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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**

**Report of the Committee of Experts on the Transport of  
Dangerous Goods and on the Globally Harmonized System of  
Classification and Labelling of Chemicals on its eighth  
session**

held in Geneva on 9 December 2016

**Addendum**

**Annex II**

**Amendments to the sixth revised edition of the Recommendations on  
the Transport of Dangerous Goods, Manual of Tests and Criteria  
(ST/SG/AC.10/11/Rev.6)**

GE.17-04713(E)



\* 1 7 0 4 7 1 3 \*

Please recycle



## Section 1

1.1.2 Amend the second sentence to read as follows: “It therefore assumes technical competence on the part of the testing body.”.

1.3.1 In the first sentence, replace “risk” by “hazard”. In the second sentence, replace “risks” by “hazards”.

## Section 10

10.3.3.2 Amend to read as follows:

“10.3.3.2 The acceptance procedure for substances designed to have a practical explosive or pyrotechnic effect starts with the application of test series 3 to determine if the substance is too sensitive for transport in the form in which it is tested. If the substance passes all tests, the procedure for the assignment to the appropriate division is applied. If the substance fails any of the tests, it is forbidden for transport in the form tested. A substance which fails test type 3 (c) may be altered and resubmitted to test type 3(c). A substance which fails test types 3 (a), 3 (b) or 3 (d) may be encapsulated or packaged to reduce sensitiveness to external stimuli and submitted to test type 4(b).”.

Renumber current paragraph 10.3.3.3 to 10.3.3.4.

Renumber current paragraph 10.3.3.4 to 10.3.3.3 and amend as follows:

“10.3.3.3 All articles as presented for transport (packaged or unpackaged) should be subjected to test series 4. However, if there is sufficient information to indicate that the article would not be too dangerous for transport, the competent authority may decide to waive all or part of these tests for the article. If the product passes all the required tests in test series 4, the procedure for assignment to the appropriate division is applied. If the product fails any of the required tests, it is forbidden for transport in the form tested, but it may be modified or repackaged and resubmitted to test series 4. If the competent authority suspects that the product may be subject to stimuli other than those specified in test series 4 resulting in potentially dangerous effects, additional information or tests may be required (see note under paragraph 2.1.3.3.1 of the Model Regulations).”.

## Section 11

11.3.2 Delete “during transport”.

11.3.3 Replace “should be performed” by “are performed”. Replace “is to be transported under conditions” by “is likely to encounter conditions”.

11.3.4 Replace “considered for transport” by “considered for packing”.

11.5.1.2.1 (d) Replace “ $30 \pm 3$  MPa” by “ $29 \text{ MPa} \pm 4 \text{ MPa}$ ”.

11.5.1.3.1 In footnote 1, replace “transport conditions” by “operating conditions”.

## Section 12

12.1.1 Replace “Class 1” by “the class of explosives”.

12.3.2 Delete “during transport”.

12.3.3 Replace “should be performed” by “are performed”. Replace “is to be transported under conditions” by “is likely to encounter conditions”.

12.5.1.2.1 (d) Replace “30 ± 3 MPa” by “29 MPa ± 4 MPa”.

12.5.1.3.1 In footnote 1, replace “transport conditions” by “operating conditions”.

## Section 13

13.1 Amend to read as follows:

“13.1 This test series is used to answer the questions in boxes 10 and 11 of Figure 10.2 by determining the sensitiveness of the substance to mechanical stimuli (impact and friction), to heat and to flame. The question in box 10 is answered “no” if a “+” is obtained in test type 3(c) and the substance shall be categorised as an unstable explosive; consequentially the substance is not permitted for transport. The question in box 11 is answered “yes” if a “+” is obtained in any of the test types 3(a), 3(b) or 3(d). If a “+” is obtained, the substance shall be categorised as an unstable explosive in the form in which it was tested but may be encapsulated or otherwise desensitized or packaged to reduce its sensitiveness to external stimuli.

**NOTE:** *Although explosives categorised as unstable explosives are forbidden for transport they are not prohibited in other sectors where special precautions may be applied.”.*

13.3.2 Replace “wetting agent provided for transport” by “wetting agent specified”.

13.3.3 Amend the middle of the sentence as follows: “... at ambient temperature unless the substance is likely to encounter conditions ...”.

13.4 Throughout the whole sub-section replace “too dangerous to transport” and “too dangerous for transport” by “an unstable explosive”.

*(Applies to the following paragraphs: 13.4.1.1; 13.4.1.4.1; 13.4.1.4.2; 13.4.2.1; 13.4.2.4; 13.4.3.1; 13.4.3.4.1 (twice); 13.4.3.4.2 (twice); 13.4.4.1; 13.4.4.4; 13.4.5.1; 13.4.5.4.2; 13.4.5.4.3; 13.4.6.1; 13.4.6.4.1; 13.4.6.4.2; 13.4.7.1; 13.4.7.5.1 and 13.4.7.5.2)*

13.4.2.3.1 (c) Replace “are transported” by “are manufactured”.

13.4.6.3.1.1 At the end of the second sentence replace “wetting agent required for transport” by “wetting agent specified”.

13.4.7.3.1 At the end of the second sentence replace “wetting agent required for transport” by “wetting agent specified”.

13.5 Throughout the whole sub-section replace “too dangerous to transport” and “too dangerous for transport” by “an unstable explosive”.

*(Applies to the following paragraphs: 13.5.1.1; 13.5.1.3.4; 13.5.2.1; 13.5.2.4 (twice); 13.5.3.1; 13.5.3.4; 13.5.4.1 and 13.5.4.5)*

13.5.1.3.1 At the end of the second sentence replace “wetting agent provided for transport” by “wetting agent specified” and in sub-paragraph (c) replace “are transported” by “are manufactured”.

13.5.3.3.1 Replace “wetting agent provided for transport” by “wetting agent specified”.

13.5.4.3.1 Replace “wetting agent provided for transport” by “wetting agent specified”.

13.6.1.1 Replace “stability” by “thermal stability” and delete “to determine if the substance is too dangerous to transport” at the end on the sentence.

13.6.1.3.1 Amend the last sentence to read as follows: “If explosion or ignition occurs then the substance is too thermally unstable for transport and shall be categorized as an unstable explosive”.

13.6.1.4.2 Amend the end of the sentence to read as follows: “...considered thermally unstable, shall be categorised as an unstable explosive and is not permitted for transport.”.

