



**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 Transport
of Dangerous Goods
Forty-ninth session**

Geneva, 27 June – 6 July 2016

Item 10 (c) of the provisional agenda

**Issues relating to the Globally Harmonized System of
Classification and Labelling of Chemicals:
Classification criteria for flammable gases****Sub-Committee of Experts on the Globally Harmonized
System of Classification and Labelling of Chemicals
Thirty-first session**

Geneva, 6 – 8 July 2016

Item 2 of the provisional agenda

**Joint work with the Sub-Committee of Experts on the
Transport of Dangerous Goods (TDG Sub-Committee)****Comprehensive consideration of the hazard class
flammable gases in the course of introducing new
classification criteria****Transmitted by the experts from Germany, the European
Industrial Gases Association (EIGA) and the European
Chemical Industry Council (CEFIC)¹**

1. During the December 2015 sessions of the Sub-Committee of Experts on the Transport of Dangerous Goods (TDG Sub-Committee) and of the Sub-Committee of Experts on the Globally Harmonized System of Classification and Labelling of Chemicals (GHS Sub-Committee) the Joint TDG-GHS informal working group on classification criteria for flammable gases presented the results of its work consisting of new classification criteria to be used for dividing flammable gases. These new criteria (presented as option 3 during the sub-committees joint meeting in December 2015) allow using either the lower flammability limit (LFL) or the fundamental burning velocity (FBV). The advantage is that new testing is not enforced and that also in the absence of data on the FBV the criteria can be applied based on calculation of the LFL. The sub-committees acknowledged and supported the new criteria during their joint meeting in December 2015 as well (see ST/SG/AC.10/C.4/60, Annex II, paragraph 4).

¹ In accordance with the programme of work of the sub-committees approved by the Committee at its seventh session (see ST/SG/AC.10/C.3/92, para.95, ST/SG/AC.10/C.4/56, annex II, and ST/SG/AC.10/42, para.15).

2. Experts from Germany, CEFIC and EIGA participated in the discussions of the informal working group and also fully support its conclusion with regard to the choice of the new criteria.

3. Aiming at a comprehensive approach for a new categorization of the hazard class flammable gases, the experts from Germany, CEFIC and EIGA presented a proposal (see informal document INF.26 (TDG Sub-Committee, 48th session) – INF.8 (GHS Sub-Committee, 30th session)) which is based on the agreed criteria as worked out by the informal working group. It applies exactly the same criteria but seeks for a more straightforward solution for the categorization of the hazard class flammable gases which is not narrowed down to sub-categorize category 1 into 1A and 1B but which is taking into account the hazard class as a whole.

4. As a result of the discussions in the joint session in December 2015, "*the authors of INF.8 together with any other interested experts were invited to continue working on the proposal, to include the consequential amendments to current provisions in the GHS and in the Model Regulations and to provide a detailed impact assessment on the consequences and benefits of the proposed changes*" (see ST/SG/AC.10/C.4/60, Annex II, paragraph 7).

5. This document is the requested follow-up document and for this purpose contains the following annexes:

- Annex 1: Proposed amendments to Chapter 2.2 of the GHS
- Annex 2: Consequential amendments to Annex 1, Table A1.2, of the GHS
- Annex 3: Consequential amendments to Annex 3, Section 3 of the GHS
- Annex 4: Consequential amendments to Annex 4, Section 9 of the GHS
- Annex 5: Consequential amendments to the United Nations Recommendations on the Transport of Dangerous Goods, Model Regulations
- Annex 6: Impact assessment
- Annex 7: Benefits of the comprehensive consideration of the hazard class flammable gases

6. The TDG and GHS sub-committees are invited to consider the proposal as contained in annexes 1 to 5 to this document.

Annex 1

Proposed amendments to Chapter 2.2 of the GHS

Short explanations: As pyrophoric gases are classified as category 1 by default according to this proposal, they automatically have the pictogram flame and the signal word danger assigned and no additional pictogram and signal word are needed.

Action requested of the sub-committees:

The sub-committees are invited to consider the proposed amendments to Chapter 2.2 as shown below. The proposal contains two alternative decision logics, one with reference to transport of dangerous goods and one without. The sub-committees are invited to choose the option deemed most appropriate.

Amendments are shown as follows: Additions are underlined, deletions are ~~in strikethrough~~.

“CHAPTER 2.2 FLAMMABLE GASES

2.2.1 Definitions

- 2.2.1.1 A *flammable gas* is a gas having a flammable range with air at 20 °C and a standard pressure of 101.3 kPa.
- 2.2.1.2 A *pyrophoric gas* is a flammable gas that is liable to ignite spontaneously in air at a temperature of 54 °C or below.
- 2.2.1.3 A *chemically unstable gas* is a flammable gas that is able to react explosively even in the absence of air or oxygen.

