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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
(Nineteenth session, 2-6 July 2001,
agenda item 11 (c) (i))

GLOBAL HARMONIZATION OF SYSTEMS OF CLASSIFICATION AND LABELLING OF CHEMICALS

Physical hazards
Criteria for flammable aerosols

Note by the secretariat

General

1. In order to facilitate discussions on the development of classification criteria for the flammability of aerosols by the UN/ILO Working Group on Classification Criteria for Physical Hazards during the nineteenth session of the Sub-Committee of Experts on the Transport of Dangerous Goods, the secretariat has prepared the present document summarizing the agreements reached so far and the issues still at stake (see also the reports of the Working Group in documents ST/SG/AC.10/C.3/36, Annex 4 and ST/SG/AC.10/27, Annex 5).

The results have also been summarized in the form of a draft flow chart for classification in the Annex to this document, for further improvement.

Definition of aerosols

2. A definition of aerosols is available (see ST/SG/AC.10/C.3/28/Add.3, annex, para. 3.4), as follows:

> "Aerosols, this means aerosol dispensers, are any non-refillable receptacles made of metal, glass or plastics and containing a gas compressed, liquefied or dissolved under pressure, with or without a liquid, paste or powder, and fitted with a release device allowing the contents to be ejected as solid or liquid particles in suspension in a gas, as a foam, paste or powder or in a liquid state or in a gaseous state."

Hazard levels

3. The UN/ILO Working Group agreed that there should be at least two hazard levels (FLAMMABLE, EXTREMELY FLAMMABLE).

Issue to be considered:

The Working Group should decide whether or not a third intermediate (highly flammable) level is necessary (see ST/SG/AC.10/27, Annex 5, paras. 9, 15 and 16, see also FEA/CSPA suggestion in ST/SG/AC.10/C.3/2001/8, para. 4 (a) that the number of levels can be limited to the two above levels).

Flammable components criteria

4. Aerosols should be considered for classification as Flammable if they contain any flammable component which is classified as flammable according to the GHS criteria, i.e.:

flammable liquids (flashpoint # 93 °C) (see ST/SG/AC.10/C.3/28, Annex, para. 3.1)
flammable solids (see ST/SG/AC.10/C.3/28, annex, para. 3.2)
flammable gases and gas mixtures (see ST/SG/AC.10/C.3/28/Add.3, Annex, para. 3.3)

***NOTE**: The Working Group agreed that the designation "any flammable components" did not cover pyrophoric, self-heating or water-reactive substances, because according to representatives of the aerosol industry, such components are never used as aerosol contents (ST/SG/AC.10/C.3/36, Annex 4).*

5. Aerosols with 1% or less of flammable components should be classified as non-flammable (ST/SG/AC.10/27, Annex 5, para. 8).

6. Aerosols with 85% or more flammable components should be classified as Extremely Flammable (ST/SG/AC.10/27, Annex 5, para. 8).

Issue to be considered:

There are examples quoted by the industry where aerosols with less than 1% flammable materials in them may ignite in the flammability tests and conversely, aerosols with more than 85% flammable materials that would not ignite in the flammability tests and have a low chemical heat of combustion. From this it would appear that the percentage of flammable material might not be a useful indicator of the behaviour of an aerosol, and a new proposal has been submitted by FEA/CSPA in ST/SG/AC.10/C.3/2001/8, para. 4 (c).

Test criteria

7. The test regime for flammability of aerosols should consist of three tests (ignition distance test, enclosed space test, foam test) and aerosols should be classified as Flammable if any of the tests give a positive result (ST/SG/AC.10/C.3/36, Annex 4).