13.6.2.1 Replace “stability” by “thermal stability” and delete “to determine if the substance is too dangerous to transport” at the end of the sentence.

13.6.2.4.2 Amend the end of the sentence to read as follows: “...considered thermally unstable, shall be categorised as an unstable explosive and is not permitted for transport.”.

13.7.1.3 In the last paragraph, replace “too dangerous for transport” by “an unstable explosive”.

## Section 15

15.3.2 Replace “to be transported under conditions” by “likely to encounter conditions”.

15.4.1.3 Delete the fourth sentence (“In all cases,... shipping density.”). In the fourth last but one sentence, replace “which have to be transported in regions of high ambient temperatures” by “which could be subjected to high ambient temperatures”.

Figures 15.4.1.1 Amend the description for (B) to read as follows: “Cardboard tube”.

Figure 15.4.1.2 Amend the description for (B) to read as follows: “Cardboard tube”. Delete the dimensions from the description of (E) and (F).

15.6.1.1 Replace “packaged as for transport” by “as packaged for transport”.

15.6.1.2 (a) Replace “transport” by “classification”.

## Section 16

16.1.1 At the end of the second sentence delete “a load is”. In the last sentence replace “Class 1” by “the class of explosives”.

16.2.2 In sub-paragraph (a), replace “carried” by “classified”. In sub-paragraph (b) (i), replace “detonation and/or ignition” by “initiation”.

16.3.1 In the second sentence replace “most disadvantageous” by “most severe”. In the third sentence replace “carried” by “classified”.

16.4.1.3.1 In the second sentence replace “carried” by “classified”.

16.4.1.3.2 (c) Replace “Class 1” by “the class of explosives”.

16.4.1.3.5 Delete the last sentence.

16.4.1.4 Delete the text between parentheses.

16.5.1.3 In the second sentence and in the last but one sentence, replace “carried” by “classified”.

16.5.1.4 (c) Replace “Class 1” by “the class of explosives”.

16.5.1.6 In the second sentence replace “carried” by “classified”.

16.6.1.3.9 In the first sentence, insert “Division 1.4, Compatibility Group S in transport” before “UN No.0012”.

16.6.1.4.6 In the last sentence, insert “Division 1.4, Compatibility Group S in transport” before “UN No. 0012”.

16.7.1.3.1 “In the second sentence replace “are to be carried” by “are classified”.”

## Section 17

17.11.1.2.1 In the last but one sentence, replace “to surround articles transported bare” by “to surround bare articles”.

## Section 18

18.1 Amend the end of the last paragraph to read: “... of ANEs for containment in portable tanks as an oxidizing substance.”.

Table 18.1 Amend the end of note <sup>b</sup> to the table to read: “... of ANEs for containment in portable tanks as an oxidizing substance.”.

18.6.1.2.1 (d) Replace “ $30 \pm 3$  MPa” by “29 MPa  $\pm$  4 MPa”.

18.7.1.1 Amend the end of the first sentence to read: “... suitability for containment in portable tanks as an oxidizing substance.”.

18.7.1.4 Amend the middle of the second paragraph to read: “...should not be contained in portable tanks as an oxidizing substance...”.

18.7.2.1 Amend the end of the first paragraph to read: “...to be contained in portable tanks as an oxidizing substance”.

18.7.2.4.8 Amend the middle of the second paragraph to read: “...should not be contained in portable tanks as an oxidizing substance...”.

## Section 20

Figure 20.1 (a), Exit B, replace “subsidiary risk” by “subsidiary hazard”.

20.4.2 (b) (c) replace “subsidiary risk” by “subsidiary hazard”.

20.4.3 (b) (c) replace “subsidiary risk” by “subsidiary hazard”.

Figure 20.2, item 9.7, replace “risks” by “hazards”.

Figure 20.3, Exit B, replace “subsidiary risk” by “subsidiary hazard”.

## Section 25

25.4.1.2.1 (d) Replace “ $30 \pm 3$  MPa” by “29 MPa  $\pm$  4 MPa”.

## Section 28

28.1 In sub-paragraph (b) and in the second reference, replace “Frank-Kamenskii” by “Frank-Kamenetskii”.

## Section 30

30.1.1 (h) Replace “Ammonium nitrate fertilizers” by “Ammonium nitrate based fertilizers”.

30.2 (c) Replace “risk” by “hazard”.

## Section 32

32.3.1.1 Replace “risk” by “hazard”.

32.3.1.2 Replace “risk” by “hazard”.

32.3.1.3 Replace “risk(s)” by “hazard(s)” twice. At the end, replace “risks” by “hazards”.

## Section 33

33.2.1.4.4.1 Amend the last sentence to read as follows: “Powders of metals or metal alloys should be classified when they can be ignited and the reaction spreads over the whole length (100 mm) of the sample in 10 minutes or less.”.

33.2.1.4.4.2 Amend the last sentence to read as follows: “Packing group II should be assigned to powders of metals or metal alloys if the zone of reaction spreads over the whole length (100 mm) of the sample in five minutes or less.”.

33.2.1.4.4.3 Amend the last sentence to read as follows: “Packing group III should be assigned to metal powders if the reaction spreads over the whole length (100 mm) of the sample in more than five minutes but not more than ten minutes.”.

## Section 34

34.3.1 Add the following new last sentence: “By exception, solid ammonium nitrate based fertilizers are not classified as oxidizing solids on the basis of results from tests O.1 or O.3, since the hazardous properties are not sufficiently described by the outcome of tests for oxidizing properties. Instead, such fertilizers are classified on the basis of acquired experience and knowledge of their hazardous behaviour. They shall be classified in accordance with the procedure as set out in Section 39.”.

34.4.1.1 Replace “fibrous cellulose” by “cellulose”.

34.4.1.2.2 Replace the first sentence by “Dried white cellulose <sup>1</sup>, with a fibre mean diameter of approximately 25 µm, grain size less than 100 µm, apparent density of approximately 170 kg/m<sup>3</sup> and pH-value between 5 and 7, is used as the combustible material.”. Footnote 1 remains unchanged.

34.4.1.4.2 At the end, replace “risks” by “hazards”.

34.4.2.1 Replace “fibrous cellulose” by “cellulose”.

34.4.2.2.5 Replace the first sentence by “Dried white cellulose <sup>3</sup>, with a fibre mean diameter of approximately 25 µm, grain size approximately 100 µm, apparent density 150 to 200 kg/m<sup>3</sup> and pH-value between 5 and 7.5, is used as the combustible material.”. The text of footnote 3 is replaced by: “<sup>3</sup>Source reference available from the national contact for test details in France (see Appendix 4)”.

