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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

Twenty-eighth session,
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Sub-Committee of Experts on the Globally Harmonized System of Classification and Labelling of Chemicals

Tenth session, 7-9 December 2005,
Item 2 of the provisional agenda

UPDATING OF THE GLOBALLY HARMONIZED SYSTEM OF CLASSIFICATION AND LABELLING OF CHEMICALS (GHS)

Physical hazards

Identification of some open issues not yet properly addressed in the GHS

Transmitted by Germany

Preliminary remark

The issues addressed in this working document have been introduced during the last meeting of the Sub-Committee of Experts on the GHS in an informal document. The Sub-Committee had no objection to the principle to work on these issues but would take such a decision at the December session based on a working document.

This working document is based on the informal document but gives some additional information on the background and a bit more detailed proposals in order to outline possible alternatives.

1. Introduction

Currently some hazardous properties of certain types of substances which are partly covered by the UN Recommendations on the Transport of Dangerous Goods, Model Regulations and also partly by European Directives are not yet completely addressed in the GHS. However, due to the hazardous physical properties of these substances, their incorporation into the GHS should be considered in order to ensure safe handling, storage and transportation.

These types of substances are:

- *Ammonium nitrate;*
- *Substances having explosive properties although not classified as explosives;*
- *Explosives and explosive articles which are not packed for transport;*
- *Desensitized explosives;*
- *Certain properties of flammable liquids;*
- *Chemically unstable gases.*

2. Background

(a) Ammonium nitrate

A correct classification of ammonium nitrate is indispensable for its safe handling and transportation. The consequences of disregarding its dangerous properties became last apparent in the major accident at a fertilizer plant in Toulouse.

The problem regarding the dangerous properties of ammonium nitrate is a bit complicated, because they are normally not detected by the classical test methods for explosive properties or resistance to detonation or oxidizing properties. However, due to its dangerous properties it is currently classified for transport, storage and use on a listing principle as follows (these classifications are based on a "grandfather clause" and not on test results, meaning that the named ammonium nitrates are assigned to the respective class irrespective of the test results):

Transport: Ammonium nitrate is classified in the UN Recommendations on the Transport of Dangerous Goods:

UN No. 0222 AMMONIUM NITRATE with more than 0.2% combustible substances, including any organic substance calculated as carbon, to the exclusion of any other added substance† Class 1.1 D

UN No. 1942 AMMONIUM NITRATE, with not more than 0.2% total combustible material, including any organic substance, calculated as carbon to the exclusion of any other added substance. Class 5.1 (corresponding GHS hazard class: oxidizing solid) (assigned due to listing and not due to test results)

UN No. 2067 AMMONIUM NITRATE BASED FERTILIZER
Class 5.1 (corresponding GHS hazard class: oxidizing solid) (assigned due to listing and not due to test results)

UN No. 2071 AMMONIUM NITRATE BASED FERTILIZER
Class 9 (no corresponding hazard class in the GHS)

UN No. 3375 AMMONIUM NITRATE EMULSION or SUSPENSION or GEL , intermediate for blasting explosives
Class 5.1 (corresponding GHS hazard class: oxidizing liquid or solid) (assigned due to listing and not due to test results)

Storage and use: Ammonium nitrate is specifically named in Directive 96/82/EC (Seveso-II-Directive) and its amendment Directive 2003/105/EC, which is harmonized in principle with the transport regulations for Europe (ADR/RID) with regard to its composition but not with regard to its hazardous characteristics.
The amendment requires that all ammonium nitrate fertilizers have to be tested for the capability of self-sustaining decomposition (ammonium nitrate > 45%) and for their resistance to detonation (ammonium nitrate > 70%). If they do not pass the detonation test, the threshold according to the Seveso-II-Directive is so low that these preparations are virtually not used as fertilizer.

Test Series 8: Ammonium nitrate emulsions, suspensions or gels are subjected to test series 8 for their classification. However, the tests according to this test series are not completely adequate due to the specific properties of ammonium nitrate emulsions, suspensions and gels. Therefore, this test series is under discussion in the working group explosives of TDG. The results and possible changes of test series 8 are of importance for the GHS and should be closely reviewed with regard to appropriate classification and hazard communication.

(b) Substances having explosive properties although not classified as explosives

There are some types of substances (examples are organic peroxides, self-reactive substances and substances of other classes such as hydroxylammonium salts but also substances which are not classified in any other class) which have explosive properties although not classified as explosives. In this context explosive properties mean thermal sensitivity (Koenen test) and mechanical sensitivity (to drop weight impact and friction).

Currently, according to the classification system of the GHS these substances are only partially tested for explosive properties and as a result not classified or labelled completely adequate. This is also the case for test series 1 and 2 which are described in the UN Manual of Tests and Criteria for the acceptance procedure for classification of substances into class 1. All these substances are tested for their thermal sensitivity by the Koenen test but they are not tested for their mechanical sensitivity to impact and friction. However, if explosive properties according to these tests are existent they must be communicated in order to ensure safe handling.

