



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

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**Issues relating to the Globally Harmonized System
of Classification and Labelling of Chemicals:
review of Chapter 2.1**

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

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Item 2 (b) of the provisional agenda

**Classification criteria and related hazard communication:
review of Chapter 2.1**

A new Chapter 2.1 for the GHS

**Transmitted by the expert from Sweden on behalf of the Informal
Correspondence Group on the Review of Chapter 2.1***

Introduction

1. This document contains a proposal for a new Chapter 2.1 for the GHS, hazard class “Explosives”, and consequential amendments to Annex 1 and Annex 3, section 1, to the GHS. It is recognised that precautionary statements need to be allocated to the new classifications suggested herein, and a supplemental document to this end is intended to follow. While no changes to the UN Model Regulations are suggested herein (or are planned), some editorial amendments to the Manual of Tests and Criteria will be needed, and a forthcoming document is intended to address this.

2. The document has been prepared by the expert from Sweden on behalf of the Informal Correspondence Group (ICG) that has been working on the review of GHS Chapter 2.1. It constitutes the outcome of the discussions within this group, including compromises made, and does not necessarily reflect the position of any of its members. This document has been circulated within the ICG for comment before its submission.

Background

3. On the basis of a proposal from the expert from Australia and the Australian Explosives Industry Safety Group (AEISG)¹, a review of Chapter 2.1 of the GHS was initiated at the twenty-eight session of the Sub-Committee of Experts on the Globally Harmonized System (SCEGHS) in December 2014. The key questions posed by these authors were, in short: (i) whether the classification and hazard communication for

* 2020 (A/74/6 (Sect.20) and Supplementary, Subprogramme 2).

¹ ST/SG/AC.10/C.3/2014/79–ST/SG/AC.10/C.4/2014/15.

Explosives are appropriate for sectors other than transport, and (ii) what the correct classification is for explosives that are not packaged for transport.

4. As the expert from Australia resigned from leading the effort², the expert from Sweden took on this role as of the twenty-ninth session of the SCEGHS³ in July 2015 and has been leading the work ever since. Directly after his appointment, delegates from both sub-committees were invited to join an Informal Correspondence Group (ICG) on the review of GHS Chapter 2.1. This ICG subsequently built up over time and currently counts more than fifty experts, approximately half of them from the SCEGHS and the other half from the Working Group on Explosives (EWG) under the Sub-Committee of Experts on the Transport of Dangerous Goods (SCETDG).

5. The work of the ICG has mainly been intersessional, and from the thirtieth session of the SCEGHS, the expert from Sweden has reported on the progress to every session of both sub-committees⁴. In the recent years, the ICG has also had physical meetings in the margins of, or as part of, the SCEGHS, which have also continuously been reported⁵. Several combined ICG/EWG-meetings have also been held as part of the EWG-meetings, and reported back in the subsequent reports of the EWG⁶ and associated documents⁷. The total amount of documents on this item is by now substantial and the expert from Sweden has regularly sent out summary tables to help ICG-members to keep track of them.

6. In the initial informal document by the expert from Sweden on this item, three areas where current Chapter 2.1 is problematic were identified⁸:

- (a) Substances, mixtures and articles that have explosive properties but escape classification as explosives due to their transport packaging.
- (b) Substances, mixtures and articles where the GHS-classification is different when removed from of the transport packaging.
- (c) Substances, mixtures and articles that are not packaged for transport.

These rather fundamental problems were already pointed out by the expert from Germany in 2007⁹, and the second and third items are essentially the same as those pointed to by the experts from Australia and AEISG in the document from December 2014¹⁰.

Core of the current problems – the absence of a transport configuration

7. The current GHS classification system for explosives basically mimics that for transport classification, as per the UN Model Regulations. That system, which was developed to ensure safe transport, in practice relies on there being a transport configuration to which a division can be assigned. Furthermore, the transport configuration is often specifically designed to attenuate the explosive effect.

8. The GHS, however, is a system that applies also to other sectors, where a transport configuration does not necessarily exist. In manufacturing and processing of explosives there

² UN/SCETDG/47/INF.23 - UN/SCEGHS/29/INF.8.

³ ST/SG/AC.10/C.4/58, paragraph 8.

⁴ UN/SCETDG/48/INF.32 - UN/SCEGHS/30/INF.9, UN/SCETDG/49/INF.37 - UN/SCEGHS/31/INF.10, UN/SCETDG/50/INF.11 - UN/SCEGHS/32/INF.8, UN/SCETDG/51/INF.15 - UN/SCEGHS/33/INF.7, UN/SCETDG/52/INF.20 - UN/SCEGHS/34/INF.10, UN/SCETDG/53/INF.46 - UN/SCEGHS/35/INF.16, UN/SCETDG/54/INF.29 - UN/SCEGHS/36/INF.19, ST/SG/AC.10/C.3/2019/32-ST/SG/AC.10/C.4/2019/5, ST/SG/AC.10/C.4/2019/10 and UN/SCETDG/56/INF.3.