34.4.2.4.2 At the end, replace “risks” by “hazards”.

34.4.3.1 Replace "fibrous cellulose" by "cellulose".

34.4.3.2.2 Replace the first sentence by “Dried white cellulose <sup>5</sup>, with a fibre mean diameter of approximately 25 µm, grain size less than 100 µm, apparent density of approximately 170 kg/m<sup>3</sup> and pH-value between 5 and 7, is used as the combustible material.”. Footnote 5 reads: “<sup>5</sup> Source reference available from the national contact for test details in France (see Appendix 4)”. In 34.4.3.3, renumber footnote 5 as footnote 6.

34.4.3.5.4 In the paragraph after “Not Division 5.1”, replace “risks” by “hazards”.

## Section 38

38.2 In the heading, replace “ammonium nitrate fertilizers” by “ammonium nitrate based fertilizers”.

38.2.1.1 Replace “ammonium nitrate” by “ammonium nitrate based” (twice).

38.2.3.1 Replace “ammonium nitrate fertilizer” by “ammonium nitrate based fertilizer”.

38.2.3.2 Replace “ammonium nitrate fertilisers” by “ammonium nitrate based fertilizers”.

38.2.3.3 At the beginning, replace “Ammonium nitrate fertilizers” by “Ammonium nitrate based fertilizers”.

Insert the following new 38.2.3.4:

“38.2.3.4 The overall classification procedure for ammonium nitrate based fertilizers is set out in Section 39.”.

38.3.2.1 At the end, add the new following sentence: “A cell or battery that is an integral part of the equipment it is intended to power that is transported only when installed in the equipment, may be tested in accordance with the applicable tests when installed in the equipment.”.

38.3.2.3 Amend the definition of “Disassembly” to read as follows:

“*Disassembly* means a rupture of the cell or battery case where solid components are ejected.

**NOTE:** *During cell or component cell testing, ejection of internal components is acceptable. Energy of ejected components shall be limited and can be measured as follows:*

(a) *It will not penetrate a wire mesh screen (annealed aluminium wire with a diameter of 0.25 mm and grid density of 6 to 7 wires per cm) placed 25 cm away from the cell; or*

(b) *It can be measured by a method demonstrated to be equivalent to the one described in sub-paragraph (a) above.”.*

38.3.3 (b) In (i), replace “ten” by “five”. Add a new paragraph (ii) to read as follows and renumber the following paragraphs consequently: “Five cells after 25 cycles ending in fully charged states;”. In paragraph (iv) (previously (iii)), replace “50” by “25”.

38.3.3 (c) In paragraph (iii), after “rated capacity” add “and five cells after 25 cycles ending at 50% of the design rated capacity;”. In paragraph (iv), after “rated capacity” add “and five cells after 25 cycles ending at 50% of the design rated capacity.”.

38.3.3 (d) In paragraph (ii), replace “50” by “25”.

38.3.3 (e) In paragraphs (v) and (vi), replace “50” by “25”.

38.3.3 Add the following new 38.3.3.1

“38.3.3.1 Provisions 38.3.2.1 and 38.3.3 are summarized in the following table

**Table 38.3.2: Summary table of required tests for primary cells and batteries**

Primary cells and batteries										
		T.1	T.2	T.3	T.4	T.5	T.6	T.7	T.8	Sum <sup>c</sup>
Cells not transported separately	undischarged state						5			20
	fully discharged state						5		10	
Cells	undischarged state	10					5			40
	fully discharged state	10					5		10	
Single cell batteries <sup>a</sup>	undischarged state	10					5			40
	fully discharged state	10					5		10	
Small batteries	undischarged state	4								8
	fully discharged state	4								
Large Batteries	undischarged state	4								8
	fully discharged state	4								
Batteries assembled with tested batteries ≤ 500 g Li	undischarged state			1						1
Batteries assembled with tested batteries > 500 g <sup>b</sup> Li										0

<sup>a</sup> A single cell battery containing one tested cell does not require testing unless a change in cell design could result in the failure of any test.

<sup>b</sup> If the assembled battery is of a type that has been verified as preventing:

- (i) Overcharge;
- (ii) Short circuits; and
- (iii) Over discharge between the batteries.

<sup>c</sup> The sum represents the number of tests required, not the number of cells or batteries tested.



**Table 38.3.3: Summary table of required tests for rechargeable cells and batteries**

Rechargeable cells and batteries										
		T.1	T.2	T.3	T.4	T.5	T.6	T.7 <sup>a</sup>	T.8	Sum <sup>d</sup>
Cells not transported separately from a battery	first cycle, 50% charged state						5			30
	25th cycle, 50% charged state						5			
	first cycle, fully discharged state								10	
	25th cycle, fully discharged state								10	
Cells	first cycle, fully charged state	5								40
	25th cycle, fully charged state	5								
	first cycle, 50% charged state						5			
	25th cycle, 50% charged state						5			
	first cycle, fully discharged state								10	
	25th cycle, fully discharged state								10	
Single cell batteries <sup>b</sup>	first cycle, fully charged state	5						4		48
	25th cycle, fully charged state	5								
	first cycle, 50% charged state						5			
	25th cycle, 50% charged state						5			
	25th cycle, fully charged state							4		
	first cycle, fully discharged state								10	
	25th cycle, fully discharged state								10	
Small batteries	first cycle, fully charged state	4						4		16
	25th cycle, fully charged state	4						4		
Large batteries	first cycle, fully charged state	2						2		8
	25th cycle, fully charged state	2						2		
Batteries assembled with tested batteries ≤ 6 200 Wh or ≤ 500g Li	fully charged state			1				1		2
Batteries assembled with tested batteries > 6 200 Wh or > 500g Li <sup>c</sup>										0

<sup>a</sup> Batteries or single cell batteries not equipped with battery overcharge protection that are designed for use only as a component in another battery or in equipment, which affords such protection, are not subject to the requirements of this test;

<sup>b</sup> Except for the T.7 Overcharge test, a single cell battery containing one tested cell does not require testing unless a change in cell design could result in the failure of any test;

<sup>c</sup> *If the assembled battery is of a type that has been verified as preventing:*