2.2.2 Classification criteria

- 2.2.2.1 A flammable gas is classified in one of the two categories for this class according to the following table:

Table 2.2.1: Criteria for flammable gases

| Category | Criteria |
|----------|--|
| 1 | Gases, which at 20 °C and a standard pressure of 101.3 kPa <u>have a flammable range in air and which are not assigned to Category 2.:</u> (a) are ignitable when in a mixture of 13% or less by volume in air; or (b) 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 101.3 kPa, have a flammable range while mixed in air <u>and:</u> <u>(a) a lower flammability limit (LFL) > 6 % by volume in air; or</u> <u>(b) a fundamental burning velocity (FBV) < 10 cm/s.</u> |

NOTE 1: *In the absence of data which positively allow assignment of a gas (mixture) to category 2, the gas (mixture) should be classified as category 1.*

NOTE 2: *Ammonia and methyl bromide may be regarded as special cases for some regulatory purposes.*

NOTE 3: *Aerosols should not be classified as flammable gases. See Chapter 2.3.*

2.2.2.2 A flammable gas is additionally classified as pyrophoric if it meets the criteria in the following table:

Table 2.2.2: Criteria for pyrophoric gases

| Category | Criteria |
|-----------------------|--|
| Pyrophoric gas | Flammable gas that ignite spontaneously in air at a temperature of 54 °C or below. |

NOTE 1: *Spontaneous ignition for pyrophoric gases is not always immediate, and there may be a delay.*

NOTE 2: *In the absence of data on its pyrophoricity, a flammable gas mixture should be classified as a pyrophoric gas if it contains more than 1% (by volume) of pyrophoric component(s).*

NOTE 3: *A gas that is classified as a pyrophoric gas is classified as a flammable gas of category 1 by default.*

2.2.2.3 A flammable gas that is also chemically unstable is additionally classified in one of the two categories for chemically unstable gases using the methods described in Part III of the Manual of Tests and Criteria according to the following table:

Table 2.2.3: Criteria for chemically unstable gases

| Category | Criteria |
|----------|---|
| A | Flammable gases which are chemically unstable at 20°C and a standard pressure of 101.3 kPa |
| B | Flammable gases which are chemically unstable at a temperature greater than 20°C and/or a pressure greater than 101.3 kPa |

NOTE 1: *A gas that is classified as a chemically unstable gas is classified as a flammable gas of category 1 by default.*

2.2.3 Hazard communication

2.2.3.1 General and specific considerations concerning labelling requirements are provided in *Hazard communication: Labelling* (Chapter 1.4). Annex 1 contains summary tables about classification and labelling. Annex 3 contains examples of precautionary statements and pictograms which can be used where allowed by the competent authority.

Table 2.2.4: Label elements for flammable gases

| | Flammable gas | | Additional sub-categories | | |
|-------------------------|-------------------------|-------------------------------|---|--|--|
| | | | Pyrophoric gas | Chemically unstable gas | |
| | Category 1 | Category 2 | Pyrophoric gas | Category A | Category B |
| Symbol | Flame | Flame No symbol | <i>No additional symbol</i> Flame | <i>No additional symbol</i> | <i>No additional symbol</i> |
| Signal word | Danger | Warning | <i>No additional signal word</i> Danger | <i>No additional signal word</i> | <i>No additional signal word</i> |
| Hazard statement | Extremely flammable gas | Flammable gas | May ignite spontaneously if exposed to air | May react explosively even in the absence of air | May react explosively even in the absence of air at elevated pressure and/or temperature |

2.2.3.2 If a flammable gas or gas mixture is additionally classified in one or more sub-categories, then all relevant classification(s) should be communicated on the safety data sheet as specified in Annex 4, and the relevant hazard communication elements included on the label.

2.2.4 Decision logic and guidance

The decision logic and guidance, which follow, are not part of the harmonized classification system, but have been provided here as additional guidance. It is strongly recommended that the person responsible for classification studies the criteria before and during use of the decision logic.