⁵ UN/SCEGHS/35/INF.30, UN/SCEGHS/37/INF.26, UN/SCEGHS/38/INF.32.

⁶ UN/SCETDG/53/INF.67, UN/SCETDG/54/INF.50 (reproduced as UN/SCEGHS/36/INF.34), UN/SCETDG/55/INF.55 (reproduced as UN/SCEGHS/37/INF.24).

⁷ UN/SCEGHS/36/INF.46, UN/SCETDG/55/INF.56 - UN/SCEGHS/37/INF.21.

⁸ UN/SCEGHS/29/INF.13.

⁹ ST/SG/AC.10/C.3/2007/10 ST/SG/AC.10/C.4/2007/1.

¹⁰ ST/SG/AC.10/C.3/2014/79–ST/SG/AC.10/C.4/2014/15.

is obviously no transport configuration. In supply and use it is often an inner packaging or an article that is handled, and not the transport configuration.

9. The absence of a transport configuration is the core of the problems with the current Chapter 2.1. It leads to situations where GHS classification is not possible and where the classification, and therefore the GHS hazard communication, understates or otherwise does not reflect the actual hazard.

Boundary conditions for a solution to the problems

10. It is inherent that any new GHS classification system needs to be harmonized with the classification system used for transport, i.e. the UN Model Regulations. It was clear early in the work that a boundary condition for any solution to the GHS problems would be not to make any changes to the UN Model Regulations.

11. In an early informal document by the expert from Sweden, some fundamental principles for the work to come were stipulated¹¹ which were further refined along the way. They came to guide the work and serve as boundary conditions. Essentially, they meant that the current scope of Chapter 2.1 was to be kept (“no new explosives”) and that no new mandatory testing should be introduced.

The development of an amended classification system for the GHS

12. The ICG initially struggled with finding a way to patch the gaps of the current GHS classification and labelling system, in order to overcome the problems identified. However, these attempts to find an easy solution to bridge the problems failed and it was eventually recognized that the core problem lay in the dependence on the transport packaging and was not that easily circumvented.

13. A key milestone was achieved in the autumn of 2016, when the ICG started to focus around an amended classification system for the GHS that would overcome the dependence on the transport packaging. This idea of adding another layer of classification to the GHS classification was vividly discussed in the combined ICG/EWG-meeting of December that year and presented to the sub-committees for their summer 2017 sessions¹².

14. In essence it amounted to the introduction of two main categories for the GHS, where Category 2 comprises explosives that are assigned to a division and is identical in scope as Class 1 for transport. Within Category 2, explosives would be separated into three sub-categories depending on whether their explosion hazard is deemed high, medium or low in the primary packaging (see paragraph 17 below for a description of this concept). Category 1 comprises all other explosives, including those that cannot be assigned to a division due to being too sensitive.

| GHS Class | Explosives | | | |
|----------------------------|-----------------------|---------|----|----|
| GHS Category | 1 | 2 | | |
| GHS Sub-category | <i>Not applicable</i> | 2A | 2B | 2C |
| UN Model Regulations Class | <i>Not applicable</i> | Class 1 | | |

15. This amended classification system has since then been developed further with technical criteria and hazard communication elements into the proposed new Chapter 2.1 as presented in Annex I to this document.

¹¹ UN/SCETDG/48/INF.32 - UN/SCEGHS/30/INF.9.

¹² ST/SG/AC.10/C.3/2018/33- ST/SG/AC.10/C.4/2018/7.

Main features of the new Chapter 2.1 for the GHS

Explosion hazard of the transport configuration *versus* that of the primary packaging

16. The transport configurations and their divisions according to Part I of the Manual of Tests and Criteria remain the foundation also of the revised GHS Chapter 2.1. Whether or not the explosive has been assigned to a division is the basic criterion that separates explosives in Category 1 (not assigned to a division) from those in Category 2 (assigned to a division). The divisions are also fundamental for the further segregation of explosives into the three sub-categories 2A, 2B and 2C within Category 2. The divisions also remain relevant for situations where explosives are handled in their transport configuration, notably when stored.

17. Central to the new classification system is the concept of the primary packaging, which is defined as “the minimum level of packaging of a configuration assigned to a division, in which the explosive substance, mixture or article is intended to be retained until use.” Normally, the primary packaging is simply the innermost container. The new classification system seeks to assess whether or not the explosion hazard at the level of the primary packaging reflects that of the transport configuration.¹³

18. If the explosion hazard at the level of the transport configuration is high, it is concluded that it is also high at the level of the primary packaging. All transport configurations except some assigned to Division 1.4 (see paragraph 19 below) are deemed to be of a “high hazard”, which leads to classification in sub-category 2A of the proposed new system.