- (i) *Overcharge;*
- (ii) *Short circuits; and*
- (iii) *Over discharge between the batteries.*

<sup>d</sup> *the sum represents the number of tests required, not the number of cells or batteries tested.”.*

38.3 Add the following new sub-section 38.3.5:

**“38.3.5 Lithium cell and battery test summary**

The following test summary shall be made available:

<b>Lithium cell or battery test summary in Accordance with sub-section 38.3 of Manual of Tests and Criteria</b>	
The following information shall be provided in this test summary:	
(a)	Name of cell, battery, or product manufacturer, as applicable;
(b)	Cell, battery, or product manufacturer’s contact information to include address, phone number, email address and website for more information;
(c)	Name of the test laboratory to include address, phone number, email address and website for more information;
(d)	A unique test report identification number;
(e)	Date of test report;
(f)	Description of cell or battery to include at a minimum:
(i)	Lithium ion or lithium metal cell or battery;
(ii)	Mass;
(iii)	Watt-hour rating, or lithium content;
(iv)	Physical description of the cell/battery; and
(v)	Model numbers.
(g)	List of tests conducted and results (i.e., pass/fail);
(h)	Reference to assembled battery testing requirements, if applicable (i.e., 38.3.3 (f) and 38.3.3 (g));
(i)	Reference to the revised edition of the Manual of Tests and Criteria used and to amendments thereto, if any; and
(j)	Signature with name and title of signatory as an indication of the validity of information provided.

”.

## Section 39

Add the following new section 39:

### “Section 39

#### **Classification procedure and criteria relating to solid ammonium nitrate based fertilizers**

##### **39.1 Purpose**

This section presents the United Nations scheme for the classification of solid ammonium nitrate based fertilizers as referred to in the Model Regulations, Chapter 3.3, special provisions 307 and 193.

### 39.2 Scope

Any new solid fertilizer composition containing ammonium nitrate shall be subjected to the classification procedure as set out in 39.4.

### 39.3 Definitions

39.3.1 An ammonium nitrate based fertilizer is a uniform mixture containing ammonium ( $\text{NH}_4^+$ ) and nitrate ( $\text{NO}_3^-$ ) ions. See also 39.3.3.

39.3.2 A compound fertilizer is a uniform mixture that contains at least two of the three primary nutrients nitrogen (N), phosphorus (P) and potassium (K).

39.3.3 In determining the ammonium nitrate content, all nitrate ions for which a molecular equivalent of ammonium ions is present in the fertilizer shall be calculated as ammonium nitrate.

39.3.4 Combustible substances as referred to in paragraph 39.4 include also inorganic substances that can be oxidized, e.g. elemental sulphur. For organic substances the content of combustibles is calculated as carbon.

39.3.5 Materials that may be incompatible with ammonium nitrate include urea, acids, superphosphates with free acid, elemental sulphur, sulphides and most transition metals, including heavy metals (e.g. copper), and chlorides. Note however that this listing is not exhaustive.

### 39.4 Classification procedure

39.4.1 Solid ammonium nitrate based fertilizers are classified on the basis of their composition and experience and knowledge of their hazardous behaviour. Occasionally, the classification is complemented by testing for the ability to undergo self-sustaining decomposition or for explosive properties. These principles are condensed in the flowchart in 39.5.

39.4.2 UN No. 2067 may only be used for ammonium nitrate based fertilizers that do not show explosive properties when tested in accordance with Test Series 2 of this Manual.

39.4.3 Ammonium nitrate based fertilizers that do not fulfil the requirements for classification as UN No. 2067, can be assigned another suitable UN number in Class 1 or Class 5, Division 5.1, provided that the suitability for transport is demonstrated and this is approved by the competent authority. This may for instance be when contamination has occurred in e.g. an accident, so that the fertilizer can be transported under a suitable UN number e.g. in Class 1 as approved by the competent authority.

39.4.4 Ammonium nitrate based fertilizers that meet composition limits relevant for inclusion in the class of Explosives as set out in 39.5 shall be classified in that class regardless of the results when tested in accordance with Test Series 2 of this Manual.

39.4.5 Ammonium nitrate based fertilizers that meet composition limits relevant for classification as oxidizing solids as set out in 39.5, or are otherwise classified as oxidizing solids, shall not be exempted from that classification on the basis of the results from tests O.1 and/or O.3 in Section 34 of this Manual. See also paragraph 34.3.1 in Section 34 of this Manual.

39.4.6 Fertilizers that contain 70 % or more ammonium nitrate shall not contain ammonium sulphate as nutrient, unless they are compound fertilizers with less than 90% ammonium nitrate and with at least 10% inorganic materials excluding ammonium nitrate and ammonium sulphate.

39.4.7 Compound fertilizers that meet the composition limits relevant for potential inclusion for transport in Class 9 shall be tested for their capability to undergo self-sustaining decomposition according to the method given in paragraph 38.2.4 of this Manual (test S.1, trough test) and classified according to criteria given there and in 39.5.