Issue to be considered:

A text for test procedures has been proposed by FEA/CSMA in document ST/SG/AC.10/C.3/2000/34, but has never been formally endorsed. Comments were submitted by the United States of America in informal document UN/SCETDG/18/INF.42. The only agreement recorded is that aerosols containing 1% or more of flammable components should be tested in the position in which the dispenser is designed to be used , and if the test results were negative, an additional test should be carried out in the position of the dispenser

most likely to result in a positive result. Some delegations felt that the requirement to conduct the test in the additional direction should only apply in the case of the ignition distance test. The Working Group may wish to confirm whether the test procedures, as drafted in ST/SG/AC.10/C.3/2000/34 are suitable or need be amended.

Foam test

8. For foam aerosols, if there is a stable flame of 4 cm height for 2 seconds or more, the aerosol should be considered as flammable (ST/SG/AC.10/27, Annex 5, para. 10).

Issue to be considered:

Foam aerosols will be classified as Extremely Flammable if there is a stable flame of [≥ 20 cm] [and] [or] [seven or more] seconds. These extreme flammability figures were placed in square brackets pending verification by the industry (ST/SG/AC.10/27, Annex 5, para.10) (see also ST/SG/AC.10/C.3/2001/8, para. 4 (b)).

Spray aerosols

9. For spray aerosols, if the chemical heat of combustion was above 20 kJ/g, the aerosol would be considered as flammable (ST/SG/AC.10/27, Annex 5, para. 11).

Issues to be considered:

(a) The Working Group agreed that, if the chemical heat of combustion was above [30 kJ/g] the aerosol would be considered as Extremely Flammable (ST/SG/AC.10/27, Annex 5, para. 11).

The Working Group should consider the value in square brackets.

(b) The Working Group may also wish

(i) to consider whether the chemical heat of combustion criterion should also apply to foam aerosols;

(ii) to indicate which standard should be applied to determine the chemical heat of combustion or to draft a standard method.

10. For spray aerosols if the chemical heat of combustion was below 20 kJ/g, an ignition distance test should be performed and the aerosol would be considered as flammable if ignition occurred at a distance between 15 cm and 90 cm (ST/SG/AC.10/27, Annex 5, para. 12).

Issues to be considered:

(a) The Working Group agreed that the aerosol would be considered as Extremely Flammable if ignition occurred at a distance of [45 cm/90 cm] or more. The values between square brackets have to be confirmed;

(b) Since classification as extremely flammable is possible for aerosols with a chemical heat of combustion above 30 kJ/g or below 20 kJ/g, the Working Group may wish to consider whether there should be a criterion for classification of aerosols as extremely flammable when the chemical heat of combustion is comprised between 20 and 30 kJ/g.

Enclosed space tests

11. If there were no positive results in the ignition distance test then tests should be carried out to assess the propensity to ignite in an enclosed space. These tests assess the time it would take to ignite in a volume of $1m^3$ and the density of aerosol that may ignite in $1m^3$. As the tests are usually performed in receptacles that are not a standard cubic metre, the results are expressed in the time and density equivalent to that for a cubic metre (ST/SG/AC.10/27, Annex 5, para. 14).

Issue to be considered:

The Working Group should discuss the threshold values which have been left between square brackets ([150] [300] $s.m^{-3}$ for the time equivalent and [150] [300] [600]$g.m^{-3}$ for the deflagration density.

Annex

Figure 1 (a) : FLOW CHART SCHEME FOR CLASSIFICATION OF AEROSOLS WITH RESPECT TO THEIR FLAMMABILITY - Preliminary screening