The explosive properties of these substances become evident in the A.14 method as described in the annex of Directive 67/548/EEC (Dangerous Substances Directive). In this test series the intrinsic properties of potentially explosive substances are determined by the thermal sensitivity test and the mechanical sensitivity tests (impact and friction).

If substances show explosive properties either in the thermal sensitivity test or in one of the mechanical stimuli tests (impact or friction), two possibilities exist:

1. The substances have other hazardous properties and are classified accordingly (e.g. as organic peroxide, self-reactive substance or substances currently assigned to classes 4, 5.1 or 8). These substances need additional labelling of the explosive properties. (For organic peroxides and self-reactive substances (type A and B) this is already regulated in Annex 2, sections A2.8 and A2.15 of the GHS. However, this is based on the results of heating under confinement only and not on the mechanical sensitivity. For the other substances there is no such regulation at all.)

2. The substances do not have other hazardous properties and as a result are currently not classified by the normal classification procedure. These substances are currently classified

by a "grandfather clause" or they are not classified at all. This should be avoided and possible non-classification of such substances should not be risked.

An example for the importance of the mechanical sensitivity tests is a mixture of potassium perchlorate and sulfur. One of the mechanical stimuli tests of the A.14 method reveals explosive properties (result of impact test = 5 J), however, according to the GHS the mechanical sensitivity is not communicated and the hazard statement contains no such information.

(c) Explosives and explosive articles which are not packed for transport

Once a substance or article is provisionally accepted as an explosive or explosive article according to the acceptance procedure in the UN Manual of Tests and Criteria and the GHS, subsequent testing for the assignment to a division of class 1 (test series 6) is carried out together with the packaging of the substance or article. This approach is sufficiently safe for transport and storage dealing only with packed substances and articles. However, this approach is not appropriate to point out the hazards of unpacked explosive substances and articles and to ensure their safe handling and use.

The packaging can have a significant influence on the explosive effects of substances and articles. The type of packaging can change the response of packed explosives or explosive articles in test series 6. One and the same explosive substance or article can therefore be assigned to different hazard groups depending on the used packaging (see the example for the blasting caps given in the appendix of this document). As a result of test series 6 an appropriately packed explosive substance or article can also be rejected from class 1 and be assigned to another class. The example of the classification procedure for musk xylene (UN No. 2956) given in the appendix of this paper demonstrates the influence of packaging on the assignment to a hazard class and the gaps of the GHS to communicate explosive properties of unpacked substances and mixtures appropriately (see also UN Manual of Tests and Criteria, section 10.5).

In the GHS unpacked substances and articles are tested within the acceptance procedure for the class of explosives (test series 1 to 4) and within the test series 5. Only the assignment to the hazard groups "unstable explosive" and 1.5 is possible. However, currently there is no possibility to communicate the explosive properties of unpacked substances and articles which were determined in the course of the acceptance procedure. Furthermore, tests for the determination of the sensitivity to impact and friction as described in the test method A.14 (annex of Directive 67/548/EEC (Dangerous Substances Directive)) are missing. Test series 3 contains only impact and friction tests with lower exclusion criteria for the decision whether the explosive is unstable in the form it was tested.

For unpacked articles the GHS provides two tests, a thermal stability test and a free-fall impact test. However, during handling, manufacturing and use elevated temperatures and dropping are not the only risks for an accidental initiation. Unpacked explosive articles may be subjected to other forces as well, e.g. drop-weight impact, bending, electrostatic discharge.

Pyrotechnic articles which are used as life-saving air bag inflators or modules or seat-belt pretensioners (UN No. 3268) are assigned to class 9 according to the UN Model Regulations. Special provision 280 is currently not considered in the GHS.

(d) Desensitized explosives

Solid desensitized explosives are explosive substances which are wetted with water or alcohols or are diluted with other substances, to form a homogeneous solid mixture to suppress or at least reduce their explosive properties.

Liquid desensitized explosives are explosive substances which are dissolved or suspended in water or other flammable or non-flammable liquid substances, to form a homogeneous liquid mixture to suppress or at least reduce their explosives properties.

Desensitized explosives are currently not classified as a separate hazard class according to the GHS. Some desensitized explosives for TDG are classified by listing depending on their physical state and the agents used to achieve desensitization as flammable solid or flammable liquid. However, even such desensitized explosives may become explosive under certain circumstances – especially after long term storage and during handling and use – and some desensitized explosives may even show explosive properties and thus positive test results in the A.14 method.