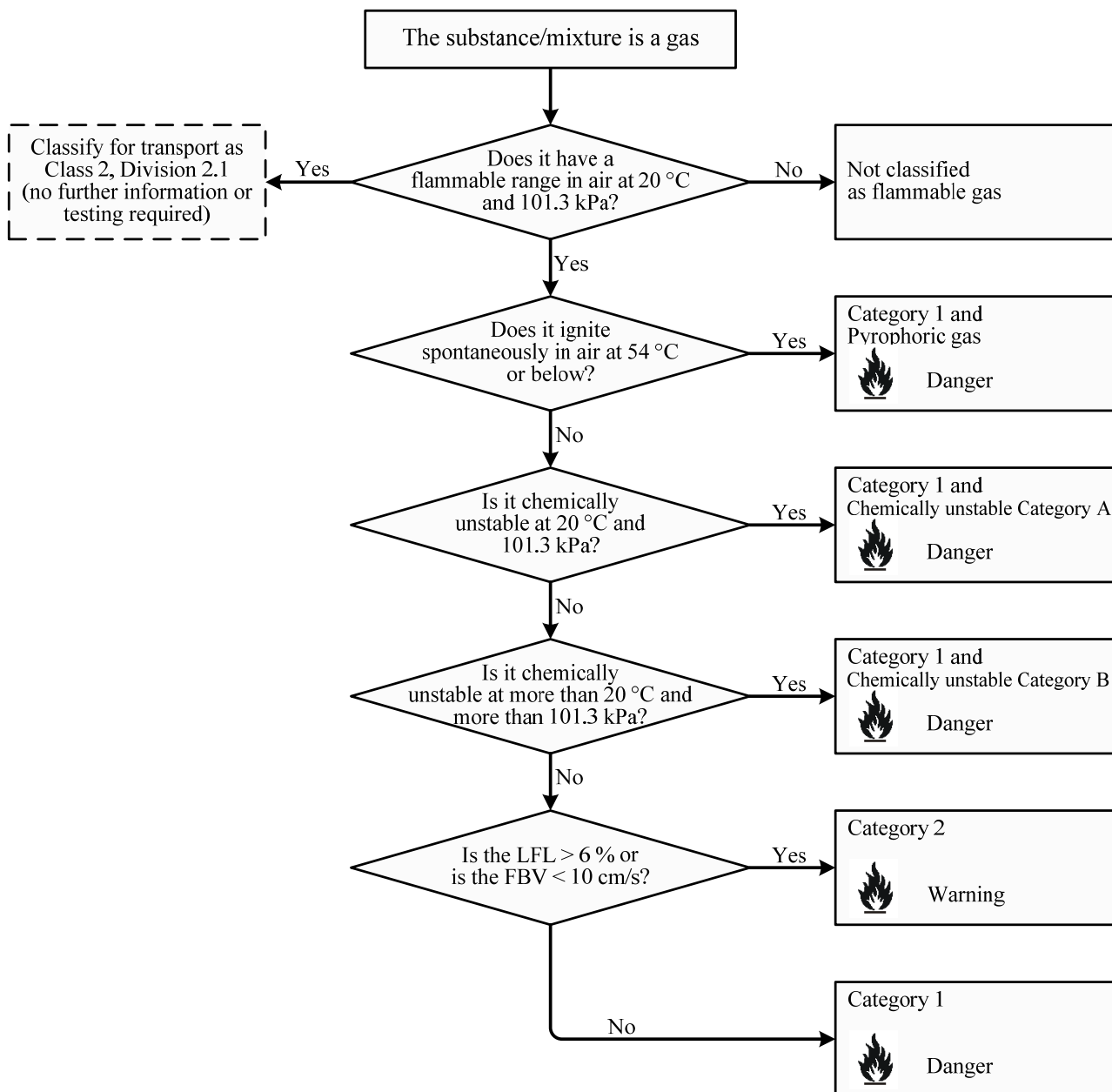
2.2.4.1 *Decision logic for flammable gases*

To classify a flammable gas, data on its flammability, on its ability to ignite in air and on its chemical instability are required. The classification is according to decision logic 2.2-(a).

