



Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

Sub-Committee of Experts on the Globally Harmonized System of Classification and Labelling of Chemicals

Forty-seventh session

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Item 2 (g) of the provisional agenda

Work on the Globally Harmonized System of Classification and Labelling of Chemicals:

Practical classification issues (proposed amendments
to the Globally Harmonized System)

Proposal to address simple asphyxiants in annex 11

Transmitted by the expert from the United States of America on behalf
of the practical classification issues informal working group*

I. Purpose

1. At the forty-third session, the Sub-Committee approved addressing simple asphyxiants in annex 11 of the Globally Harmonized System (GHS) as part of the practical classification issues informal working group's (PCI IWG) program of work (see INF.34. thirty-fourth session). The proposed amendments in the annex of this document will bring consistency in the global approach to identifying and communicating the simple asphyxiant hazard. In addition, it will bring attention to this hazard, which is not well understood, but that claims multiple lives every year^{1,2}.

II. Background

2. In annex 4, paragraph A4.3.2.3 of the GHS, "suffocation" is included as a hazard not resulting in classification that should be communicated in section 2 of the safety data sheet. However, the GHS does not provide guidance on how the hazard should be addressed or what should be covered with respect to the suffocation hazard.

3. Asphyxiation is a well-known issue in the workplace. A simple asphyxiant is a vapor or gas that can cause unconsciousness and death by suffocation due to lack of oxygen and frequently contributes to industrial accidents involving loss of life^{1,2}. They are of particular

* A/78/6 (Sect. 20), table 20.5.

¹ Compressed Gas Association (CGA), *CGA P-76 Hazards of Oxygen-Deficient Atmospheres*, 1st ed., 2018.

² U.S. Chemical Safety and Hazard Investigation Board Report No. 2021-03-I-GA January 2021 Fatal Liquid Nitrogen Release at Foundation Food Group.

concern for those who work in confined spaces, as these gases are colourless and odourless and offer no warning properties.

4. During the seventeenth session of the Sub-Committee, the PCI IWG had on its program of work an item to address simple asphyxiants³. The PCI IWG submitted an official document for the twentieth session addressing simple asphyxiants in the “gases under pressure” chapter of the GHS⁴. After submitting the document, an objection was raised in the PCI IWG on the proposal and consensus could not be reached on an alternate proposal. Therefore, the document was withdrawn on the understanding that work on the development of a proposal to address simple asphyxiants in the GHS would continue⁵.

5. At its thirty-third session, the Sub-Committee adopted the proposal for a new annex 11 in the GHS, to provide guidance on hazards that do not result in classification, but which may need to be assessed and communicated. The first hazard addressed in annex 11 is “dust explosion”. In a subsequent Sub-Committee session, a member of the PCI IWG suggested that the informal working group should reconsider addressing simple asphyxiants in annex 11, given that the suffocation hazard is already noted in annex 4. Incorporating simple asphyxiants in annex 11 also addresses some concerns expressed when it was proposed to be included in the “gases under pressure” chapter.

6. Informal document INF.19 from the forty-sixth session⁶ provides the historical context of previous discussions on this issue, along with a draft proposal that has been refined into the proposal in the annex to the present document.

III. Overview of “simple asphyxiant” hazard in annex 11

7. The annex of this document provides guidance on understanding the “simple asphyxiant” hazard and a consistent approach to identifying and communicating it. It is organized as follows:

- Section A.11.3.1 “Scope and applicability”
- Section A.11.3.2 “Definition”
- Section A.11.3.3 “Identification of simple asphyxiant”
- Section A.11.3.4 “Supplemental information for hazard communication”

IV. Proposal

8. The PCI IWG invites the Sub-Committee to consider the proposed amendments to the GHS as set forth in the annex of this document.

³ Informal document INF.5 (seventeenth session).

⁴ Proposal to address simple asphyxiants in the GHS ([ST/SG/AC.10/C.4/2010/16](#)).

⁵ See paragraph 18 of the report of the Sub-Committee on its twentieth session ([ST/SG/AC.10/C.4/40](#))

⁶ Informal document INF.19 (forty-sixth session).

Annex

Proposed amendments to annex 11 of the GHS

Insert the following new section A11.3 after A11.2.8.2, to read as follows:

“A11.3 Simple asphyxiants

This section provides information to facilitate the identification of simple asphyxiant hazards.