Due to their specific dangerous properties desensitized explosives are currently classified for transport, storage and use as follows:

Transport: Solid desensitized explosives are classified in the UN Recommendations on the Transport of Dangerous Goods (all class 4.1 – flammable solids):
Entries in the Dangerous Goods List for solid desensitized explosives are UN 1310, UN 1320, UN 1321, UN 1322, UN 1336, UN 1337, UN 1344, UN 1347, UN 1348, UN 1349, UN 1354, UN 1355, UN 1356, UN 1357, UN 1517, UN 1571, UN 2555, UN 2556, UN 2557, UN 2852, UN 2907, UN 3317, UN 3319, UN 3344, UN 3364, UN 3365, UN 3366, UN 3367, UN 3368, UN 3369, UN 3370, UN 3376 and UN 3380.

Liquid desensitized explosives are classified in the UN Recommendations on the Transport of Dangerous Goods (all class 3 – flammable liquids):
Entries in the Dangerous Goods List for liquid desensitized explosives are: UN 1204, UN 2059, UN 3064, UN 3343, UN 3357 and UN 3379.

Storage and use: Regulations regarding storage and use of desensitized explosives are issued at national level.

(e) Certain properties of flammable liquids

Boiling point:
The GHS offers several methods for determining the flash point, but does not provide a suitable method for determining the initial boiling point of flammable liquids. An appropriate method should be referred to because the initial boiling point is the criterion which distinguishes between Category 1 and Category 2. It should be checked whether international standardized methods and/or methods cited in Directive 67/548/EEC (A 2) are suitable.

Calculation of flash point:
In chapter 2.6.4.2.2 (b) of the GHS there is a reference to the flash point of the individual components of a mixture which must be known as necessary requirement for the calculation of the flash point of the mixture. This reference is not correct since actually the lower explosion limit is required. Furthermore, an additional restriction should be mentioned. The cited method is reliably applicable only for binary and ternary mixtures the components of which do not interact and have a well known combustion stoichiometry. The cited method is not yet validated for mixtures containing e.g. halogenated, sulfurous and/or phosphoric substances. Therefore such mixtures should be excluded until the applicability of the method is verified e.g. by literature data.

The same is valid for Appendix 6, section 4.1 (b) of the UN Manual of Tests and Criteria.

Methods for determining the flash point:
The list of methods for determining the flash point needs to be updated thus considering harmonization on an international level which in the meantime took place. Examples for widely-used methods are ISO 13736 and ISO 2719.

Flammable liquids not sustaining combustion:
The classification criteria according to chapter 2.6, section 2.6.2 of the GHS allow for an exception (non-classification) for liquids if their flash point is > 35 °C and they have a negative test result in a cited UN Test. This test is actually used for transport. Other target audiences of the GHS (e.g. handling and use) may also have interest in this exception and the respective test. (Directive 67/548/EEC which covers handling and use in the EC specifies a similar exception for liquids having a flash point > 21°C and showing no other hazards, however, a test method is not mentioned.) Taking into account the test temperatures mentioned in the UN Manual for Tests and Criteria (60.5 °C and 75 °C) this test gives reliable results only for Category 3 liquids.

In the GHS there is currently no possibility to grant an exception for Category 4 liquids. Therefore, it should be checked whether a similar exception is reasonable for this category as well and if so, appropriate test temperatures should be fixed. At least the upper flash point limit of Category 3 should be part of the exception.

In the meantime the cited test is covered by ISO 9038. Therefore, the description of the test could be replaced by reference to the standard, while the test temperatures could be fixed in the GHS.

(f) Chemically unstable gases

Among the gases classified according to the GHS there are gases which are chemically unstable. At present chemical instability is understood as the ability to react dangerously without the presence of any other gas by decomposing or polymerizing (see also para. 4.2.2.4 of the UN Recommendations on the Transport of Dangerous Goods). However, these gases are not classified as such but only based on other hazardous properties. In the UN Manual of Tests and Criteria there is also no test method for chemical instability and thermodynamic data (e.g. enthalpy of formation) alone do not provide enough information in order to decide whether a certain gas is chemically unstable. The classification of chemically unstable gases is based on other dangerous properties and these gases are classified together with stable gases e.g. as flammable, oxidizing or toxic. Examples are given in the following:

Transport: Examples for the current classification of chemically unstable gases according to the UN Recommendations on the Transport of Dangerous Goods:

Decomposition:

Acetylene (UN No. 1001, 3374)	division 2.1 (flammable gas)
Nitrous oxide (UN No. 1070)	division 2.2 (non-flammable, non-toxic gas), subsidiary risk 5.1 (oxidizing substance)
Tetrafluoroethylene, stabilized (UN No. 1081)	division 2.1 (flammable gas)

Polymerization:

Ethylene oxide (UN No. 1040)	division 2.3 (toxic gas), subsidiary risk 2.1 (flammable gas)

Chemically unstable gases may be transported when the necessary steps have been taken. However, when handling chemically unstable gases, specific precautions are necessary. Their necessity becomes apparent during occasional accidents especially in connection with acetylene, ethylene oxide and vinyl chloride.