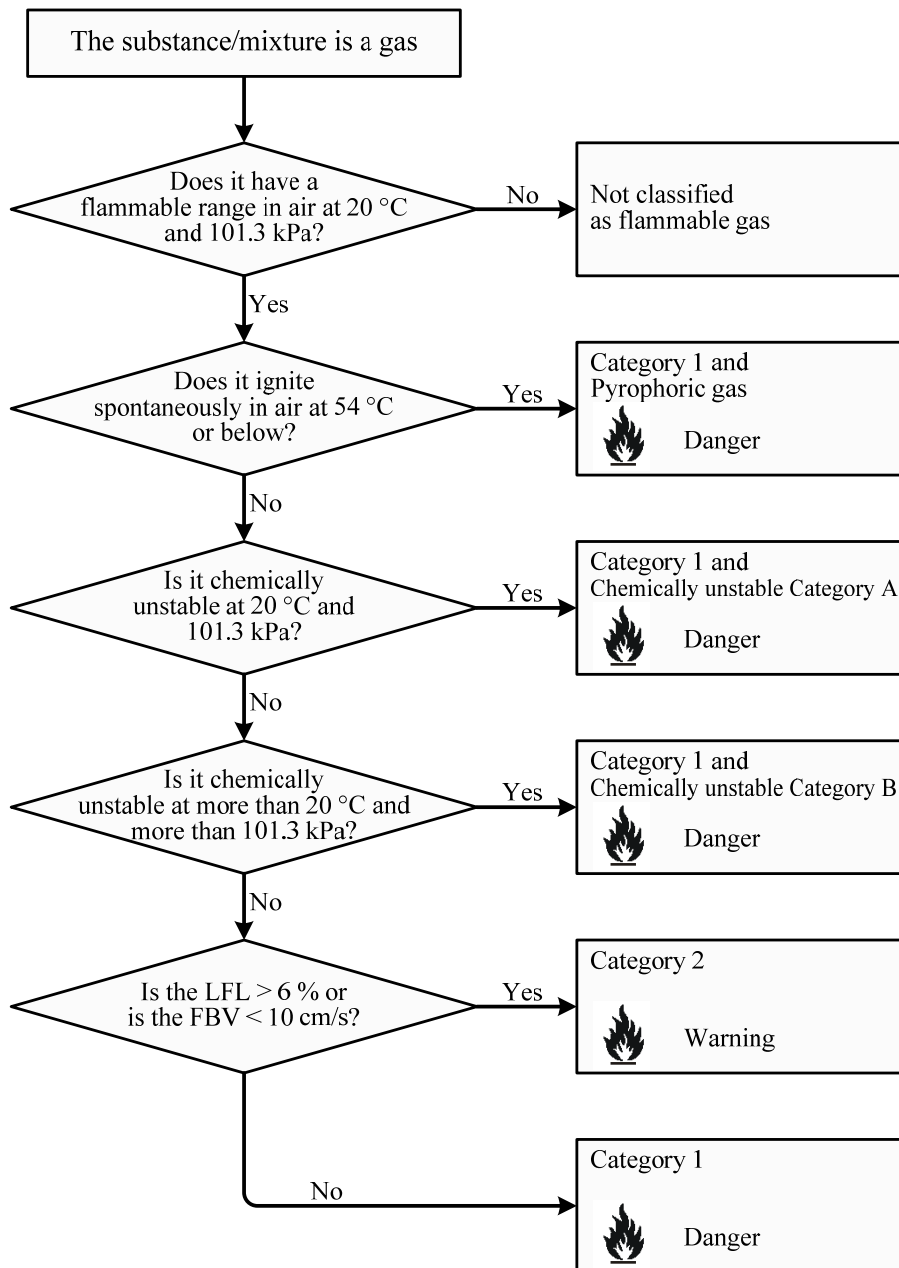
~~**Decision logic 2.2 (a)**~~

(current decision logic 2.2 (a) is deleted.

Decision logic 2.2 (option 1)



Decision logic 2.2 (option 2)



2.2.4.2 ——— ***Decision logic for pyrophoric gases***

~~To classify a flammable gas as a pyrophoric gas, data on its ability to ignite in air are required. The classification is according to decision logic 2.2 (b).~~

~~*Decision logic 2.2 (b)*~~

~~*(current decision logic 2.2 (b) is deleted.*~~

2.2.4.3 ——— ***Decision logic for chemically unstable gases***

~~To classify a flammable gas as chemically unstable, data on its chemical instability are required. The classification is according to decision logic 2.2 (c).~~

~~*Decision logic 2.2 (c)*~~

~~*(current decision logic 2.2 (c) is deleted.*~~

2.2.4.24 ***Guidance***

2.2.4.24.1 Flammability should be determined by tests or by calculation in accordance with methods adopted by ISO (see ISO 10156:2010 “Gases and gas mixtures – Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets” and, if using the fundamental burning velocity for assigning gases to category 2, see ISO 817:2014 “Refrigerants – Designation and safety classification, Annex C: Method of test for burning velocity measurement of flammable gases”). Where insufficient data are available to use these methods, tests by a comparable method recognized by the competent authority may be used.”

Consequential amendments:

Current paragraphs 2.2.4.4.2 to 2.2.4.4.4 become new paragraphs 2.2.4.2.2 to 2.2.2.4.

Current section 2.2.5 remains unchanged.

Annex 2

Consequential amendments to Annex 1, Table A1.2 of the GHS

Short explanations: As pyrophoric gases are classified as category 1 by default according to this proposal, they automatically have the pictogram flame and the signal word danger assigned and no additional pictogram and signal word are needed.

In a way it was inconsistent that for TDG the flame was indicated for pyrophoric gases because pyrophoric gases are not identified as such for the purposes of TDG. The flame is assigned solely based on the classification as flammable (division 2.1).

