

# GLOBALLY-HARMONISED HAZARD COMMUNICATION

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## **Abstract**

The Globally Harmonised System (GHS) for Classification and Labelling will provide an internationally-agreed system for hazard classification of chemical products and for communication of those hazards. The intended target audiences are those concerned with transport of dangerous goods, consumers, workers and emergency responders. Labels and safety data sheets (MSDS) are the core tools of the GHS hazard communication system, and the harmonised labelling elements are symbols (within a pictogram), signal words and hazard statements. The GHS will use a building approach in which application may vary according to the circumstances, type of product, and stage of life cycle, allowing selection of the elements appropriate to the needs of the various end users. Under the GHS, the transport sector will only use the harmonised symbols and pictograms already in use by the UNCETDG. The emergency response sector has very specific hazard communication needs, as the only target audience using hazard information primarily for response rather than for prevention. Information about acute toxicity, for example, must be communicated to emergency responders as rapidly as possible via symbols or pictograms. More detailed information about the hazards identified on the label is provided by training. Information about chronic effects is not needed for immediate response actions, and can be obtained from other information sources, e.g. the MSDS. The building block approach of the GHS is intended to meet these needs.

## **Introduction**

Current initiatives aimed to achieve a Globally Harmonised System (GHS) for Classification and Labelling arose from the declaration at the 1992 Rio Conference on Environment and Development that “A globally harmonised hazard classification and compatible labelling system (GHS), including material safety data sheets and easily understandable symbols, should be available if feasible, by the year 2000”. The GHS goals are to enhance protection of mankind and the environment, by:

- providing an internationally comprehensible system for hazard communication,

- providing a recognised framework for those countries without an existing system,
- facilitating international trade in chemicals whose hazards have been properly assessed and identified on an international basis,
- reducing the need for testing and evaluation of chemicals.

The system uses a building block approach in which application may vary according to the circumstances, type of product, and stage of life cycle, allowing selection of the elements appropriate to the needs of the various end users (transport, consumers, workers, emergency responders). There are three aspects of the work on Global Harmonisation, as follows.

1. Classification of substances, carried out under the auspices of OECD for health effects and the UN Committee of Experts on the Transport of Dangerous Goods, CETDG, for physicochemical hazards.
2. Classification of mixtures, carried out under the auspices of OECD.
3. Harmonisation of hazard communication (labels and safety data sheets), carried out under the auspices of the International Labour Office.

The work on hazard classification of substances and mixtures is largely completed, while the work on harmonisation of hazard communication is scheduled for completion at a meeting of governments, industry and workers in Geneva in May 2001. The GHS, once agreed, will be implemented via a non-binding mechanism using the existing framework of the UN Committee of Experts on Transport of Dangerous Goods (UNCETDG). The current UNCETDG will be reconfigured into a parent GHS/TDG Committee with two subcommittees, GHS and TDG. The GHS and TDG subcommittees will meet first in July 2001, with planned formal adoption of the GHS by the UN ECOSOC in 2003. It is hoped that the system will be fully operational by 2008, with widespread implementation of the system by all sectors throughout the world, including developing countries.

### **Harmonisation of hazard communication in the GHS**

During the preliminary development of the globally harmonised system of hazard communication, comprising labels and safety data sheets ((M)SDS, a number of key elements used on labels in existing systems were identified. These were:

- Signal words
- Symbols
- Pictograms
- Hazard statements
- Precautionary information
- Product identifiers
- Ingredients (in the case of mixtures)
- Colour

The harmonised system for labelling of hazardous chemicals uses these elements to achieve the intended goals of the GHS. The particular needs of the intended target





audience may however influence which elements are used, as will access to other elements of the hazard communication system. In transport, for example, the label, marking and placard are all used in the UN RTDG. They inform those in the transport chain about the hazardous characteristics of the goods, to identify the specific applicable requirements and to provide the core information required to mitigate against the effects of an accident or unforeseen release of the hazardous chemical. The transport system is based on physical and acute hazards and does therefore not cover chronic hazards. Under the GHS, the transport sector will only use certain of the label components identified above, for example signal words and hazard statements will not form part of the GHS label for transport.