3. Proposals

The named types of substances and the problems mentioned should be discussed with regard to amendments to the GHS and, if necessary, to the UN Recommendations on the Transport of Dangerous Goods - and with regard to their classification procedure and appropriate hazard communication:

(a) Ammonium nitrate: For ammonium nitrate a separate sub-category in the GHS might be useful since the general test criteria do not really meet its dangerous properties.
Changes of Test Series 8 which possibly will be decided by the working group on explosives of TDG are of importance for the GHS and should be closely reviewed with regard to appropriate classification and hazard communication.

(b) Substances having explosive properties although not classified as explosives: Explosive properties are so important that they are always considered first even if the substances are assigned to other hazard classes. For this reason a test series for explosive properties should be implemented in the GHS for all substances which might present an explosive hazard. It should be checked if the method A.14 according to Directive 67/548/EEC and suitable methods from other existing systems should be included in the GHS. As a consequence explosive properties should be communicated properly (either by labelling or in a hazard statement).

(c) Explosives and explosive articles which are not packed for transport: The assignment of explosives and explosive articles to hazard divisions should be reconsidered with regard to handling and manufacturing of explosives which are not packed for transport or storage, including appropriate hazard statements. For the comprehensive characterization of explosive properties the mechanical stimuli tests of the A.14 method according to Directive 67/548/EEC should be incorporated in the GHS. It should be reconsidered if the tests for unpacked explosive articles are sufficient to ensure safe handling and use. Special provisions of the UN Model Regulations such as the classification of pyrotechnic articles with the UN No. 3268 should be regarded in the GHS.

(d) Desensitized explosives: Desensitized explosives should be incorporated as a new category into the GHS. As these products - which may even have explosive properties and thus positive test results in the A.14 method - are transported and used world-wide, a harmonized classification scheme including appropriate hazard statements should be discussed for inclusion in the GHS.

(e) Certain properties of flammable liquids: The methods for determining characteristics of flammable liquids should be corrected and updated with regard to a method for determining the boiling point, calculation of the flash point of mixtures and the list of cited methods for determining the flash point.
The possibility of exceptions for flammable liquids not sustaining combustion should be revised regarding its applicability (for Category 4 liquids) and regarding test temperatures.

(f) Chemically unstable gases: Currently a method for the assignment of chemically unstable gases based on general criteria is not available but the subject "chemical instability" should be considered for future work The establishment of general criteria for the assignment of chemically unstable gases should be considered in order to allow their adequate classification and hazard communication in the future. Thermodynamic data (e.g. enthalpy of formation) alone do not provide enough information in order to decide

whether a certain gas is chemically unstable. Therefore, a test method providing non-ambiguous results should be developed.
As long as such general criteria are not available, it might be considered to have specific entries for chemically unstable gases allowing for adequate hazard communication.

The Sub-Committee is invited to discuss the issues and to decide on appropriate ways to tackle them. As some of the issues may also concern the transport of dangerous goods, close co-operation with the Sub Committee on Transport should be ensured.

Since the raised issues are not simple and should be considered against the background of their context and possible implications, they might be handled in a correspondence group. Due to the various aspects concerning manufacturing, handling and storage, it would be very important that such a group consists of experts on these fields. Furthermore the experts of this group should cover not only explosives but the physical hazards related to the other substances as well. If asked to do so, Germany is willing to work in and organize such a correspondence group dealing with the above mentioned issues.

Annex

With the following examples a lot of the issues discussed in the working document can be demonstrated.

First example:

Test reports for the application of the Class 1 acceptance and assignment procedures to musk xylene (UN No. 2956) are given in the UN Manual of Tests and Criteria (section 10, Figues 10.5 to 10.8).
According to the A.14 test procedure musk xylene is considered as a substance with explosive hazard and is labelled with the symbol “exploding bomb” and the statement “explosion hazard”.
Although musk xylene is provisionally accepted as an explosive according to the acceptance procedure of TDG / GHS, the assignment procedure lead to the conclusion that musk xylene is not an explosive in the special form it was packed.
According to TDG appropriately packed musk xylene may be classified into class 4.1 with special provisions and limited quantity. According to the GHS musk xylene would be classified as flammable solid and labelled only with the symbol “flame” and the hazard statement “Heating may cause a fire”. The explosion hazard is not mentioned, not even as subsidiary risk.