Amendments are shown as follows: Additions are underlined, ~~deletions are in strikethrough~~.

“A1.2 Flammable gases (see Chapter 2.2 for classification criteria)

| Classification | | Labelling | | | | Hazard statement codes |
|-----------------|-------------------------------|--------------------------------|-----------------------------------|---|---|------------------------|
| Hazard class | Hazard category | Pictogram | | Signal word | Hazard statement | |
| | | GHS | UN Model Regulations ^a | | | |
| Flammable gases | 1 | | | Danger | Extremely flammable gas | H220 |
| | 2 | | | Warning | Flammable gas | H221 |
| | Pyrophoric gas | <u>No additional pictogram</u> | <u>Not required</u> | <u>No additional signal word</u> Danger | May ignite spontaneously if exposed to air | H232 |
| | A (chemically unstable gases) | <u>No additional pictogram</u> | <u>Not required</u> | <u>No additional signal word</u> | <u>Additional hazard statement:</u> May react explosively even in the absence of air | H230 |
| | B (chemically unstable gases) | <u>No additional pictogram</u> | <u>Not required</u> | <u>No additional signal word</u> | <u>Additional hazard statement:</u> May react explosively even in the absence of air at elevated pressure and/or temperature | H231 |

^a Under the UN Recommendations on the Transport of Dangerous Goods, Model Regulations, the symbol, number and border line may be shown in black instead of white. The background colour stays red in both cases.


Annex 3

Consequential amendments to Annex 3, Section 3 of the GHS

Amendments are shown as follows: Additions are underlined, ~~deletions are in strikethrough~~.

Amend the matrix tables for flammable gases (categories 1 and 2) and pyrophoric gases, in A3.3.5, as follows:

FLAMMABLE GASES
(CHAPTER 2.2)
(Flammable gases)

| Hazard category | Signal word | Hazard statement | Symbol |
|-----------------|----------------|----------------------------------|--|
| 1 | Danger | H220 Extremely flammable gas | Flame  |
| <u>2</u> | <u>Warning</u> | <u>H221</u> <u>Flammable gas</u> | |

| Precautionary statements | | | |
|---|--|--|----------|
| Prevention | Response | Storage | Disposal |
| P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. | P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely. P381 In case of leakage, eliminate all ignition sources. | P403 Store in a well-ventilated place. | |

FLAMMABLE GASES
(CHAPTER 2.2)
(Flammable gases)

| |
|-----------------------------------|
| Symbol <i>No symbol</i> |
|-----------------------------------|

| Hazard category | Signal word | Hazard statement |
|-----------------|-------------|--------------------|
| <u>2</u> | Warning | H221 Flammable gas |

| Precautionary statements | | | |
|---|--|--|----------|
| Prevention | Response | Storage | Disposal |
| P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. | P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely. P381 In case of leakage, eliminate all ignition sources. | P403 Store in a well-ventilated place. | |

**FLAMMABLE GASES
(CHAPTER 2.2)
(Pyrophoric gases)**

| Hazard category | Signal word | Hazard statement | Symbol |
|-----------------|--|---|--------------------------------------|
| Pyrophoric gas | <u>No additional signal word</u> Danger | H232 May ignite spontaneously if exposed to air | Flame <u>No additional symbol</u> |



| Precautionary statements | | | |
|---|----------|---------|----------|
| Prevention | Response | Storage | Disposal |
| P222 Do not allow contact with air. <i>– if emphasis of the hazard statement is deemed necessary.</i> P280 Wear protective gloves/protective clothing/eye protection/face protection. Manufacturer/supplier or the competent authority to specify the appropriate type of equipment. | | | |

Note: This table lists only precautionary statements that are assigned due to the pyrophoricity of the gas. For the other precautionary statements that are assigned based on the flammability, see the respective tables for flammable gases.”

The current matrix table for chemically unstable gases remains unchanged.

Annex 4

Consequential amendments to Annex 4 section 9 of the GHS

Amendments are shown as follows: additions are underlined.

“Table A4.3.9.2: Data relevant with regard to physical hazard classes (supplemental)

This table lists properties/safety characteristics and test results that are not required on the SDS but may be useful to communicate when a substance or mixture is classified in the respective physical hazard class. Data which is deemed relevant with regard to a specific physical hazard but not resulting in classification (e.g., negative test results close to the criterion) may also be useful to communicate. Include any relevant information, such as a short description, value(s), unit, conditions (e.g., temperature, pressure), method, each as appropriate.

The name of the hazard class the data relates to may be indicated together with the data but it is not necessary to do so because the resulting classification is already indicated in Section 2 of the SDS. Thus, the data may be listed in the same way as the data according to Table A4.3.9.1.