Emergency responders share this philosophical approach. In these systems more detailed information about the hazards associated with the label is provided by training which is an integral part of the hazard communication system. The emergency response strategy of CTIF comprises 4 clear steps. These are the provision of (i) immediate information - labelling, (ii) short information - a short summary of the hazard information related to a chemical, (iii) detailed information - a safety data sheet and (iv) expert information - assistance from a specialist.

Following classification of a substance or a mixture using the harmonised classification criteria, the supplier of the chemical must select the correct label elements to communicate that harmonised classification information to the target audience(s) to which the product is being supplied. The Tables in the Appendix to this paper detail the symbols and signal words elements that have been provisionally allocated to each of the hazard levels within a selection of the hazard classes of the GHS. The labelling elements for sensitisers, carcinogens, mutagens, chemicals toxic for reproduction, chemicals having acute or chronic target organ toxicity (TOST) and chemicals having acute or chronic aquatic toxicity have not been included in these Tables, due to space constraints. These can be seen in the full papers from the ILO (1). It should be noted that the allocation of elements shown in the Tables reflect the proposals in the working document for the May, 2001, meeting in Geneva, rather than the final GHS agreement. It is anticipated that a number of these may change following that meeting.



### Symbols and pictograms

The following are the symbols that will be used in the GHS. With the exception of the exclamation mark and fish and tree, they are the standard symbol set used in the UN RTDG model regulations.

Flame	Flame over circle	Exploding bomb	Corrosion
			



The current proposal to be discussed in Geneva in May proposes that all hazard pictograms used in the harmonised system, both for transport and for supply purposes, should be in the shape of a square set at a point, as currently used for transport of dangerous goods. For containers subject to the scope of the UN RTDG model regulations, the colour used as background to the GHS pictograms will remain the same as those currently described in the model regulations. When a container is intended for supply and use and is outside the scope of the UN RTDG model regulations, the pictograms will contain no background colour. However, it is proposed that the frame will be red and sufficiently wide to ensure the red border is clearly visible, although a black border may be used where the label is intended for use nationally. Examples of the pictogram in the UN RTDG model regulations and the proposed pictogram for use in other settings are shown below for flammable gas.

Pictogram for flammable gas in the UN RTDG model regulations	Non UN RTDG pictogram for flammable gas
	

Concerns have been expressed, however, about the potential confusion between “transport” and “supply” pictograms on packages and containers that may be used both in transport and supply in workplace situations. It may be necessary to adopt a different shape or format for the supply pictogram in the GHS before final agreement.

### Signal Words

As shown in the Tables, the signal words to be used in the GHS are “Danger” and “Warning”. “Danger” is used for the more severe hazard levels (i.e. in the main for hazard levels 1 and 2), while “Warning” is used for the less severe.

### Hazard Statements, Precautionary Statements, Product Identifiers and Ingredient Declaration

In addition to the agreements reached on symbols, pictograms and colour described above, harmonised hazard statements have also been allocated for each hazard level within each hazard class of the GHS. These have not been included in this paper due to space constraints. A set of precautionary statements (safety advice) has also been developed which, while not being totally harmonised, can be used with the other GHS

elements, particularly by countries which do not have, as yet, a national system of labelling.

The product identifier is the " name or number used for a hazardous product on a label or in the (M)SDS". It provides a unique means by which the product user can identify the chemical by the GHS label within the particular use setting. Where the product is subject to the scope of the UN RTDG, the UN proper shipping name should however be used on the container. The label for a substance will include the chemical identity of the substance. In the case of mixtures, the competent authority may choose to require the inclusion of all ingredients that contribute to the hazards of the mixture. In any event, the label will include the chemical identity of ingredients, present in the mixture above a certain concentration, which have been classified as acutely toxic, corrosive, carcinogenic, mutagenic, toxic to reproduction or sensitising. 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 (M)SDS, in lieu of including them on labels.

### **Supplemental Information**

A large number of other labelling elements have additionally been identified in the various systems currently in use, including precautionary advice on use, disposal, first aid, etc. These elements have not been initially prioritised for harmonisation, but it is planned that such information can still be included on labels, as supplementary information.