### 39.5 Classification criteria

39.5.1 Ammonium nitrate based fertilizers shall be classified in accordance with the flowchart below.

**Figure 39.1 (a)**

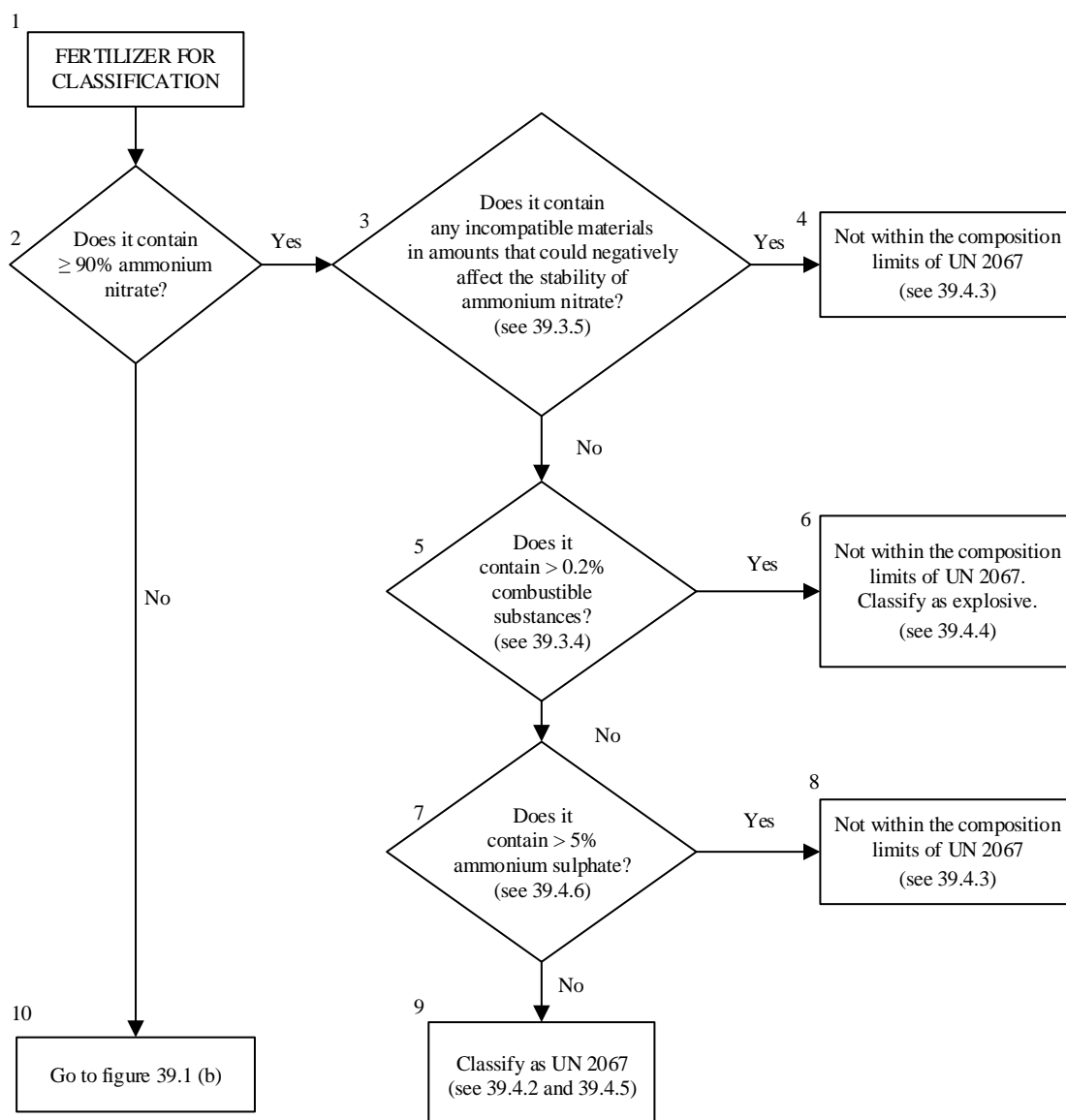


Figure 39.1 (b)