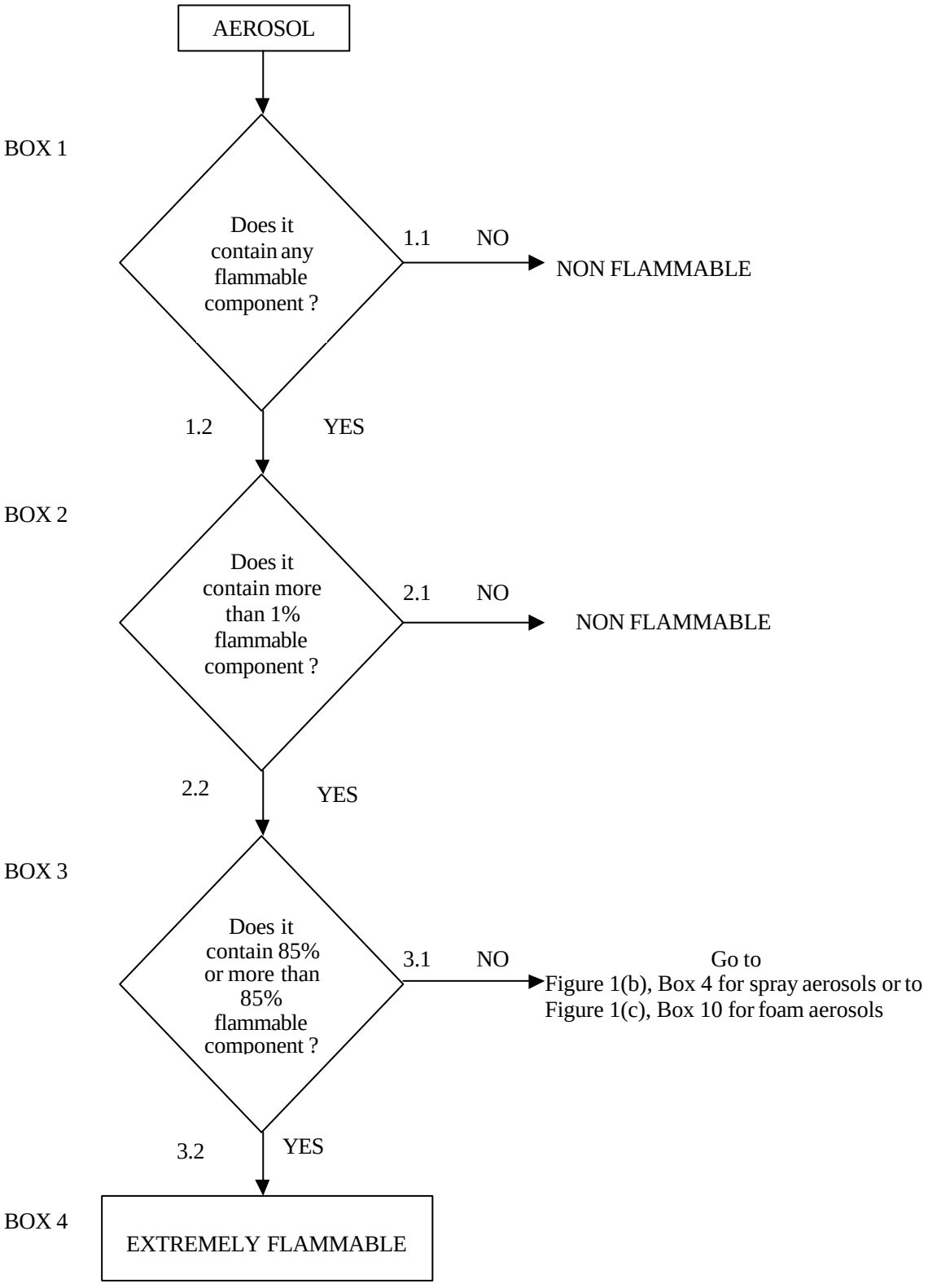

Figure 1 (b) : FLOW CHART SCHEME FOR CLASSIFICATION OF AEROSOLS WITH RESPECT TO THEIR FLAMMABILITY - Testing of spray aerosols