### **Material Safety Data Sheets**

Under the GHS, a (M)SDS should be produced for any sector that requires it, for all substances and mixtures, which are considered hazardous within the meaning of the GHS. This is primarily for workplace audiences where, as is currently the case, employers and workers will use it as a source of information about hazards, including environmental hazards, and to obtain advice on safety precautions. In addition, the (M)SDS will provide an important source of information for other target audiences in the GHS. So certain elements of information may be used by those involved with the transport of dangerous goods, emergency responders (including poison centres), those involved in the professional use of pesticides and consumers. However, these audiences will receive additional information from a variety of other sources such as the UN RTDG document and package inserts for consumers and will continue to do so. The introduction of a harmonised labelling system therefore, is not intended to affect the primary use of the (M)SDS which is for workplace users.

The GHS has agreed to use the 16 heading format of ISO, also recommended by other organisations including ILO, ANSI and the EU, as follows: (1) Identification, (2) Composition/information on ingredients, (3) Hazard(s) identification, (4) First-aid measures, (5) Fire-fighting measures, (6) Accidental release measures, (7) Handling and storage, (8) Exposure controls/personal protection, (9) Physical and chemical properties, (10) Stability and reactivity, (11) Toxicological information, (12) Ecological information, (13) Disposal considerations, (14)Transport information, (15) Regulatory information, (16) Other information. It has also agreed on a number of

subheadings under the main headings, under which information should be provided if applicable or available.

## **Conclusions**

Looking to the future, the question can be asked "how far can harmonisation go?" Huge strides have been made in achieving the harmonised classification systems for substances and mixtures and the harmonised hazard communication system that is the topic of this paper. These systems must, however, be applied consistently in all countries within each end use application (consumer, workplace, transport), using the building block approach. Additional sectoral/regional requirements for labelling will lead to lack of harmonisation. In conclusion, the task is huge, and there is still much work to be done and political barriers to be overcome. On the other hand, the benefits (economic and, possibly, a more logical, comprehensible system) are immense. Will "Rio 10 years on" in 2002 provide the necessary impetus to cement the work that has been done to date?

## **References**

1. ILO Working Group on Hazard Communication, draft step 3 document, proposed harmonisation of chemical hazard communication in the globally harmonised system
2. Harmonised Integrated Classification system for human health and environmental hazards of chemical substances and mixtures, OECD, ENV/JM/HCL(2001)

## **Useful URLs**

OECD Harmonised Integrated Classification system for human health and environmental hazards of chemical substances and mixtures  
<http://www.oecd.org/ehs/classify> (Password-protected web site)

UN Physical Hazards of Substances and Mixtures  
<http://www.unece.org/trans/danger/danger.htm>

ILO Working Group on Hazard Communication  
<http://www.ilo.org/public/english/protection/safework/ghs/> (Password-protected)

IFCS (Intergovernmental Forum for Chemical Safety)  
<http://www.who.int/ifcs/>

## **Author biographical note**

Dr Iona Pratt is Director of Specialist Units in the Health and Safety Authority, and is a graduate in chemistry and biochemistry from Trinity College, Dublin. The work of the Specialist Units relates chemical safety legislation administered by the Authority, including transport of dangerous goods by road, the Seveso Directive, the EU Directives related to Classification, Packaging and Labelling, the EU-wide Notification of New Chemicals scheme and work on Existing Chemicals. She is Chairperson of the ILO Working Group on Harmonisation of Hazard Communication.

**APPENDIX**  
**Allocation of Label Elements for GHS Hazard Classes**

**Table 1. Acute Toxicity (Oral, Dermal, Inhalation)**

	Category 1	Category 2	Category 3	Category 4	Category 5
Criteria	5 mg/kg	50 mg/kg	300mg/kg	2 000 mg/kg	
Symbol	Skull and Crossbones	Skull and Crossbones	Skull and Crossbones	Exclamation Mark	No symbol is used
Signal Word	Danger	Danger	Danger	Warning	Warning