Unless otherwise specified, the test methods referred to in this Table are described in the Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria (referred to as the Manual of Tests and Criteria hereafter).

| Chapter | Hazard class | Property/Safety characteristic/Test result and Remarks/Guidance |
|---------|-----------------|---|
| 2.2 | Flammable gases | <p><u>for pure flammable gases:</u></p> <ul style="list-style-type: none"> – no data on the explosion / flammability limits is needed because these are indicated based on Table A4.3.9.1 – indicate the T_{Ci} (maximum content of flammable gas which, when mixed with nitrogen, is not flammable in air, in %) as per ISO 10156 – <u>indicate the fundamental burning velocity (FBV) if the gas is classified as category 2 based on the FBV</u> <p><u>for flammable gas mixtures:</u></p> <ul style="list-style-type: none"> – indicate the explosion / flammability limits, if tested (if classification as flammable is based on the calculation as per ISO 10156, assignment of cat. 1 is compulsory) – <u>indicate the fundamental burning velocity (FBV) if the gas is classified as category 2 based on the FBV</u> |

The remainder of the table remains unchanged.

Annex 5

Consequential amendments to the United Nations Recommendations on the Transport of Dangerous Goods, Model Regulations

Amend Chapter 2.2, section 2.2.2 as follows: (*additions are underlined, deletions are in strikethrough*).

“2.2.2 Divisions

2.2.2.1 Substances of Class 2 are assigned to one of the three divisions based on the primary hazard of the gas during transport.

NOTE: (unchanged)

(a) Division 2.1 *Flammable gases*

Gases which at 20 °C and a standard pressure of 101.3 kPa:-

- (i) ~~are ignitable when in a mixture of 13 per cent or less by volume with air; or~~
- (ii) ~~have a flammable range with air of at least 12 percentage points regardless of the lower flammable limit.~~

Flammability shall be determined by tests or by calculation in accordance with methods adopted by ISO (see ISO 10156:2010). Where insufficient data are available to use these methods, tests by a comparable method recognized by a national competent authority may be used;”

The remainder of the text under section 2.2.2 remains unchanged.

Annex 6

Impact assessment

1. For the impact assessment it can be distinguished between jurisdictions/sectors which have only GHS category 1 of the flammable gases implemented and those which have implemented both, category 1 and 2.

Jurisdictions/sectors which are currently using only category 1

2. Such jurisdictions have used the same building block as the Model Regulations on the Transport of Dangerous Goods (TDG) by implementing only category 1. For these jurisdictions/sectors the impact assessment as already presented in informal document INF.26 (TDG Sub-Committee 48th session) – INF.8 (GHS Sub-Committee 30th session) would apply in the same manner.

3. In that impact assessment it was pointed out that the authors are not aware of gases (including mixtures) that actually would be classified differently based on the proposal, i.e. of gases that would fulfil the criteria for the current GHS category 2 and thus would be newly classified as flammable in division 2.1 for TDG (or the corresponding equivalent of other jurisdictions/sectors applying the building block approach in the same way as the Model Regulations). Therefore, the expert from Germany had requested the Sub-Committee's experts to come forward with such gases, should there be any. However, no such gases were identified up-to-date. EIGA did some research and confirmed that they could not find any. And no other expert has made us aware of any such gas. The impact assessment that was made for the purposes of TDG therefore would apply in principle also to other jurisdictions/sectors which have implemented category 1 only. Hence, it is repeated in the following.

Impact assessment on TDG classifications of gases

4. The formal changes in 2.2.2.1 (a) of the UN Recommendations on the Transport of Dangerous Goods, Model Regulations are comparatively minor:

- (a) Division 2.1 Flammable gases
Gases which at 20 °C and a standard pressure of 101.3 kPa:
- (i) ~~are ignitable when in a mixture of 13 per cent or less by volume with air; or~~
 - (ii) ~~have a flammable range with air of at least 12 percentage points regardless of the lower flammable limit.~~
- Flammability shall be determined by tests or by calculation in accordance with methods adopted by ISO (see ISO 10156:2010). Where insufficient data are available to use these methods, tests by a comparable method recognized by a national competent authority may be used;

5. As a consequence of the proposal, gases that have a flammable range in air but where the LFL is >13 % by volume and the flammable range is < 12 percentage points would be covered in addition by the criteria for TDG division 2.1, see also the last line in the following table:

| LFL in % | Flammable range in percentage points | TDG Division 2.1? | |
|-------------|---|-------------------|----------|
| | | currently | proposed |
| ≤ 13 | ≥ 12 | yes | yes |
| ≤ 13 | < 12 | yes | yes |
| > 13 | ≥ 12 | yes | yes |
| > 13 | < 12 | no | yes |

6. However, when applying ISO 10156:2010 (referred to in section 2.2.2.1 (a) of TDG and in chapter 2.2 of the GHS), no gases at all would be assigned to the last line (i.e. to the current category 2 of the GHS or out of division 2.1).