19. For explosives assigned to Division 1.4, meaning that the explosion hazard at the level of the transport configuration is “not high”¹⁴, criteria are set out that essentially assess whether the relatively benign behaviour of the transport configuration is attributed to attenuating features such as a special packaging (which may include spacing or specific orientations of explosive articles). On the basis of this assessment, the explosive is classified into either sub-category 2A (high hazard), 2B (medium hazard) or 2C (low hazard), reflecting the explosion hazard at the level of the primary packaging. Explosives that detonate and disintegrate are always classified as sub-category 2A.

Hazard communication to reflect the hazard of the primary packaging

20. Once the explosion hazard at the level of the primary packaging has been determined, and a classification is assigned on that basis, it is possible to assign GHS hazard communication elements at that level, i.e. that reflect the explosion hazard at the level of the primary packaging instead of the explosion hazard as configured for transport.

21. The hazard communication elements were discussed at the thirty-seventh and thirty-eighth sessions of the SCEGHS. For Category 1 and sub-categories 2A and 2B there were no strong opinions deviating from the initial proposals made¹⁵. For sub-category 2C, however, the choice of the GHS pictogram (or no pictogram) gave rise to some discussions, eventually leading to a small preference for the exclamation mark pictogram (GHS07). While the existing hazard statement H204¹⁶ was tentatively assigned to both sub-categories 2B and 2C, there was a general wish that the hazard statements for these sub-categories should preferably be different to be able to tell the two apart.¹⁷

22. There have been some subsequent discussions in the ICG on finding another hazard statement for sub-category 2C that is at least slightly different from H204. At the point of writing, however, no such suggestion can be presented but attempts are likely to continue.

¹³ It is recognised that larger explosive articles may be supplied without a primary packaging, and the new classification system proposed addresses also these.

¹⁴ See description of the divisions in Chapter 2.1 of the UN Model Regulations.

¹⁵ UN/SCETDG/56/INF.8 - UN/SCEGHS/38/INF.6.

¹⁶ Hazard statement H204 reads “Fire or projection hazard”.

¹⁷ UN/SCEGHS/38/INF.32.

Category 1 for all explosives not assigned to a Division

23. Those explosives that have not been assigned to a division are all classified in Category 1 of the new system. There are two main reasons for not being assigned to a division:

- (a) The explosive is considered too dangerous for transport and can therefore not be assigned to a division. This is the case for explosives that show positive results in Test series 3 or 4.
- (b) The explosive is not in a form suitable for performing the tests to assign it to a division, e.g. not packaged. This is the case for explosives in manufacturing and processing.

24. As the classification within Category 2 reflects the explosion hazard at the level of the primary packaging, also explosives that are taken out of that packaging are generally classified in Category 1¹⁸. Removing the primary packaging for use of an explosive does however not trigger re-classification, as it would make no sense to do so just before utilising the explosive.

Harmonisation with the UN Model Regulations

25. Category 2 of the new GHS classification system is completely harmonised with Class 1 of the UN Model Regulations, including the exemptions made. That means that a substance, mixture or article that is not classified as Class 1 according to the UN Model Regulations will also not be classified as an Explosive according to the GHS, as long as it stays in the transport configuration. When out of that configuration, however, it may become an Explosive according to the GHS.

Derogation for substances and mixtures in the Research and Development phase

26. Substances and mixtures not manufactured with the view of creating an explosive or pyrotechnic effect need to be subjected to testing, unless it can be ruled out via screening that they could have explosive properties¹⁹. The tests required are those of Test series 2 of the Manual of Tests and Criteria, which require more than a kilogram of material. In the early stages of research and development (R&D), this amount of material is not available, and the material is frequently also very expensive as these substances (they are rarely mixtures) are typically candidate molecules for pharmaceuticals or biocides. Furthermore, statistics show that it is very rare that these substances explode in the prescribed tests²⁰, with the added issue of then leaving the test facility contaminated with the often highly bioactive material. This can pose a substantial health risk for the staff that needs to clean the site from the unconsumed material (that may be scattered all around) after completion of the prescribed tests.

27. While the current GHS Chapter 2.1 does not explicitly make any exemption for the above R&D cases, in practice such an exemption already exists as it is unreasonable to require the standard testing. An assumption of a positive result in Test series 2 without testing is not an option, as that would require further testing and even larger amounts of material to assign a division²¹. In practice, these materials are instead classified as self-reactive substances and mixtures Type C (see Chapter 2.8 of the GHS), which is a stringent classification, provided some small-scale testing demonstrates that it is unlikely that they have explosive properties to such a degree that they would have to be classified as explosives²². The new GHS Chapter 2.1 acknowledges this practice by stating the exemption and the conditions for it, in the form

¹⁸ Exemptions are made for articles that are supplied without a primary packaging or where the primary packaging does not attenuate the explosive effect, as then the classification in Category 2 reflects that of the article(s).

¹⁹ Through the screening methods in section 2.1.4 of current GHS Chapter 2.1, which are identical to those in Appendix 6 of the Manual of Tests and Criteria.