1A) RESULTS FROM APPLICATION OF THE CLASS 1 ACCEPTANCE PROCEDURE

0. Name of substance:	5-tert-BUTYL-2,4,6-TRINITRO-m-XYLENE (MUSK XYLENE)
1. General data	
1.1 Composition:	99% tert-butyl-2,4,6-trinitro-m-xylene
1.2 Molecular formula:	$C_{12}H_{15}N_3O_6$
1.3 Physical form:	Fine crystalline powder
1.4 Colour:	Pale yellow
1.5 Apparent density:	840 kg/m3
1.6 Particle size:	< 1.7 mm
2. Box 2:	Is the substance manufactured with the view to producing a practical explosive or pyrotechnic effect?
2.1 Answer:	No
2.2 Exit:	Go to Box 3
3. Box 3:	Test Series 1
3.1 Propagation of Detonation:	UN gap test (test 1(a))
3.2 Sample conditions:	Ambient temperature
3.3 Observations:	Fragmentation length 40 cm
3.4 Result:	"+", propagation of detonation
3.5 Effect of heating under confinement:	Koenen test (test 1(b))
3.6 Sample conditions:	Mass 22.6 g
3.7 Observations:	Limiting diameter 5.0 mm 1) Fragmentation type "F" (time to reaction 52 s, duration of reaction 27 s)
3.8 Result:	"+", shows some explosive effects on heating under confinement
3.9 Effect of ignition under confinement:	Time/pressure test (test 1(c)(i))
3.10 Sample conditions:	Ambient temperature
3.11 Observations:	No ignition
3.12 Result:	"—", no effect on ignition under confinement

[1] *This limiting diameter cited in the UN Manual of Tests and Criteria section 10.5 is too low. Our tests resulted in 12 mm.*

3.13 Exit:	Go to Box 4
4. Box 4:	Is it an explosive substance?
4.1 Answer from Test Series 1:	Yes
4.2 Exit:	Go to box 5
5. Box 5:	Test Series 2
5.1 Sensitivity to shock:	UN gap test (test 2(a))
5.2 Sample conditions:	Ambient temperature
5.3 Observations:	No propagation
5.4 Result:	"—", not sensitive to shock
5.5 Effect of heating under confinement:	Koenen test (test 2(b))
5.6 Sample conditions:	Mass 22.6 g
5.7 Observations:	Limiting diameter 5.0 mm 1) Fragmentation type "F" (time to reaction 52 s, duration of reaction 27 s)
5.8 Result:	"+", violent effect on heating under confinement
5.9 Effect of ignition under confinement:	Time/pressure test (test 2(c)(i))
5.10 Sample conditions:	Ambient temperature
5.11 Observations:	No ignition
5.12 Result:	"—", no effect on ignition under confinement
5.13 Exit:	Go to Box 6
6. Box 6:	Is the substance too insensitive for acceptance into Class 1?
6.1 Answer from Test Series 2:	No
6.2 Conclusion:	Substance to be considered for Class 1 (box 8)
6.3 Exit:	Go to Box 9
7. Box 9:	Test Series 3
7.1 Thermal stability:	75 °C/48 hour test (test 3(c))
7.2 Sample conditions:	100 g of substance at 75 °C
7.3 Observations:	No ignition, explosion, self-heating or visible decomposition
7.4 Result:	"—", thermally stable
7.5 Impact sensitivity:	BAM Fallhammer test (test 3(a)(ii))
7.6 Sample conditions:	as received
7.7 Observations:	Limiting impact energy 25 J
7.8 Result:	"—", not too dangerous in form tested
7.9 Friction sensitivity:	BAM friction test (test 3(b)(i))
7.10 Sample conditions:	as received
7.11 Observations:	Limiting load > 360 N
7.12 Result:	"—", not too dangerous in form tested
7.13 Ease of deflagration to detonation transition:	Small scale burning test (test 3(d))
7.14 Sample conditions:	Ambient temperature
7.15 Observations:	Ignites and burns slowly
7.16 Result:	"—", not too dangerous in form tested
7.17 Exit:	Go to box 10
8. Box 10:	Is the substance thermally stable?
8.1 Answer from test 3(c):	Yes
8.2 Exit:	Go to box 11