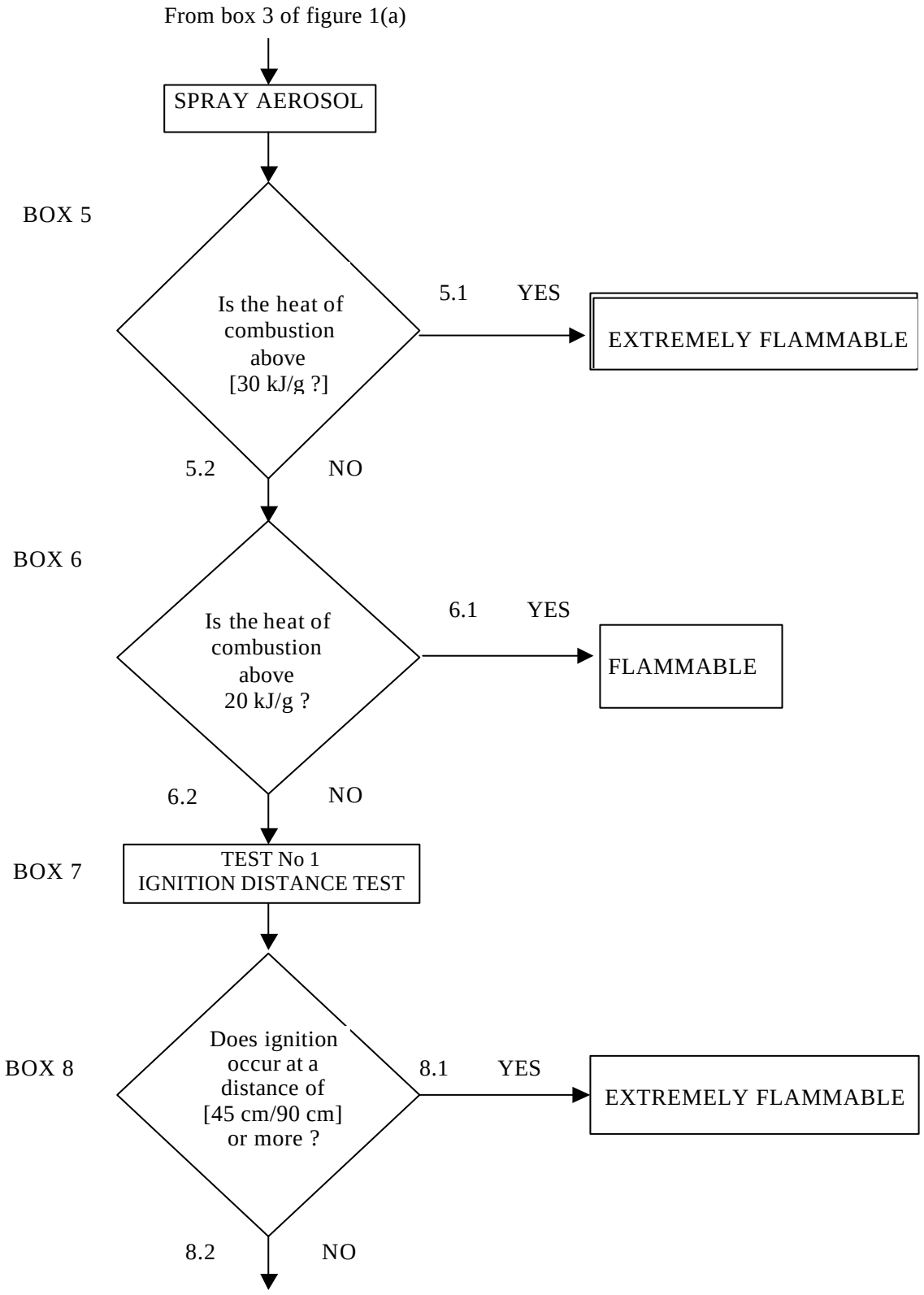

Figure 1 (b) : FLOW CHART SCHEME FOR CLASSIFICATION OF AEROSOLS WITH RESPECT TO THEIR FLAMMABILITY - Testing of spray aerosols (**Cont'd**)