²⁰ See ST/SG/AC.10/C.3/2018/78.

²¹ Test series 6 of the Manual of Tests and Criteria is decisive for assigning the division and requires substantial amounts of material to be performed (packages).

²² Substances showing a tendency of being too explosive are normally discarded at an early stage as it is not feasible to handle explosives with regards to the measures (and permits) needed.

of a note. Importantly, this exemption can only be applied to substances and mixtures that have not been manufactured with the view of creating an explosive or pyrotechnic effect.

The consequences of changing the GHS system

28. Introducing new Chapter 2.1 constitutes a major change compared to the current chapter, leading to new GHS classifications and to new GHS labelling for all explosives. It also means that implementations of editions of the GHS before the new Chapter 2.1 and after will come to differing classification results and differing labelling.

29. This being said, for the explosives industry there should be significant simplification as all “high hazard” explosives, which includes all high explosives used by the commercial explosives industry, will be assigned to one single classification with the same simple hazard communication. No new testing or review of performed classification tests is needed for this. It should be noted that introduction of the new Chapter 2.1 means that Division 1.6 will have hazard communication elements assigned, which currently it has not.

30. For the non-explosives industry, there may be a challenge. For pyrotechnics assigned to Division 1.4 for transport, an assessment needs to be done on basis of existing test results. This would also be the case for other explosives such as airbags, ammunitions and cartridges for various power tools (nail guns etc.). However, the system allows default classification into the most stringent sub-category (sub-category 2A), although this may not be preferred.

31. As regards the labelling, the division-dependence of the hazard statements will be lost, meaning that it will no longer be possible to derive the division (for transport) of a given explosive indirectly from the GHS hazard statement. Instead, a precautionary statement is intended to state the division (for transport) on the GHS label, as has recently been discussed in the ICG.²³

Proposals

32. The sub-committees are invited to consider the new GHS Chapter 2.1 as presented in Annex I to this document. At the time of writing, it is noted that there may still be a few amendments needed to complete the new chapter. In particular, some members of the ICG have indicated that it needs to be confirmed that the exemption for articles containing explosives excluded from Class 1 of the UN Model Regulations functions as intended (see paragraph 2.1.1.2.2 (d) in section 2.1.1 of the proposed new Chapter 2.1). Furthermore, some members of the ICG have expressed a wish to make another attempt at devising a hazard statement for sub-category 2C that is different from that of sub-category 2B (see paragraphs 20-22 above and section 2.1.3 of the proposed new Chapter 2.1). A supplemental informal document may thus be prepared with additional amendments to complete the proposed new Chapter 2.1.

33. In addition, the decision logic flowcharts to be inserted into section 2.1.4.1 of the new chapter are still under development at the time of writing. The aim is to present these in a forthcoming informal document.

Consequential amendments

34. Provided adoption of the new GHS Chapter 2.1 is endorsed, the sub-committees are invited to adopt the consequential amendments to the codification of hazard statements in Section 1 of Annex 3 to the GHS, as presented in Annex II to this document, and the consequential amendments to the classification and labelling summary tables in Annex 1 of the GHS, as presented in Annex III to this document.

²³ UN/SCETDG/56/INF.8 - UN/SCEGHS/38/INF.6 and UN/SCEGHS/38/INF.32.

35. In order to complete the introduction of the new Chapter 2.1 in the GHS, amendments are needed also to the allocation of precautionary statements in Section 3 of Annex 3, as well as editorial amendments to Part I of the Manual of Test and Criteria. Proposals for these amendments will be addressed in separate documents.

Annex I

Amendments to GHS Part I, Chapter 2.1

Replace Chapter 2.1 with the following:

“CHAPTER 2.1

EXPLOSIVES

2.1.1 Definitions and general considerations

2.1.1.1 Definitions

An *explosive substance or mixture* is a solid or liquid substance or mixture 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 and mixtures are included even when they do not evolve gases.

A *pyrotechnic substance or mixture* is a substance or mixture 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.

An *explosive article* is an article containing one or more explosive substances or mixtures.

Primary packaging means the minimum level of packaging of a configuration assigned to a division, in which the explosive substance, mixture or article is intended to be retained until use.

Division means the classification of an explosive substance, mixture or article according to Part I of the *Manual of Tests and Criteria* and relates to it being in a certain configuration.

NOTE: *Divisions are generally assigned for the purpose of transport and may be subject to further packaging specifications according to the UN Model Regulations to be valid.*

2.1.1.2 Scope

2.1.1.2.1 Except as provided in 2.1.1.2.2, the class of explosives comprises

- (a) Explosive substances and mixtures;
- (b) Explosive articles, except devices containing explosive substances or mixtures in such quantity or of such a character that their inadvertent or accidental ignition or initiation shall not cause any effect external to the device either by projection, fire, smoke, heat or loud noise; and
- (c) Substances, mixtures and articles not mentioned under (a) and (b) above which are manufactured with the view to producing a practical explosive or pyrotechnic effect.