**Table 2. Skin corrosion/irritation**

	Category 1A	Category 1B	Category 1C	Category 2	Category 3
Criteria	Destruction of dermal tissue; visible necrosis in at least one animal	Destruction of dermal tissue; visible necrosis in at least one animal	Destruction of dermal tissue; visible necrosis in at least one animal	Reversible adverse effects in dermal tissue	Reversible adverse effects in dermal tissue
Symbol	Corrosion	Corrosion	Corrosion	No symbol is used	No symbol is used
Signal Word	Danger	Danger	Danger	Warning	Warning

**Table 3. Eye corrosion/irritation**

	Category 1	Category 2A	Category 2B	-
Criteria	Irreversible damage to cornea, iris, conjunctiva 21 days after exposure	Adverse effects on cornea, conjunctiva, iris, reversible in 21 days	Adverse effects on cornea, conjunctiva, iris, reversible in 7 days	
Symbol	Exclamation mark	No symbol is used	No symbol is used	
Signal Word	Danger	Warning	Warning	

**Table 4. Flammable liquid**

	Category 1	Category 2	Category 3	Category 4	-
Criteria	Flash point < 23° C and initial boiling point ≤ 35° C	Flash point < 23° C and initial boiling point > 35° C	Flash point ≥ 23° C and ≤ 60° C	Flash point > 60° C and ≤ 93° C	
Symbol	Flame	Flame	Flame	No symbol is used	
Signal Word	Danger	Danger	Warning	Warning	

**Table 5. Flammable solid**

	Category 1	Category 2	-	-
Symbol	Flame	Flame		
Signal Word	Danger	Warning		

**Table 6. Flammable gas**

	Category 1	Category 2	-	-
Symbol	Flame	No symbol is used		
Signal Word	Danger	Warning		

**Table 7. Pyrophoric liquid**

	Category 1	-	-	-
Symbol	Flame			
Signal Word	Danger			



**Table 8. Pyrophoric and self-heating substance**

	Category 1	Category 2	Category 3	-
Symbol	Flame	Flame	Flame	.
Signal Word	Danger	Danger	Warning	

**Table 9. Self-reactive substances**

	Type A	Type B	Types C and D	Types E and F	Type G
Symbol	Exploding Bomb	Exploding Bomb and Flame	Flame	Flame	<i>Note: There are no label elements allocated here.</i>
Signal Word	Danger	Danger	Danger	Warning	

**Table 10. Substances which in contact with water emit flammable gases**

	Category 1	Category 2	Category 3	-
Symbol	Flame	Flame	Flame	
Signal Word	Danger	Danger	Warning	

**Table 11. Oxidising liquids and solids**

	Category 1	Category 2	Category 3	-
Symbol	Flame over circle	Flame over circle	Flame over circle	
Signal Word	Danger	Danger	Warning	

**Table 12. Oxidising gas**

	Category 1	-	-	-
Symbol	Flame over circle			
Signal Word	Danger			

**Table 13. Organic peroxides**

	Type A	Type B	Types C and D	Types E and F	Type G
Symbol	Exploding Bomb	Exploding bomb and flame over circle	Flame over circle	Flame over circle	<i>There are no label elements allocated to this hazard class</i>
Signal Word	Danger	Danger	Danger	Warning	

**Table 14. Explosives**

Symbol	Exploding Bomb	Exploding Bomb	Exploding Bomb	Exploding Bomb	Exploding Bomb	Exploding Bomb	Exploding Bomb	Exploding Bomb	Exploding Bomb
Signal Word	Danger	Danger	Danger	Danger	Danger	Danger	Danger	Danger	Danger
	Unstable/Division 1.1 Substances and articles which have a mass explosion hazard.	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 projection or both, but not a mass explosion hazard.	Division 1.4 Substances and articles which present no significant hazard	Division 1.5 Very insensitive substances which have a mass explosion hazard	Division 1.6 Extremely insensitive articles which do not have a mass explosion hazard			
				No GHS label elements. However, the UN RTDG requires the number 1.4 to appear on an orange background.	No GHS label elements. However, the UN RTDG requires the number 1.5 to appear on an orange background	No label elements. However, the UN RTDG requires the number 1.6 to appear on an orange background			

