMSA) has been in the forefront of harmonization in the international community due to the need to ensure safe shipping and handling of products in international trade. However, don’t assume that the GHS Hazard Classes of “Hazardous to the Aquatic Environment,” and “Hazardous to the Ozone Layer” are treated the same within DOT. In particular, the DOT definition of marine pollutants may not be the same as the hazard categories for a material, which is Hazardous to the Aquatic Environment under GHS.

The Environmental Protection Agency (EPA) has not officially adopted GHS, but is primarily considering its effect and possible harmonization with pesticide labeling requirements under the Fungicide, Insecticide and Rodenticide Act (FIFRA). Therefore, don’t change your RCRA labels on hazardous wastes at this time.

The Consumer Product Safety Commission (CPSC) is also considering harmonization with GHS, but there is no timetable set for any changes. Since the chemical testing requirements under HCS 2012 are “test neutral,” don’t stop considering the data generated under 15 CFR Part 1500.40 through 1500.42 if this data is available and relevant to the chemicals being classified under HCS 2012.

Summary

The GHS is coming and organizations preparing to transition their hazard communication policies, programs and informational and training materials must take a close look at how health and physical hazards are classified under the new criteria. Some employees and customers may be surprised by the appearance of new visual features such as pictograms and changes to the familiar MSDS and an informational program targeted for these key audiences must be prepared to serve the organization’s communities and enhance its reputation. The earliest OSHA compliance date of December 1, 2013, by which employees must be trained in the new label

elements and the format of the Safety Data Sheet, is fast approaching. A useful Fact Sheet on this training requirement is available on the OSHA website.

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