2.1.1.2.2 The following substances, mixtures and articles are excluded from the class of explosives:

- (a) Ammonium nitrate-based emulsions, suspensions or gels which meet the criteria of Test series 8 of the *Manual of Tests and Criteria* for classification as ANEs of Category 2 oxidizing liquids (Chapter 2.13) or Category 2 oxidizing solids (Chapter 2.14).

- (b) Substances and mixtures which meet the criteria for classification as desensitized explosives according to the criteria of Chapter 2.17.
- (c) Substances and mixtures which have not been manufactured with the view to producing, in themselves, an explosive or pyrotechnic effect and which:
 - (i) are self-reactive substances and mixtures according to the criteria of Chapter 2.8; or
 - (ii) are organic peroxides according to the criteria of Chapter 2.15; or
 - (iii) are deemed not to have explosive properties on basis of the screening procedures in Appendix 6 of the *Manual of Tests and Criteria*; or
 - (iv) are too insensitive for inclusion in the hazard class according to Test series 2 of the *Manual of Tests and Criteria*; or
 - (v) are excluded from assignment within Class 1 of the *UN Model Regulations* based on results in Test series 6 of the *Manual of Tests and Criteria*.
- (d) Articles containing explosives which are allowed for transport but excluded from Class 1 by specific UN-numbers and associated special provisions according to the Dangerous Goods List of the *UN Model Regulations*, and which are in the transport configuration.

NOTE: *Performing Test series 2 requires a substantial amount of material, which may not be available in the initial stages of research and development. Substances and mixtures in the research and development phase for which not enough material exists to perform Test series 2 of the Manual of Tests and Criteria may, for the purpose of further scientific characterisation, be regarded as self-reactive substances and mixtures Type C (see Chapter 2.8), provided that:*

- (i) *The substance or mixture is not manufactured with the view to producing an explosive or pyrotechnic effect; and*
- (ii) *The decomposition energy of the substance or mixture is less than 2000 J/g; and*
- (iii) *The result in test 3(a) and test 3(b) of the Manual of Tests and Criteria is negative; and*
- (iv) *The result in test 2(b) of the Manual of Tests and Criteria is “no explosion” at an orifice diameter of 6 mm; and*
- (v) *The expansion of the lead block in Test F.3 of the Manual of Tests and Criteria is less than 100 ml per 10 g substance or mixture.*

2.1.1.3 *Other considerations*

2.1.1.3.1 *The relation to the classification according to the UN Model Regulations*

The GHS classification of substances, mixtures and articles as explosives builds largely on the classification used for transport according to the *UN Model Regulations*. Information on their transport division and, when available, some of the underlying test results according to Part I of the *Manual of Tests and Criteria*, is therefore relevant for the GHS classification. While the transport divisions are designed for the purpose of safe transportation of explosives, the GHS classification draws from this classification to ensure appropriate hazard communication in other sectors, in particular supply and use. In doing this, any mitigating effects of the transport configuration on the explosive behaviour, such as a particular packaging, are evaluated as they may not be present in sectors outside of transport.

2.1.1.3.2 *The configuration dependence of the division*

Entry into the hazard class of explosives is based on the intrinsic explosive properties of substances and mixtures. The assignment to a division, however, is also dependent on the configuration using packaging, and the incorporation into articles of such substances and mixtures. The division is the relevant level of classification when the explosive is in the configuration to which the division was assigned, e.g. when transported or stored, and may form the basis for explosives licencing and safety measures such as distance requirements. The hazard categories, on the other hand, are the relevant level of classification for the safe handling.

2.1.1.3.3 *The hierarchy of the categories*

Category 2 only contains explosives which have been assigned to a division and corresponds to Class 1 of the *UN Model Regulations*. The sub-categories within Category 2 classify explosives on basis of the hazardous behaviour of the explosive in its primary packaging or, where applicable, of the explosive article alone. An explosive that has not been assigned to a division is classified in Category 1 of the hazard class of explosives. This may be because it is considered too dangerous to be assigned a division, or because it is not (yet) in a suitable configuration to assign it to a division. Explosives in Category 1 are therefore not necessarily more hazardous than explosives in Category 2.

2.1.1.3.4 *Change of classification over the life cycle*

As the assignment to a division depends on the configuration, the classification of an explosive may change over its life-cycle as a result of reconfiguration. An explosive that was assigned to a division in a certain configuration, and hence classified in a sub-category within Category 2, no longer retains that division when out of that configuration. If assigned to another division in the new configuration, it may need to be classified in another sub-category within Category 2, and if not assigned a to division it should be classified in to Category 1. However, the use of an explosive, meaning the preparation and intentional functioning, including removal from the primary packaging for functioning or installation or deployment in readiness for functioning, is not intended to require such re-classification.