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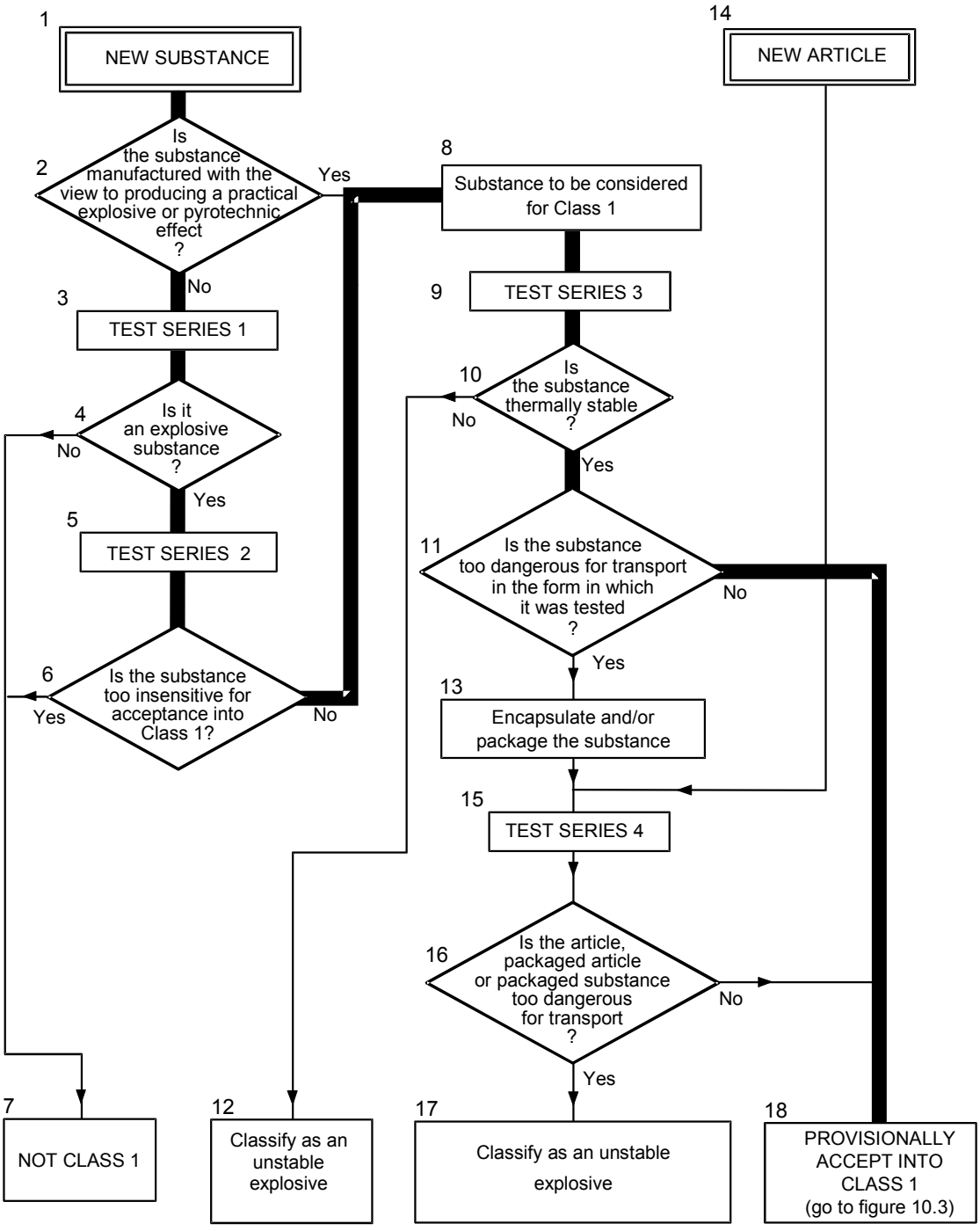
[1] *This limiting diameter cited in the UN Manual of Tests and Criteria section 10.5 is too low. Our tests resulted in 12 mm.*

9. Box 11:	Is the substance too dangerous in the form in which it was tested?
9.1 Answer from Test Series 3:	No
9.2 Exit:	Go to box 18
10. Conclusion:	PROVISIONALLY ACCEPT INTO THIS CLASS
10.1 Exit:	Apply the Class 1 assignment procedure