A11.3.1 *Scope and applicability*

A11.3.1.1 An asphyxiant is a vapour or gas that can cause unconsciousness and death by suffocation due to lack of oxygen. Asphyxiants can be either chemical asphyxiants or simple asphyxiants. Simple asphyxiants are gases or vapours which are harmful to the body when they become so concentrated that they reduce oxygen in the air (normally about 21 percent) to dangerous levels. When the concentration of a particular gas increases, the fraction of inspired oxygen decreases, causing decreased oxygen in the blood. Thus, the severity and timing of effects are dependent on the fraction of inspired oxygen in the atmosphere. For example, inhaling an atmosphere containing no oxygen causes loss of consciousness in a matter of seconds because such an atmosphere not only fails to provide fresh oxygen, but also removes that already present in the bloodstream. There will be little sense of breathlessness to warn the victim that something is amiss, and they will rapidly lose consciousness. The heart will continue to function for a short time, but will then arrest, causing circulatory failure leading to death.

A11.3.1.2 Asphyxiation is a well-known hazard in the workplace. Simple asphyxiants frequently contribute to industrial accidents involving loss of life and are of particular concern for those who work in confined spaces.

A11.3.1.3 Competent authorities and trade associations use various approaches including implementing regulations, reference standards and guidance on safe practices for working in environments where oxygen levels can be reduced. They may also establish a minimum safe level of oxygen. Section A11.3.5 contains examples of regulations, reference standards and guidance documents.

A11.3.1.4 Chemical asphyxiants cause suffocation by either preventing the uptake of oxygen in the blood or by preventing the normal oxygen transfer from the blood to the tissues or within the cell itself. The specific toxic health effects associated with chemical asphyxiants are covered by acute toxicity (chapter 3.1), specific target organ toxicity- single exposure (chapter 3.8) and specific target organ toxicity - repeated exposure (chapter 3.9).

A11.3.2 *Definition*

Simple asphyxiant refers to gases or vapours that displace oxygen and can thus cause oxygen deprivation in those who are exposed, which may lead to unconsciousness and death, after exposure to a substance or mixture.

A11.3.3 *Identification of simple asphyxiants*

Simple asphyxiants are of particular concern in enclosed spaces. Some examples of well-known simple asphyxiants from experience include: carbon dioxide, hydrogen, nitrogen, helium, neon, argon, krypton, xenon, ethane, ethylene, acetylene, methane, propane, propylene, aliphatic alkanes and the chlorofluorocarbons. Evaluation of other gases and vapours (e.g., some solvents) as simple asphyxiants requires expert judgment to evaluate evidence such as human experience, information from similar substances, and other pertinent data. In cases where a substance or mixture is already classified for acute toxicity via inhalation, then identification as a simple asphyxiant is not warranted.

A11.3.4 Supplemental information for hazard communication

A11.3.4.1 As explained in 1.4.6.3, there are many communication elements which have not been standardized in the harmonized system. Some of these clearly need to be communicated to the downstream user. For substances and mixtures that are simple asphyxiants, information should be provided in section 2 of the safety data sheet (A4.3.2) that addresses hazards that do not result in classification.

A11.3.4.2 To communicate the simple asphyxiant hazard, competent authorities may require the use of the following phrases on labels, safety data sheets and/or operating instructions or may leave the choice to the manufacturer or supplier.

- (a) “May displace oxygen and be fatal”.
- (b) In addition, the phrase “Danger” may be used in conjunction with item (a).

A11.3.5 References

A11.3.5.1 Examples of regulations, reference standards, and guidance documents on safe practices for working in environments where oxygen levels can be reduced are provided below:

- (a) U.S. OSHA Respiratory Protection Standard (29 CFR 1910.134);
- (b) U.S. OSHA Permit Required Confined Spaces (29 CFR 19010.146);
- (c) U.K. HSE Control of Substances Hazardous to Health (COSHH) Regulations 2002 (as amended). Approved Code of Practice L5 (Sixth edition, 2013) ISBN: 9780717665822;
- (d) U.K. HSE Confined Spaces Regulation 1997. Approved Code of Practice, Regulations and guidance L101 (Third edition, 2014) ISBN: 978 0 7176 6622 5;
- (e) German Technical Rules for Hazardous Substances, TRGS 528 Welding Work, GMBI 2020 p. 463 [No. 23] (7 August 2020);
- (f) U.K. HSE EH40/2005 Workplace exposure limits (fourth edition 2020) ISBN: 9780717667031 EH40/2005;
- (g) German Working in oxygen reduced atmosphere (DGUV Information 205-006);
- (h) U.K. HSE Confined spaces: A brief guide to working safely INDG258 (revision 1, 2013) ISBN: 9780717664894 Confined spaces: A brief guide to working safely INDG258;
- (i) U.K. HSE Guidance on permit-to-work systems A guide for the petroleum, chemical and allied industries HSG 250 (first edition, 2005) ISBN: 978 0 7176 2943 5;
- (j) Hazards of Oxygen-Deficient Atmospheres, U.S. Compressed Gas Association P-76 (2018);
- (k) Hazards of Oxygen-Deficient Atmospheres, European Industrial Gas Association Document 44 (2018); and
- (l) Hazards of Oxygen-Deficient Atmospheres, Asian Industrial Gas Association 008/18”.