2.1.1.3.5 *Exclusions from the hazard class*

Some substances, mixtures and articles that have explosive properties are excluded from the hazard class of explosives because they are not considered sensitive enough or because they do not present a significant explosion hazard in a particular configuration. The safety data sheet is an appropriate means to convey information on explosive properties for such substances and mixtures, and the explosion hazards of such articles (see Chapter 1.4).

2.1.2 Classification criteria

2.1.2.1 Explosive substances, mixtures and articles of this class are classified into one of two categories according to the following table:

| Category | Criteria |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Explosive substances, mixtures and articles which: (a) have not been assigned a division and which: (i) are manufactured with the view of producing an explosive or pyrotechnic effect; or (ii) are substances or mixtures which show positive effects when tested in Test series 2 of the <i>Manual of Tests and Criteria</i> or (b) are out of the primary packaging of the configuration to which a division was assigned ^a , unless they are explosive articles assigned to a division: (i) without a primary packaging; or (ii) in a primary packaging that does not attenuate the explosive effect, taking into account also intervening packaging material, spacing or critical orientation. |
| 2 | Explosive substances, mixtures, and articles which have been assigned to a division. |

^a Explosives in Category 2 that are removed from their primary packaging for use remain classified in Category 2, see 2.1.1.3.4.

2.1.2.2 The divisions are as follows:

- (a) Division 1.1: Substances, mixtures and articles which have a mass explosion hazard (a mass explosion is one which affects almost the entire quantity present virtually instantaneously);
- (b) Division 1.2: Substances, mixtures and articles which have a projection hazard but not a mass explosion hazard;
- (c) Division 1.3: Substances, mixtures 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:
 - (i) combustion of which give rise to considerable radiant heat; or
 - (ii) which burn one after another, producing minor blast or projection effects or both;
- (d) Division 1.4: Substances and articles which present no significant hazard: substances, mixtures 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;
- (e) Division 1.4 compatibility group S: Substances, mixtures and articles so packed or designed that any hazardous effects arising from accidental functioning are confined within the package unless the package has been degraded by fire, in which case all blast or projection effects are limited to the extent that they do not significantly hinder fire-fighting or other emergency response efforts in the immediate vicinity of the package.
- (f) Division 1.5: Very insensitive substances or mixtures which have a mass explosion hazard: substances and mixtures 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. The probability of transition from burning to detonation is greater when large quantities are present.

- (g) Division 1.6: Extremely insensitive articles which do not have a mass explosion hazard: articles which predominantly contain extremely insensitive substances or mixtures and which demonstrate a negligible probability of accidental initiation or propagation. The hazard from articles of Division 1.6 is limited to the explosion of a single article.

NOTE 1: For some regulatory purposes, the divisions are further subdivided into compatibility groups which identify the kinds of explosives that are deemed to be compatible (see 2.1.2 of the UN Model Regulations, Chapter 2.1).

NOTE 2: While Division 1.4 compatibility group S is not a division of its own, this classification corresponds to a separate division based on additional criteria.

NOTE 3: For classification tests on explosive 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 substance or mixture 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, it must also be tested in the new form.

2.1.2.3 Explosive substances, mixtures and articles in Category 2 are assigned to one of three sub-categories in accordance with the following table:

| Sub-category | Criteria |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2A | Explosive substances, mixtures and articles in Category 2 which have been assigned: (a) Division 1.1, 1.2, 1.3, 1.5, or 1.6; or (b) Division 1.4 and are not meeting the criteria for sub-category 2B or 2C. ^a |
| 2B | Explosive substances, mixtures and articles in Category 2 which have been assigned to Division 1.4 and a compatibility group other than S, and which: (a) do not detonate and disintegrate when functioned as intended; and (b) exhibit no high hazard event ^b in test 6(a) or 6(b) of the <i>Manual of Tests and Criteria</i> ; and (c) do not require attenuating features, other than that which may be provided by a primary packaging, to mitigate a high hazard event. ^b |
| 2C | Explosive substances, mixtures and articles in Category 2 which have been assigned to Division 1.4 compatibility group S, and which: (a) do not detonate and disintegrate when functioned as intended; and (b) exhibit no high hazard event ^b in test 6(a) or 6(b), or in the absence of these test results, similar results in test 6(d) of the <i>Manual of Tests and Criteria</i> ; and (c) do not require attenuating features, other than that which may be provided by a primary packaging, to mitigate a high hazard event. ^b |

^a The manufacturer, supplier or competent authority may classify an explosive of Division 1.4 as sub-category 2A on basis of data or other considerations even if it meets the technical criteria for sub-category 2B or 2C.

^b A high hazard event is exhibited when performing test 6(a) or 6(b), according to the *Manual of Tests and Criteria*, by
(a) a significant change in the witness plate shape, such as perforation, gouge, substantial dent or bowing; or
(b) instantaneous scattering of most of the confining material.