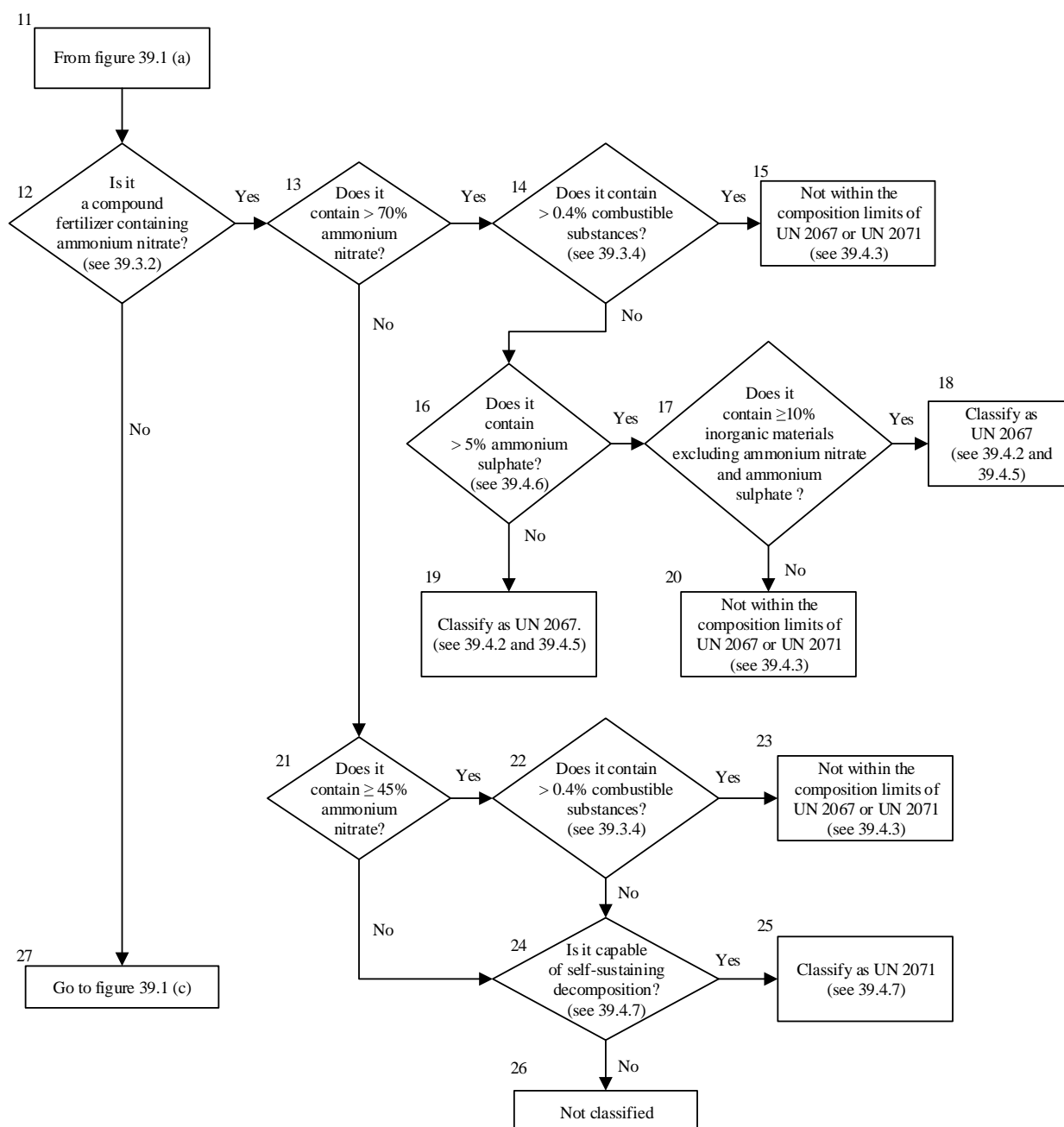
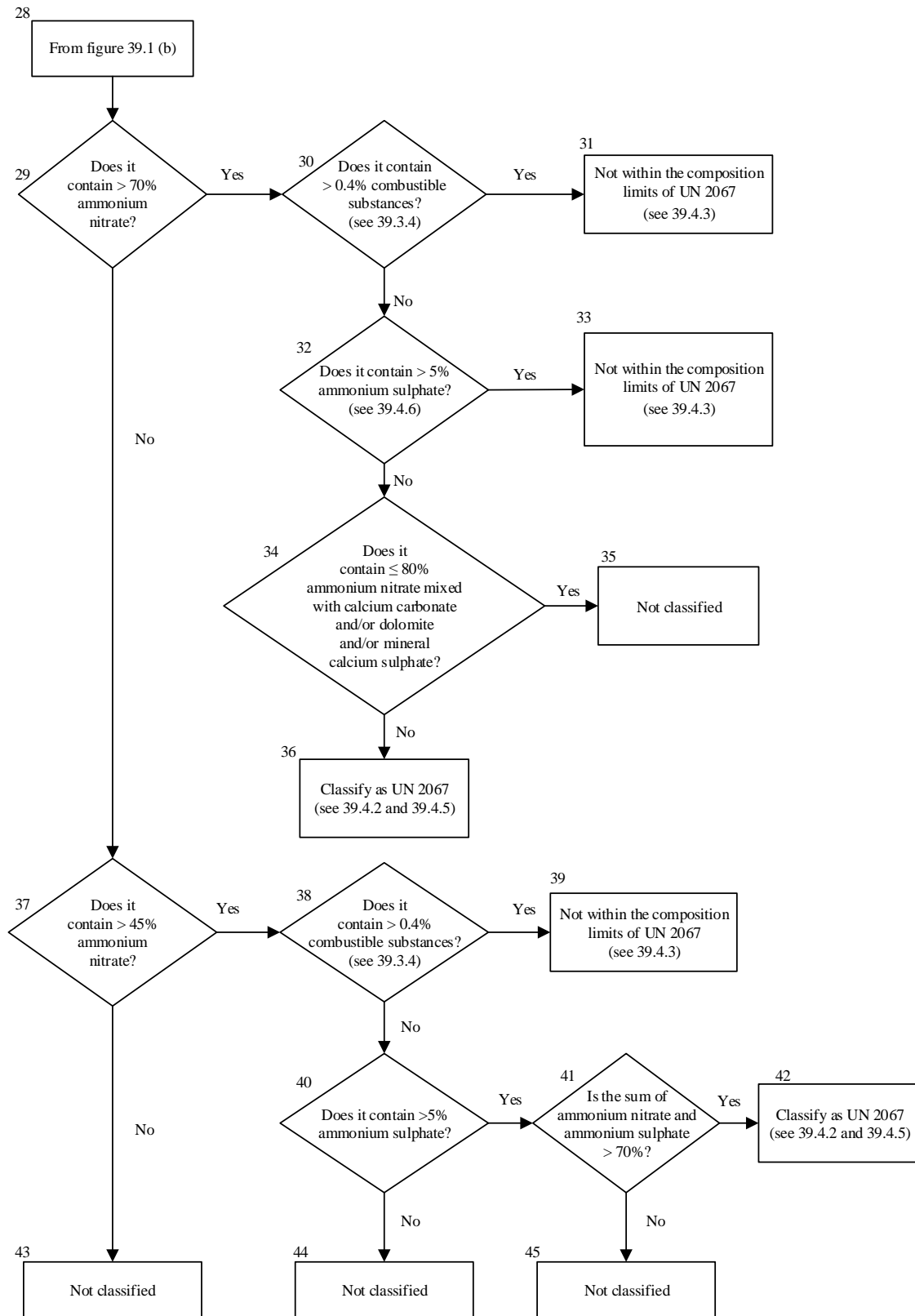


Figure 39.1 (c)



## Section 51

51.2.2 Amend the introductory sentence to read as follows: “Any explosive while in a desensitized state shall be considered in this class unless, in that state:”.

51.2.2 (a) Amend to read as follows:

“(a) It is intended to produce a practical explosive or pyrotechnic effect;”.

51.2.2 (b) In sub-paragraph (b), replace “They have a mass explosion hazard” by “It has a mass explosion hazard” and “their corrected burning rate” by “the corrected burning rate”.

51.2.2 (c) Replace “Their exothermic” by “The exothermic”.

## Appendix 4

In the column “Address”:

- For France, replace “INERIS/LSE” with “INERIS/CERT”
- For Germany, delete “Abteilung II” and insert “Abteilung 2” under “Bundesanstalt ...”
- For the Netherlands, delete “Prins Maurits Laboratory”
- For Japan, replace the address with the following:  
 “Physical & Chemical Analysis Center  
 Nippon Kaiji Kentei Kyokai (NKKK)  
 1-14-2 Sachiura, Kanazawa-ku  
 Yokohama 236-0003, Japan”
- For Spain, replace the address with the following:  
 “Laboratorio Oficial J.M. Madariaga (LOM)  
 Erik Kandel, 1 (Tecnogetafe)  
 E-28906 Getafe (Madrid)  
 Spain”
- For Sweden, replace the address with the following:  
 “Swedish Civil Contingencies Agency  
 Section for the Safe Handling of Hazardous Substances  
 S-651 81 Karlstad  
 Sweden”
- For the United States of America, replace the address with the following:  
 “Associate Administrator for Hazardous Materials Safety  
 Pipeline and Hazardous Materials Safety Administration  
 US Department of Transportation  
 1200 New Jersey Avenue, SE  
 Washington, D.C. 20590  
 USA”.

## Appendix 5

Section 2 At the end of the 7th sentence (“Usually, the bursting pressure...”) replace “transport” by “operating”. At the end of the 8th sentence (“The 10 l vessel...”) delete “as to be used in transport”.

## Appendix 6

2.1 In the first sentence, replace “a new substance” with “new substances” and offered for transport” with “offered for classification”.