7. Originally, ISO 10156 was worked out for the selection of cylinder valve outlets and used for TDG. In clause 3.2.4 it is explicitly stated that the test substance shall be classified as flammable if the test is positive (i.e. if the gas has a flammable range at all). Later, when ISO 10156:2010 was also used for the purposes of GHS, a new clause 3.5 was added, stating that "this International Standard does not include methods to classify flammable gas mixtures into either category 1 or category 2 according to the GHS (see Annex A). Consequently, all mixtures containing flammable gases or flammable liquids as components and meeting the criteria of the testing method or the calculation method should be classified as category 1". The calculation method determines only whether a gas mixtures is flammable (has a flammable range in air) or not. Therefore gas mixtures, for which the calculation method determines that they are flammable, are assigned to GHS category 1 and TDG division 2.1 (regardless of whether they might be one of the rare cases actually belonging to the last line in the above table).

8. But what about actual changes to real TDG classifications of pure gases and gas mixtures?

Pure gases classified in the Dangerous Goods List

9. The Dangerous Goods List does not contain any pure gas that fulfils the criteria of the last line in the above table. That means all gases that are currently assigned to division 2.2 or 2.3 would still be classified correctly and in accordance with the criteria as "non-flammable" even if the criteria for division 2.1 were changed as proposed.

Gas mixtures

10. Theoretically, there might be some gas mixtures (N.O.S. entries) fulfilling the criteria of the last line according to the above table. And theoretically, these would be newly covered by TDG division 2.1 (if ISO 10156 is not applied and if they do not have a named entry in the Dangerous Goods List). However, the experts from EIGA did some research in order to identify such gas mixtures but could not find any. Also no other expert has made us aware of any such gas mixture.

11. In addition, it should be kept in mind that such gas mixtures (should they exist) are already assigned to TDG division 2.1. The reason is that gas mixtures in most cases are classified based on the calculation method as given in ISO 10156:2010. And as explained above, in that case also any gas mixture that would fall into the last line of the above table is assigned to TDG division 2.1 and GHS category 1.

Special cases ammonia and methyl bromide

12. Ammonia and methyl bromide could remain in Division 2.3 according to UN Nos. 1005 and 1062 as currently given in the Dangerous Goods List. Other jurisdictions/sectors could chose to do the same based on Note 1 in section 2.2.2.1 of the GHS as well.

13. Ammonia has a flammable range well above 12 percentage points (see for example IEC 60079-20-1:2010 according to which ammonia has an LFL of 15.0 % and an UFL of 33.6 %, i.e. a flammable range of 18.6 %. Even when considering slight differences to different test methods, it is clear that the flammable range of ammonia would never be below 12 percentage points.²

14. Methyl bromide has an LFL of 8.6 % (according to ISO 10156:2010).

15. Therefore it is clear that both, ammonia and methyl bromide already now are classified outside of TDG division 2.1 based on other considerations and not based on criteria. And this situation could remain as is, even if TDG division 2.1 was changed as proposed.

Jurisdictions/sectors which have category 1 and 2 implemented

16. Some changes would result for jurisdictions/sectors which already have category 1 and 2 of the hazard class flammable gases implemented. So far, there is no distinction between flammable gases with regard to the degree of hazard because all flammable gases are clustered in category 1. And that was the very problem why the IWG was installed in the first place: Flammable gases have different properties with regard to their flammability but - unlike from the other hazard classes - they are not divided and categorized based on the degree of hazard and instead all are clustered in category 1.

17. A new categorization thus allows introducing a useful categorization. The criteria for that categorization as worked out by the IWG were acknowledged and supported by the Sub-Committees in their joint session.

18. Using these same criteria for a distinction between category 1 and 2 rather than for a distinction between new sub-categories 1A and 1B would shift exactly these gases which are deemed to be not "extremely flammable" from the old category 1 to category 2. As these gases always had the flame pictogram assigned, it is proposed to assign the flame pictogram to category 2 as well. Consequently, the only changes resulting for these gases would be the hazard statement and the signal word. This seems reasonable based on the clear criteria which qualify only those gases for category 2 which are "less flammable" based on the higher LFL or the lower burning velocity.

² Independent of the authors intention not to touch the classification as division 2.3 under UN No. 1005, we would like to draw the attention to some additional information regarding ammonia.