2.1.3 Hazard communication

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.

| Category | 1 | 2 | | |
|-----------------------------|---------------------------------------------------------------------------|-----------------------|---------------------------|---------------------------|
| Sub-category | <i>Not applicable</i> | 2A | 2B | 2C |
| Symbol ^a | Exploding bomb | Exploding bomb | Exploding bomb | Exclamation mark |
| Signal word | Danger | Danger | Warning | Warning |
| Hazard statement | Explosive | Explosive | Fire or projection hazard | Fire or projection hazard |
| Additional hazard statement | Very sensitive ^b or May be sensitive ^c | <i>Not applicable</i> | <i>Not applicable</i> | <i>Not applicable</i> |

^a For Divisions 1.4, 1.5 and 1.6 no symbol appears on the label for transport, according to the UN Model Regulations.

^b To be assigned additionally to explosives that are sensitive to initiation as determined by test series 3 or 4 of the Manual of Tests and Criteria. May also be applied to explosives sensitive to other stimuli, e.g. electrostatic discharge.

^c To be assigned additionally to explosives for which sufficient information on their sensitivity to initiation is not available.

NOTE: Substances and mixtures excluded by 2.1.1.2.2 (c) (v) still have explosive properties. The user should be informed of these intrinsic explosive properties because they have to be considered for handling – especially if the substance or mixture is removed from its packaging or is repackaged – and for storage. For this reason, the explosive properties of the substance or mixture should be communicated in sub-section 2.3 (Other hazards which do not result in classification) and Section 9 (Physical and chemical properties) or 10 (Stability and reactivity) of the Safety Data Sheet in accordance with Table 1.5.2, and other sections of the Safety Data Sheet, as appropriate.

Similarly, articles excluded by 2.1.1.2.2 (d) may still pose an explosion hazard which should be conveyed in sub-section 2.3 of the Safety Data Sheet, and in other sections as appropriate.

2.1.4 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.

2.1.4.1 Decision logic

[to be developed]

2.1.4.2 Description of explosion hazard levels

| Sub-category | Explosion hazard level |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2A | Sub-category 2A represents a high explosion hazard. An explosive in this sub-category has the potential to cause complete destruction of objects and lethal or very severe injuries to persons. |
| 2B | Sub-category 2B represents a medium explosion hazard. An explosive in this sub-category has the potential to cause serious damage to objects and serious injuries to persons. Injuries may result in permanent impairment. |
| 2C | Sub-category 2C represents a low explosion hazard. An explosive in this sub-category can cause minor damage to objects and moderate injuries to persons. Injuries would not normally result in permanent impairment. |

2.1.4.3 Principles of explosives classification

2.1.4.3.1 Assigning explosives to divisions by testing

Explosives are assigned to divisions based on testing of specific configurations, which quantifies levels of blast, projections and fire. Formation of a configuration provides a level of protection from outside stimuli and fixes the sensitivity and hazard magnitude, which enables the assignment to a division. The divisions therefore describe the explosive behaviour in the particular configuration. Such descriptions reflect attenuating properties of the packaging and article, which may include spacing, or specific orientations of explosive articles to mitigate an explosive effect. The configuration is further controlled by design and packaging requirements specified in the *UN Model Regulations*. Although divisions are not valid outside of the configurations to which they were assigned, they may still be used as a basis for regulatory measures in storage and handling when these configurations are modified. This normally presumes that additional safety measures are taken to account for the modified configurations, e.g. aggregate quantity limits and protective building designs.

2.1.4.3.2 Assigning explosive to divisions based on analogy

While classification in a division or a sub-category is based on testing in accordance with Part I of the Manual of Tests and Criteria, similar explosives configurations may be classified without testing, where appropriate, based on analogy to tested explosives. The use of analogy should take into consideration whether changes to the configuration may affect the hazard posed compared to the tested configuration, and is narrowly limited according to the quantity, packaging and design of the explosive.

2.1.4.3.3 Assigning explosives to sub-categories

2.1.4.3.3.1 Assignment to sub-categories within Category 2 builds on the information provided by the division to better reflect the hazard of the explosive in its primary packaging, which is intended to be retained until use. The primary packaging is all or part of the original tested configuration. It is normally the immediate container or the innermost packaging layer and may include attenuating properties which mitigate hazardous effects. However, only flexible inner packaging such as a thin-wall plastic bag or other unsubstantial material which provides negligible attenuation of explosive effects should not be considered the primary packaging. As explosives are unpackaged from their primary packaging they may present greater sensitivity or blast, projection or fire hazards. Retaining the primary packaging until use and limiting the amount of unpacked explosives are therefore generally important safety measures when handling explosives. When an explosive is installed or deployed and is later removed from use without initiation, it should be replaced in its primary packaging or an identical primary packaging.

2.1.4.3.3.2 Multiple explosive articles may sometimes be supplied where they are in direct contact without any intervening packaging material or spacing, or critical orientation.