2.2 At the end of the first sentence insert: “taking into account their physical state, e.g. for solid nanomaterials”. In the second sentence delete “during transport”. Add a new sentence at the end to read as follows: “Some potentially corrosive materials may not be corrosive when solid but may liquefy during normal operating conditions. Judgement needs to be applied in such cases to determine the need or otherwise for testing and classification.”.

Amend section 2.3 to read as follows:

“2.3 The remarks 1.1.2 from section 1 «General introduction» are emphasized that technical competence on the part of the testing body is assumed.”.

3.1 Delete “of Division 4.1” and “of Division 5.2”.

3.2 Replace “Class 1 Acceptance Procedure” with “acceptance procedure”.

3.3 At the introductory sentence, delete “Class 1”. In sub-paragraph (d):

Delete “of Division 5.1” in the introductory sentence

In the first indent, insert “/category I” after “packing group I” and “/2” after “II”

In the second indent, insert “/category III” after “packing group III”

3.4 Delete “class 1” and replace “should be applied” with “has to be performed”.

4 In the title, delete “(Class 3)”.

5 In the title, delete “(Class 4)”.

5.1 In the title, delete “(Division 4.1)”.

Insert a section 5.2 to read as follows:

“5.2 Substances which may be polymerizing substances

Provided that the substance is not intended for polymerization, the classification procedure for polymerizing substances need not be applied if:

- (a) The chemical structure of the substance contains no double or triple bonds or strained rings; or
- (b) The compound contains double or triple bonds or strained rings, and the molecular mass M(CHON) counting only the elements C, H, O and N is more than 150; or
- (c) The compound is solid with a melting point above 50 °C.”.

Renumber existing sections 5.2 and 5.3 as 5.3 and 5.4.

5.2 (renumbered 5.3) In the title, delete “(Division 4.2)”.



5.3 (renumbered 5.4) Amend the title to read as follows: “Substances which, in contact with water, may react to emit flammable gases”.

6 In the title, delete “(Class 5)”.

6.1 In the title, delete “(Division 5.1)”.

6.1.1 In the first sentence, delete “of Division 5.1”.

6.2 In the title, delete “(Division 5.2)”.

## Appendix 7

Amend the title of the appendix to read as follows: “FLASH COMPOSITION TESTS”. Insert a new subtitle to read: “1. HSL Flash Composition Test”. Renumber existing paragraphs accordingly.

In 1.1 (former 1), after “fireworks, that are used” insert “in waterfalls, or”. In the second sentence, replace “lifting” by “propellant”.

In 1.2.2 (former 2.2), replace “vessel is closed by an aluminium bursting” by “vessel is closed by a brass or aluminium bursting”. In the last sentence, after “lead washer” insert “or a washer of a suitable deformable material (for example, polyoxymethylene)”.

In 1.4 (former 4), after “used in waterfalls,” insert “or to produce an aural effect,”. Replace “lifting” by “propellant”. Amend the table to read as follows:

Composition (mass %)	Use or effect	Minimum time for a pressure rise from 690 to 2 070 kPa (ms)	Result
Potassium perchlorate/Aluminium (77/23)	Aural (report)	0.48	Flash composition
Potassium perchlorate/ Barium nitrate/ Aluminium /Magnalium (20/20/45/15)	Aural (report)	2.15	Flash composition
Potassium perchlorate /Potassium benzoate (71/29)	Aural (whistle)	0.89	Flash composition
Potassium perchlorate /Potassium hydrogen terephthalate /Titanium (62/25/13)	Aural (whistle)	1.67	Flash composition
Potassium perchlorate /Aluminium (P2000)/Aluminium (P50) (53/16/31)	Waterfall	2.73	Flash composition
Potassium perchlorate /Aluminium (P2000)/Aluminium (P50)/ Antimony sulphide (50/15/30/5)	Waterfall	1.19	Flash composition
Potassium perchlorate/Charcoal (80/20)	Bursting	0.85	Flash composition
Potassium perchlorate/Charcoal (60/40)	Bursting	2.80	Flash composition
Potassium perchlorate/Charcoal (50/50)	Bursting	9.26	Not flash composition
Potassium perchlorate/ Potassium nitrate /Charcoal (53/26/21)	Bursting	1.09	Flash composition
Potassium perchlorate/ Potassium nitrate /Charcoal (53/26/21) (Cottonseed core)	Bursting	7.39	Not flash composition
Potassium perchlorate/Charcoal /Aluminium (59/23/18)	Bursting	1.14	Flash composition

Insert a new section 2 to read as follows:

## **“2. US Flash Composition Test**

### **2.1 Introduction**

This test may be used to determine if pyrotechnic substances in powder form or as pyrotechnic units as presented in fireworks that are used in waterfalls, or to produce an aural effect or used as a bursting charge or propellant charge, may be considered a “flash composition” for the purposes of the default fireworks classification table in 2.1.3.5.5 of the Model Regulations.

### **2.2 Apparatus and materials**

The experimental set up consists of:

A cardboard or fibreboard sample tube with a minimum inside diameter of 25 mm and a maximum height of 154 mm with a maximum wall thickness of 3.8 mm, closed at the base with a thin cardboard or paperboard disk, plug or cap just sufficient to retain the sample;

A 1.0 mm thick 160 × 160 mm witness plate consisting of steel conforming to specification S235JR (EN10025) or ST37-2 (DIN17100) or SPCC (JIS G 3141) or equivalent having a stretch limit (or rupture strength) of 185-355 N/mm<sup>2</sup>, an ultimate tensile strength of 336 - 379 N/mm<sup>2</sup> and a percentage elongation after fracture of 26-46% ;

An electric igniter, e.g. a fuse head, with lead wires of at least 30 cm in length;

A mild steel confinement sleeve (weighing approximately 3 kg) having an outside diameter of 63 mm and a minimum length of 165 mm with a flat-bottomed round bore whose interior dimensions for diameter and depth are 38 mm and 155 mm, respectively, and a notch or groove cut into one radius of the open end sufficient to allow the igniter lead wires to pass through (the steel sleeve might be provided with a rugged steel handle for easier handling);

A steel ring of approximately 50 mm height with an inner diameter of 95 mm; and

A solid metal base, e.g. a plate of approximately 25 mm in thickness and 150 mm square.