On the US Chemical Safety Board (CSB) website there is a statement of the Chairman and the CSB Investigation Supervisor in which they explicitly stated that ammonia is a flammable gas, see page 3 of the following document:

http://www.csb.gov/assets/1/19/ConAgra_Statements_final_for_print_rev_1.pdf

And the same is stated in the 3rd paragraph of the following CSB-page:

<http://www.csb.gov/csb-conducting-assessment-of-ammonia-release-at-millard-refrigerated-services-south-of-mobile-alabama/>

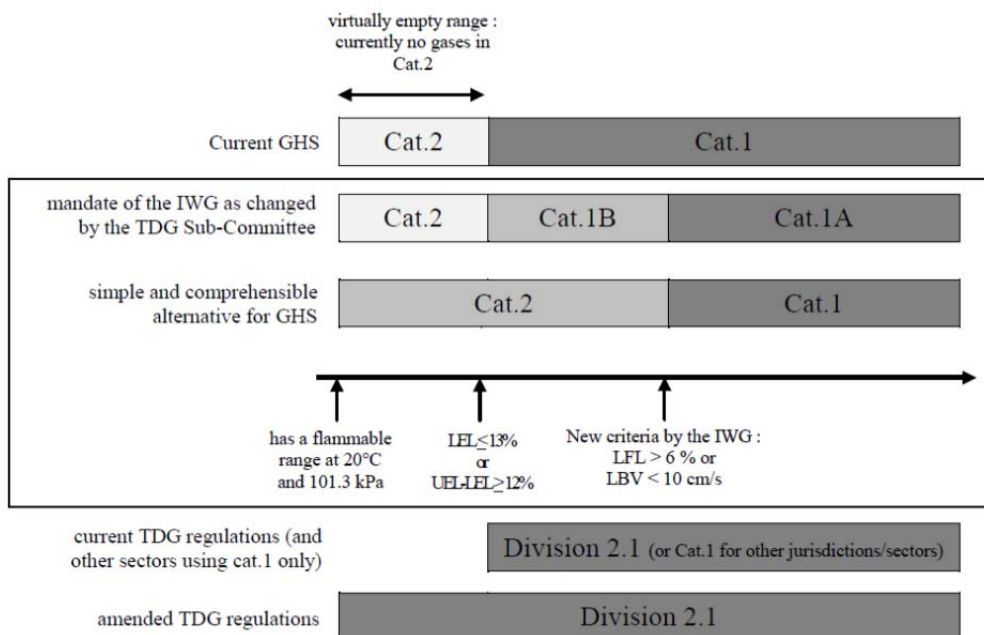
And, interesting enough, there are several web-sites in which fire-fighters request that ammonia should be considered as a flammable gas because firefighters continue to get killed or injured in ammonia fires (but please note that we cannot judge the position or integrity of the makers of these web-sites), one example is the following site:

<http://my.firefighternation.com/forum/topics/889755:Topic:2841048?q=xn%2Fdetail%2F889755%3A2841048>

Annex 7

Benefits of the comprehensive consideration of the hazard class flammable gases

1. The proposed approach would lead to a simplification of the hazard class flammable gases because the creation of further sub-categories can be avoided. The goal is maximum stringency of the hazard class and more consistency with the way in which other physical hazard classes are organized and divided into categories within the GHS.
2. The proposal would be in line with the principles for explosion protection world-wide: Any gas mixture having a flammable range in air might cause problems in case of a leakage or accident, not only in supply and use but also in transport. Drivers and rescue personnel should be aware about flammable properties in order to take appropriate measures, avoid ignition sources etc. A distinction with regard to necessary measures can be done based on the categorization of the gases.
3. Discussions between experts from the TDG and from the GHS side have shown that currently there is no harmonization with regard to the term "flammable gases" which in the beginning resulted in some confusion. This proposal is a chance to achieve global harmonization (between GHS and TDG) also with regard to the term flammable gases.
4. The current criteria distinguishing between category 1 and 2 (and between division 2.1 and other gases for TDG) were designed such as to exclude ammonia from being classified as flammable. However, the criteria were based on old data for ammonia stemming from the 1930's which were obtained when not even a standardized method for measuring the explosion limits were available. Today they have no practical purpose anymore and it would be time to get rid of such these obsolete limits.
5. The proposed simplification, the sensible use of category 2 by the proposal and the possibility to achieve harmonization also with TDG are shown in the following figure:



6. Furthermore, the above proposal would not only keep the categorization of flammable gases as simple as possible, it can also be used to merge the three flow-charts, thus clearly communicating the interfaces between the categories of flammable gases and the supplemental categories for pyrophoric and chemically unstable gases.