Provided all applicable classification evaluation occurred in this configuration, their primary packaging can be discarded without affecting the classification.

2.1.4.3.3 Occasionally, larger explosive articles are supplied without any packaging, e.g. in a handling device such as a cradle. In these cases there may be no primary packaging, i.e. the classification is of the article as such. Handling devices that do not affect the classification can be discarded.

2.1.4.3.4 *Classification during explosives manufacturing and processing*

Explosives in manufacturing and processing cannot be assigned to a division until configured for transport, and hence are assigned to Category 1. Similarly, explosives assigned to Category 2 when taken out of their primary packaging for purposes other than use, are re-assigned to Category 1 (unless their primary packaging can be discarded, see 2.1.4.3.3). The sensitivity and hazard severity of unpackaged explosives in manufacturing and processing is dependent on non-intrinsic parameters related to the methods used, including quantity, depth, confinement, initiation stimulus, composition, physical state such as particle size, etc. The hazards posed by explosives in Category 1 thus vary extensively and may also vary dynamically as they flow through a process. For these reasons, the hazard communication for Category 1 cannot provide any details regarding the explosive behaviour. Process hazards analysis and risk management principles should be applied in these cases to identify and manage the risk of processes in accordance with best practices and applicable regulations.

2.1.4.3.5 *Safety during explosives manufacturing and processing*

Category 1 also includes explosives that fail Test series 3 or 4 as configured, having an unacceptable level of sensitivity to stimuli encountered during transport. These tests and their thresholds may not be representative of the energy levels encountered during explosives processing and manufacturing, and do not include all types of stimuli that may be encountered, such as electrostatic discharge. Therefore, further investigations of the properties of the explosive at hand and appropriate risk management are needed for safe processing and handling.”

Annex II

Amendments to GHS Annex 3, Section 1

Amend table A3.1.1 as follows (changes are indicated):









| Code (1) | Physical hazard statements (2) | Hazard class (GHS chapter) (3) | Hazard category (4) |
|---------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------|------------------------------------------|
| H200 Deleted | Unstable explosive | Explosives (chapter 2.1) | Unstable explosive |
| H201 Deleted | Explosive; mass explosion hazard | Explosives (chapter 2.1) | Division 1.1 |
| H202 Deleted | Explosive; severe projection hazard | Explosives (chapter 2.1) | Division 1.2 |
| H203 Deleted | Explosive; fire, blast or projection hazard | Explosives (chapter 2.1) | Division 1.3 |
| H204 | Fire or projection hazard | Explosives (chapter 2.1) | Division 1.4 <u>2B, 2C</u> |
| H205 Deleted | May mass explode in fire | Explosives (chapter 2.1) | Division 1.5 |
| H206 | Fire, blast or projection hazard; increased risk of explosion if desensitizing agent is reduced | Desensitized explosives (chapter 2.17) | 1 |
| H207 | Fire or projection hazard; increased risk of explosion if desensitizing agent is reduced | Desensitized explosives (chapter 2.17) | 2, 3 |
| H208 | Fire hazard; increased risk of explosion if desensitizing agent is reduced | Desensitized explosives (chapter 2.17) | 4 |
| <u>H209</u> | <u>Explosive</u> | <u>Explosives (chapter 2.1)</u> | <u>1, 2A</u> |
| <u>H210</u> | <u>Very sensitive</u> | <u>Explosives (chapter 2.1)</u> | <u>1</u> |
| <u>H211</u> | <u>May be sensitive</u> | <u>Explosives (chapter 2.1)</u> | <u>1</u> |

Annex III

Amendments to GHS Annex 1

Replace current Table A1.1 with the following:

“A1.1 Explosives (see Chapter 2.1 for classification criteria)

| Classification | | | Labelling | | | | GHS Hazard statement codes |
|------------------|---------------------|----------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------|---------------------------|------------------------------------------------|
| GHS Hazard class | GHS Hazard category | UN Model Regulations class or division | GHS Pictogram | UN Model Regulations pictogram ^a | GHS Signal word | GHS Hazard statement | |
| Explosives | 1 | Not applicable |  | Not applicable | Danger | Explosive | H209 H210 ^b H211 ^b |
| | 2A | 1.1 |  |  | Danger | Explosive | H209 |
| | | 1.2 | | | | | |
| | | 1.3 | | | | | |
| | | 1.5 | |  | | | |
| | | 1.6 | |  | | | |
| | 2B | 1.4 |  |  | Warning | Fire or projection hazard | H204 |
| | 2C | |  | | Warning | Fire or projection hazard | H204 |

^a Under the UN Model Regulations, (*) indicates the place for compatibility group and (**) indicates the place for division - to be left blank if explosive is the subsidiary hazard.

^b Additional hazard statements for explosives that are sensitive to initiation or for which sufficient information on their sensitivity is not available (see section 2.1.3 of Chapter 2.1).”