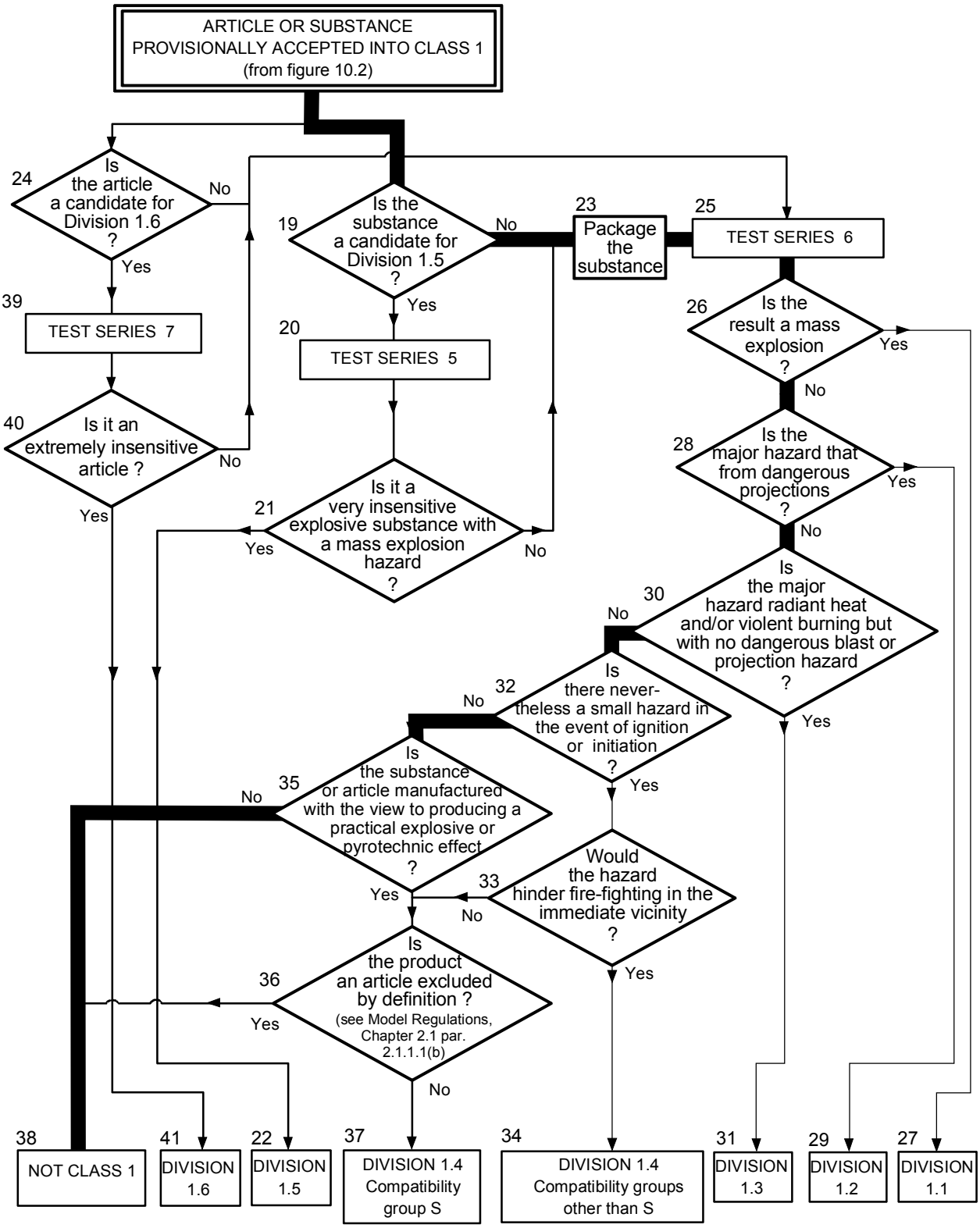
1B) PROCEDURE FOR PROVISIONAL ACCEPTANCE OF MUSK XYLENE IN CLASS 1



1C) RESULTS FROM APPLICATION OF THE ASSIGNMENT PROCEDURE

1. Box 19:	Is the substance a candidate for Division 1.5?
1.1 Answer:	No
1.2 Result:	Package the substance (box 23)
1.3 Exit:	Go to box 25
2. Box 25:	Test Series 6
2.1 Effect of initiation in the package:	Test 6(a) with detonator
2.2 Sample conditions:	Ambient temperature, 50 kg fibreboard drum
2.3 Observations:	Only localised decomposition around detonator
2.4 Result:	No significant reaction
2.5 Effect of ignition in the package:	Test 6(a) with igniter
2.6 Sample conditions:	Ambient temperature, 50 kg fibreboard drum
2.7 Observations:	Only localised decomposition around igniter
2.8 Result:	No significant reaction
2.9 Effect of propagation:	Type 6(b) test not required as no effect outside package between packages in 6(a) test
2.10 Effect of fire engulfment:	Test 6(c)
2.11 Sample conditions:	3 × 50 kg fibreboard drums mounted on steel frame above wooden crib fire
2.12 Observations:	Only slow burning with black smoke occurred
2.13 Result:	No effects which would hinder fire fighting
2.14 Exit:	Go to box 26
3. Box 26:	Is the result a mass explosion?
3.1 Answer from Test Series 6:	No
3.2 Exit:	Go to box 28
4. Box 28:	Is the major hazard that from dangerous projections?
4.1 Answer from Test Series 6:	No
4.2 Exit:	Go to box 30
5. Box 30:	Is the major hazard radiant heat and/or violent burning but with no dangerous blast or projection hazard?
5.1 Answer from Test Series 6:	No
5.2 Exit:	Go to box 32
6. Box 32:	Is there nevertheless a small hazard in the event of ignition or initiation?
6.1 Answer from Test Series 6:	No
6.2 Exit:	Go to box 35
7. Box 35:	Is the substance or article manufactured with the view to producing a practical explosive or pyrotechnic effect?
7.1 Answer:	No
7.2 Exit:	Go to box 38
8. Conclusion:	NOT AN EXPLOSIVE
8.1 Exit:	Consider for another class/division

1D) PROCEDURE FOR EXEMPTION OF MUSK XYLENE FROM CLASS 1



Second example:

The second example demonstrates the results of the acceptance and assignment procedures for non-electric blasting caps in three different packaging.