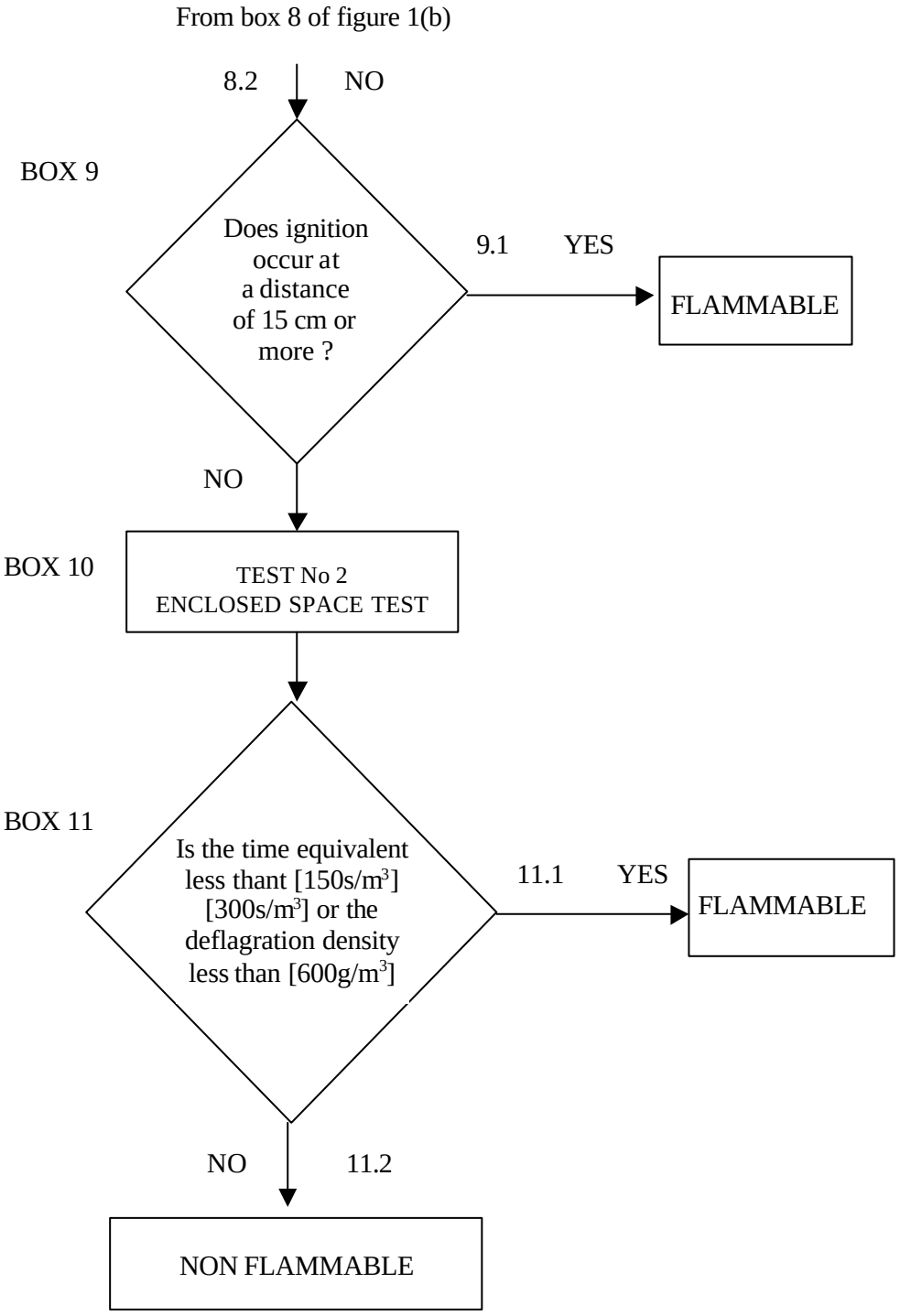

Figure 1 (c) : FLOW CHART SCHEME FOR CLASSIFICATION OF AEROSOLS WITH RESPECT TO THEIR FLAMMABILITY - Testing of foam aerosols