### **2.3 Procedure**

2.3.1 Prior to testing, the pyrotechnic substance is stored for at least 24 hours in a desiccator at a temperature of 20-30 °C. Twenty-five (25) g net mass of the pyrotechnic substance to be tested as a loose powder or granulated or coated onto any substrate, is pre-weighed and then poured carefully into a fibreboard sample tube with the bottom end closed with a cardboard or paperboard disk, cap or plug. After filling, the top cardboard or paperboard disk, cap or plug might be inserted lightly to protect the sample from spillage during transport to the test stand. The height of the sample substance in the tube will vary depending on its density. The sample should be first consolidated by lightly tapping the tube on a non-sparking surface. The final density of the pyrotechnic substance in the tube should be as close as possible to the density achieved when contained in a fireworks device.

2.3.2 The witness plate is placed on the supporting ring. If present, the paperboard or cardboard top disk, cap or plug of the fibreboard sample tube is removed and the electric igniter is inserted into the top of the pyrotechnic substance to be tested and visually positioned to an approximate depth of 10 mm. The paperboard or cardboard top disk, cap or plug is then inserted or re-inserted, fixing the igniter's position in the fibreboard sample tube and the depth of its match head. The lead wires are bent over and down along the sidewall and bent away at the bottom. The sample tube is placed vertically and centred on the witness plate. The steel sleeve is placed over the fibreboard sample tube. The igniter lead wires are positioned to pass through the slotted groove in the bottom edge of the steel

confining sleeve and will be ready to attach to the firing circuit apparatus. Finally, the alignment of the steel sleeve and the witness plate is corrected so that their centres are aligned with the centre of the steel ring. See Figure A7.10 as an example of the test set-up. The cardboard or paperboard disk, cap or plug at the bottom end of the sample tube should be placed properly to avoid air gap between the witness plate and the bottom end of the substance to be tested.

2.3.3 The electric igniter is then initiated from a safe position. After initiation and a suitable interval the witness plate is recovered and examined. The test should be performed 3 times unless a positive result is obtained earlier.

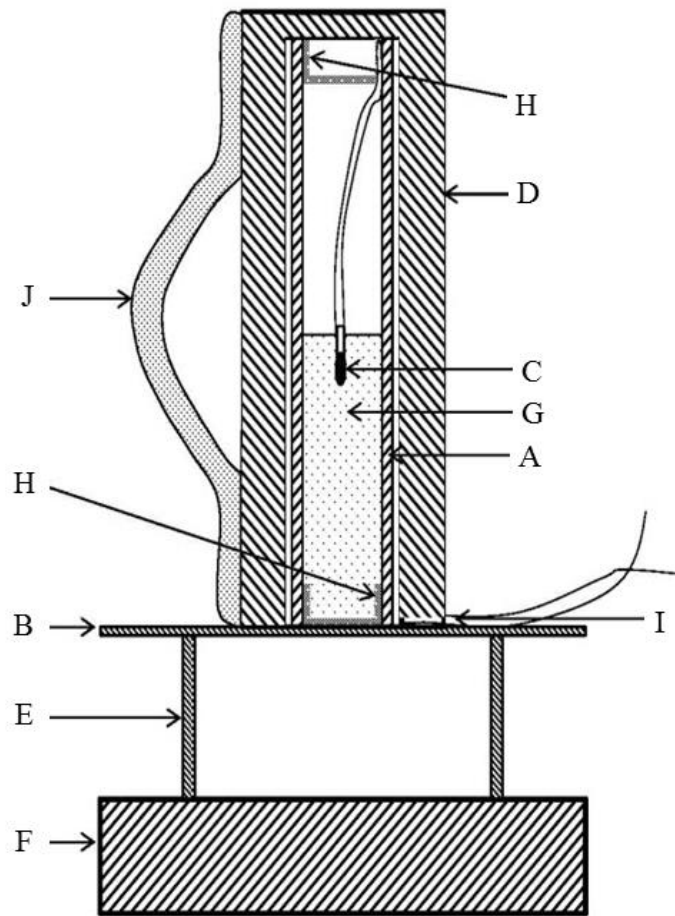
#### 2.4 Test criteria and method of assessing results

The result is considered positive “+” and the pyrotechnic substances in powder form or as pyrotechnic units as presented in the fireworks, that are used in waterfalls, or to produce an aural effect, or used as a bursting charge or propellant charge, are to be considered as flash composition if:

- (a) In any trial the witness plate is torn, perforated, pierced or penetrated; or;
- (b) The average of the maximum depths of indented witness plates from all three trials exceeds 15 mm.

#### Examples of results

Composition (mass %)	Use or effect	Observation of witness plate or averaged depth of indentation (mm)	Result
Potassium perchlorate/Aluminium (77/23)	Aural (report)	Pierced	Flash composition
Potassium perchlorate/Barium nitrate/Aluminium/Magnesium (20/20/45/15)	Aural (report)	11.3	Not flash composition
Potassium perchlorate/Potassium benzoate (71/29)	Aural (whistle)	Pierced	Flash composition
Potassium perchlorate/Potassium hydrogen terephthalate /Titanium (62/25/13)	Aural (whistle)	Pierced	Flash composition
Potassium perchlorate/Aluminium (P2000)/Aluminium (P50) (53/16/31)	Waterfall	Pierced	Flash composition
Potassium perchlorate/Aluminium (P2000)/Aluminium (P50)/Antimony sulphide (50/15/30/5)	Waterfall	Pierced	Flash composition
Potassium perchlorate/Charcoal (80/20)	Bursting	Pierced	Flash composition
Potassium perchlorate/Charcoal (60/40)	Bursting	17.7	Flash composition
Potassium perchlorate/Charcoal (50/50)	Bursting	6.7	Not flash composition
Potassium perchlorate/Potassium nitrate /Charcoal (53/26/21)	Bursting	Torn	Flash composition
Potassium perchlorate/Potassium nitrate /Charcoal (53/26/21) (Cottonseed core)	Bursting	12.7	Not flash composition
Potassium perchlorate/Charcoal/Aluminium (59/23/18)	Bursting	Pierced	Flash composition



- |   |   |
|---|---|
| (A) Cardboard or fibreboard sample tube | (B) Steel witness plate                       |
| (C) Electric igniter                    | (D) Mild steel confinement sleeve             |
| (E) Steel ring                          | (F) Solid metal base                          |
| (G) Substance to be tested              | (H) Cardboard or paperboard disk, cap or plug |
| (I) Groove in sleeve for igniter wires  | (J) Handle welded on (optional)               |

Figure A7.10".