For transport and storage purposes the blasting caps are assigned depending on the packaging to division 1.1, division 1.4 compatibility group B and division 1.4 compatibility group S.
However, while manufacturing, handling or use the unpacked blasting caps do have a mass explosion hazard if several articles are situated directly next to each other.
A single blasting cap has a certain hazard characterized by its explosive properties.

2A) RESULTS FROM APPLICATION OF THE CLASS 1 ACCEPTANCE PROCEDURE

1.	**Name of article**	Blasting cap, non-electric
2.	**General data**	*Tube, aluminium, containing a priming charge of lead azide and a secondary charge of PETN.*
2.1	Transport and storage only packed articles	Three possible kinds of packaging A. Caps without any distance between each other with outer packaging fibreboard B. Caps having a certain distance between each other with outer packaging fibreboard C. Caps having a certain distance between each other with a non combustible rigid outer packaging
2.2	Manufacturing or handling in unpacked condition	Several caps may have no distance to each other.
3.	**Box 15**	Test Series 4
3.1	Thermal stability	75°C/48 hour test (test 4(a))
3.2	Sample conditions	One package (Packaging A, B, C) at 75°C
3.3	Observations	No initiation or explosion
3.4	Result	"-", thermally stable
3.5	Drop test	12 m height
3.6	Sample conditions	One package (Packaging A, B, C)
3.9	Observations	No initiation or explosion
3.10	Result	"-", package withstand impact
4.	**Box 16**	Is the packaged article too dangerous?
4.1	Answer from test series 4	No
4.2	Exit	Go to box 18
5.	**Conclusion**	PROVISIONALLY ACCEPT INTO CLASS 1
5.1	Exit	Apply the class 1 assignment procedure

2B) RESULTS FROM APPLICATION OF THE CLASS 1 ASSIGNMENT PROCEDURE

1.	**Box 24**	Is the article a candidate for Division 1.6?
1.1	Answer	No
1.2	Exit	Go to box 25
2.	**Box 25**	Test series 6
2.1	Effect of initiation in the package	Test 6(a) with initiation
2.2	Sample conditions	One pack, one cap initiated (Packaging A,B,C)
2.3	Observations	Damage of the witness plate, disruption of the confining material (Packaging A) Single shot, outer packaging partly destroyed (Packaging B) Single shot, outer packaging intact, (Packaging C)
2.4	Result	Mass explosion (Packaging A) Single reaction (Packaging B) Single reaction (Packaging C)
2.5	Effect of propagation between packages	Type 6(b) test not required, Packaging A mass explosion, Packaging B not even propagation from one to another article Packaging C no effect outside package in 6(a) test
2.6	Effect of fire engulfment	Test 6(c)
2.7	Sample conditions	Packages of a volume of at least 0.15 m^3, packages on a steel frame above wooden crib fire. Test only for Packaging B and C
2.8	Observations	Single shots, scattering of inner and outer packaging, few indentations in the witness screen (Packaging B) Single shots, no effects outside of the package (Packaging C)
2.9	Result	Small hazard which hinder fire fighting (Packaging B) No effects which would hinder fire fighting (Packaging C)
2.10	Exit	Go to box 26
3.	**Box 26**	Is the result a mass explosion?
3.1	Answer from test series 6	Yes (Packaging A) No (Packaging B, C)
3.2	Exit	Go to box 27 (Packaging A) Go to box 28 (Packaging B, C)
4.	**Conclusion**	**Division 1.1 (Packaging A)**
5.	**Box 28**	Is the major hazard that from dangerous projections?
5.1	Answer from test series 6	No (Packaging B, C)
5.2	Exit	Go to box 30
6.	**Box 30**	Is the major hazard radiant heat and/or violent burning but with no dangerous blast or projection hazard?
6.1	Answer from test series 6	No (Packaging B, C)
6.2	Exit	Go to box 32

7.	**Box 32**	Is there nevertheless a small hazard in the event of ignition or initiation?
7.1	Answer from test series 6	Yes (Packaging B) No (Packaging C)
7.2	Exit	Go to box 33 (Packaging B) Got to box 35 (Packaging C)
8.	**Box 33**	Would the hazard hinder fire-fighting in the immediate vicinity?
8.1	Answer from test series 6	Yes (Packaging B)
8.2	Exit	Go to box 34
9.	**Conclusion**	**Division 1.4 Compatibility group B (Packaging B)**
10.	**Box 35**	Is the substance or article manufactured with the view to producing a practical explosive or pyrotechnic effect?
10.1	Answer	Yes (Packaging C)
10.2	Exit	Go to box 36
11.	**Box 36**	Is the product an article excluded by definition?
11.1	Answer	No (Packaging C)
11.2	Exit	Go to box 37
12.	**Conclusion**	**Division 1.4 Compatibility group S (Packaging C)**